

## The Ottawa Cleantech Report

Volume I - Winter 2007

The cleantech movement is growing. These are some of the cover stories from the October issues of some leading magazines:

- National Geographic Magazine—"Growing Fuel, The Right Way, The Wrong Way"
- Maclean's Magazine—"Alberta Accused of Environmental Armageddon"
- Atlantic Magazine—"How to be a Moral Investor"
- Newsweek—"Giving Globally, How to Heal the World (or at least make a real difference)"

In October the Intergovernmental Panel on Climate Change and Al Gore Jr. were awarded the Nobel Peace Prize for their efforts to build up and disseminate greater knowledge about man-made climate change. One month later the IPCC released its Fourth Assessment Report in Valencia Spain citing the unequivocal rise in global temperature and its links to the concentration of greenhouse gases in our atmosphere. Recently Google announced its "Renewable Energy Cheaper than Coal" initiative saying it will spend hundreds of millions of dollars to create alternative energy sources that are cheaper than coal, the world's dominant fuel source and pollutant. Most recently at the United Nations Climate Change Conference in Bali 187 countries agreed to launch negotiations towards a crucial and strengthened international climate change deal.

There is little doubt that there is a growing global consciousness about the issues that affect our environment and climate. In Canada the environment is consistently among the top five concerns of those polled. So there is definitely the will (my own personal belief) but who has the way?

In order for a solution to any one of the many problems surrounding fossil fuels, energy and the environment to work it has to be able to be integrated into the way we do things in an economically sustainable way. It does not matter how much potential a new technology or methodology has; if it cannot be successfully adopted by industry purely from the perspective of economics then it will never be deployed in large enough numbers to actually make a difference on the environment.

So where does the Ottawa Cleantech Initiative fit into all this? The Cleantech Initiative is part of OCRI Life

Sciences, one of the Ministry of Research and Innovation's Regional Innovation Networks (RIN) with a focus on Ottawa and Eastern Ontario. The important distinction here is that it is an 'innovation' not an 'invention' network. Inventions can sit dormant for years whereas an innovation by definition is a new way or process of actually doing something. It takes many players to get a new process or technology from innovation through to commercialization where it can become an economically viable and sustainable way of achieving a result.

These players are varied and include researchers and inventors that invent a new technology; companies that take new technology and explore its viability in an industry setting; investors that provide capital to commercialize a proven technology; and policy makers and governments that regulate sectors and create an atmosphere that encourages investment in those sectors. This is just one example of the many ways that stakeholders can collaborate. The Ottawa Cleantech Initiative is the regional hub through which all interests in clean technology (clean energy, bioproducts and environmental technology) can form the relationships needed to successfully and in a sustainable fashion change the way we do things.

According to Corporate Knights Magazine, six of the Next 10 Emerging Cleantech Leaders of Tomorrow are based right here in Ottawa. In this edition of the Ottawa Cleantech Report I speak with the President and CEO of Menova Energy Inc.—one of the six.

I look forward to working with you in the upcoming year to build on these and many other regional strengths and to realize our potential to be the clean technology capital of Canada.




Marc Macarthur  
Manager,  
Ottawa Cleantech Initiative

## An Interview with Menova Energy Inc.

Featuring Dave Gerwing, President and CEO

**MARC:** What is Power-Spar technology and how is it different from what is currently on the market?

**DAVE:** The Power-Spar is a solar concentrator made up from a highly reflective aluminum surface in an asymmetric trough configuration that tracks the sun on two axes, elevation (up and down) and azimuth (side to side). The Spars (individual troughs) are arranged in arrays of 6 and being Engineers of course the guys all call them six packs. Each six pack has about 77 sqm of area tracking the sun. From this area we can produce heat, electricity, and pipe light through plastic optical fibres to essentially supply all the forms of energy needed by a building. The systems can be flat roof, ground or raised parking lot mounted and can be configured to supply about 18 Kw of electricity (Kwe), 46 Kw of heat (Kwth) or about 2.3 million lumens of light per array of six 40 foot Spars. That is the technology.

**MARC:** How did you first determine that there was potential for this kind of product and what motivated you to pursue it?

**DAVE:** Menova Energy was spun out of Menova Engineering which has successfully developed industrial products for Ontario companies such as MDS Nordion, Ontario Power Generation Corporation, Black and Decker and Honeywell since 1995. In 1998, I, along with many other residents of the North East experienced the now Epic '98 Ice Storm. At the time, my wife and I had a five month old baby (Joshua) an electric furnace and an open hearth wood fire place. We were without heat and power for 12 days and it was a real foreshadowing event for me, as to what life would be like without natural gas or electricity. At the time our engineering company had thermal, structural and systems expertise, so we began investigating renewable energies. We started with solar thermal systems, knowing that peak oil was just around the corner. With oil at about \$20/brl then, a lot of our colleagues did let us know at the time, in no uncertain terms, that we were dreamers and wasting engineering talent. With Nymex crude oil price this morning over \$94/brl, most of those same colleagues now regard Menova management as visionary.

**MARC:** What was it like developing this kind of technology in the Ottawa environment, say compared to Montreal or Toronto?

**DAVE:** Developing the product in Ottawa was tough because there is not a lot of heavy industry manufacturing in the City. Remember, the Power-Spars are large—40' long and 4' wide. We tried to use local firms for the fabrication but this ended badly due to unacceptable quality control. Whereas there is a lot of IT talent in Ottawa, high volume manufacturing talent for large precise structures is definitely lacking. We finally ended up setting up our own facility for assembly and getting some key parts manufactured in Toronto in high volume.

Experienced Industrial controls personnel are also tough to come by in Ottawa, we eventually ended up using the southern Ontario talent and co-developing our in-house capability. One area I thought would be a slam dunk for Ottawa was the optics, unfortunately there seems to be a quite a long list of consultants that will charge significantly for their "expertise", while not really adding value or coming out of their comfort zone by adopting new software or techniques to rally around a new industry. So again we were forced to develop our own in-house expertise, which in addition to paying the first round of consultants makes it extremely expensive to do business. So all in all I would say that, as with any business, you need to have the key core competencies in-house and build the business from the ground up.

From 2002 to now was not a great time to try to raise money in Ottawa for Cleantech. We wasted many, many hours with so-called self-titled "Angels". It turned out that they want extravagant portions of the company for terse, academic, one-atom-deep-analysis of the business in return for investments of as little as \$10,000 in one case. Unfortunately, we have found the private investment community in Ottawa to be conservative, hugely risk averse with respect to cleantech. On the other hand, we found seasoned professionals in Toronto through personal connections have been the

antithesis, working tirelessly inside the organization making real differences shoring up our weak spots, contributing 100's of thousands of their own capital and leveraging their personal networks and making key industrial connections for manufacturing.

The huge advantage of being in Ottawa, seems to have been that we are in a city that is home to the Federal Government making interfacing on policy development and funding programs as well as attending government-sponsored trade shows and workshops easy and cost effective. This along with improved connections to the US and Europe through our airport have helped to extend Menova's reach internationally. Having the patent office close and a great team of IP professionals has also been key to our business.

**MARC:** Were there any partners that were or are instrumental in the success of Power-Spar? Was it difficult to find partner(s) here in Ottawa?

**DAVE:** It is definitely not possible to succeed in a vacuum in today's market; you need the best of everything to just be a contender. We have succeeded because of one-to-one personal contacts with people who believed in us and our approach to the marketplace. These people, our government sponsors, advisors, and now board members went way out of their way to connect us to groups and companies with a congruent vision for the future. There is also another long line of potential partners that wanted it all up-front, guaranteed, unrealistic demands, exploitive proposals that we are not doing business with today. Any potential cleantech entrepreneur should be prepared for both the best and the worst times of their lives when launching a new company in Ottawa, it is not easy. Only those with unquestionably supportive families and friend networks, nerves of steel, excellent connections, uncanny technical talent and the ability to completely reinvent themselves and their companies several times during the course of the company building process will survive past year five.

**MARC:** In your view what is the future direction of the solar industry both short term and long term?

**DAVE:** Looking at all the data and following what is happening on the US capital markets, solar energy has a very, very bright future and will play a bigger role than anyone has currently

forecast in the future world energy mix. In Ontario today with the 42 cent per kilowatt-hour feed in tariff, one acre of Power-Spars can return over \$500k/year in revenue. These kinds of returns, coupled with great business plans, have the ability to provide sub-five year ROI numbers today in Ontario where the sun shines less than ½ the amount of time it does in South Western USA. When people think solar they think standard flat panel 12-15% efficient PV-Electricity panels with only ROI's of 15-20 years. The Power-Spar changes that paradigm by delivering the electrons more cost effectively, and also by co-generating heat and light, adding significantly to the value proposition. Combined energy systems like this, coupled with the high volume manufacturing and regional assembly facilities proposed by Menova, will change the solar industry in the short term.

In the longer term, we must remember that the earth is a closed loop system and the only real source of sustainable energy input is the sun. Fossil fuel, bio-energy, wind, and hydro-energy all ultimately get their energy from the sun. In the case of oil it is just a timing difference of 150 million years or so between the original photosynthetic event and the pumping up of the transformed product today. Once the savvy long term investor realizes this, and starts the real accounting on energy, they will see very clearly that by investing in systems that can sustainably and cost effectively harvest solar energy and convert it into multiple value streams today. They will be way ahead of the next revolution which I like to call our sustainable future.

**MARC:** Are there any exciting things that you have planned for Menova Energy that you can share with us? What are you excited about?

**DAVE:** Well, I don't sleep much these days because there is so much to be excited about.

We have just won a Next Ten award at the recent Cleantech Forum held in Toronto from the Corporate Knights Magazine as one of the top ten privately held Clean Tech companies in Canada and that is very gratifying for all of team at Menova who have worked diligently and innovatively over the past years.

In addition, Menova was named one of Canada's Top 10 Cleantech companies. Canada's Top 10 is a program developed by OCRI and sponsored by BLG that provides

coaching and puts companies and investors face-to-face. Menova is really excited to take part in the Investment Forums in Boston and New York in January 2008.

Sustainable Development Technologies Canada (SDTC) has recently announced a grant to Menova and Trident Exploration from Calgary to develop a Solar Concentrating Bio-Reactor for the production of Algae that can then be used to create bio-based renewable fuels.

Our expansion into the European market is very exciting and we are very grateful for the partners we have there and the way they have embraced our technology.

Each day the fundamental drivers that support our business model are accelerating; rising conventional energy prices, peak oil, climate

change, air quality, solar energy feed in tariffs popping up all over the world, CO2 cap and trade system introductions, and certainly innovation on our side. With nine solid years of development experience behind us, functional concentrators in the field, and the support of the Canadian Federal Government TEAM (Technology Early Action Measures) program administered by a team of very supportive professionals at Natural Resources Canada and Sustainable Development Technologies Canada (SDTC) and of course the on-going support of the Ontario Centres of Excellence (OCE) personnel, we are well ahead of the pack that is only now waking up to the new energy reality and the current voracious demand for renewable energy.

Watch the news wire and our web site for other upcoming announcements.

### ***Power-Spar technology is different than is what is on the market in the following ways:***

- Most other systems are dedicated single source generators providing either low grade heat, PV electricity, or light, the Power-Spar can mix all three in the same array.
- The Menova Power-Spar uses advanced triple junction solar cells which have set efficiency records of over 40% today and we use 1000 times less of them than conventional one sun flat panel PV modules, of which, the best is rated at less than 20% efficient today!
- On the electricity side, which currently has the best return-on-investment, the Power-Spar is the only system on the market which allows the solar cells to be in-field upgraded. Historically this did not matter, since we took from 1954 to 2007 to get from 6 to 21% efficient for conventional 1-sun silicon based solar cells (0.28 absolute % increase/year) see article below. The need for upgradeability becomes apparent when we see this compared to a projected efficiency increase of near triple that at 0.9 absolute%/year for the new multi-sun triple junction solar cells.
- The Power-Spar mounts in unique ways to either the ground, roof tops or raised parking lot structures allowing vehicles to easily park under while at the same time providing shaded parking, very valuable in hot climates such as the US southwest.
- Most PV systems are air cooled with natural convection. The Power-Spar comes in two PV versions, air cooled and liquid cooled. The liquid cooled system can operate up to 20% more efficiently in hot climates by keeping the cells cooler than the air cooled version. In Ontario with the production-based feed-in tariff of 42 cents/kwh that can mean an extra 8 cents per kilowatt-hour, no small potatoes.
- The ability to cost-effectively capture and photons simultaneously with heat is unique to the Power-Spar. This ability has enabled Menova to develop a Solar Concentrating Photo-Bioreactor (SC-PBR) which will be used to cost effectively produce the next generation of algae-based bio-feedstock used in renewable fuel production. This is a corner stone technology for Canada that uses waste CO2 from industrial processes as the main feedstock to produce bio-fuel anywhere the sun shines.

## Patent Issues in Cleantech: What You Need to Know

A cleantech company's proprietary technology may be its most valuable asset. In fact, at a cleantech session at BioNorth 2007, Duncan Stewart, Director of Research at Deloitte Canada, defined the emerging industry as "proprietary intellectual property having to do with energy, earth, water and air."

Patents are the foundation of a company's intellectual property portfolio when technology is involved. While patents can be costly, the cost of not obtaining patent protection can be much higher. Many companies in the cleantech space are trying to solve the same problems, and chances are that a competitor may independently come up with a solution similar to yours—and patent it.

Below are answers to some basic patent questions.

**What is a patent?** A patent is an asset and a business tool that can be used to attract investment or partnership, defend against competitors, or obtain licensing revenue. A patent is also a contract with the government, where the government grants a limited monopoly for an invention in exchange for a public disclosure of how to make and use the invention.

**What can be protected?** Patents can be used to protect new and useful proprietary technology such as methods, devices, software, new compounds, and even novel products or by-products from proprietary processes. Most patents are improvements on existing technologies.

**What does a patent give you?** A patent gives the patent owner the right to exclude others for 20 years from making, using or selling the claimed invention. It does not guarantee freedom to practice the invention. For example, if you have a patent on a fuel cell with improved control circuitry, you may need to get a license from the owner of the patent on the first fuel cell.

**What do I have to include?** You have to describe the invention in enough detail to enable someone who works in the field to make and use the claimed invention without undue experimentation. You also have to describe the "best mode" for carrying out the invention.

**Where should I get protection?** Patents are regional, so you need to file a patent application in each country or region in which you want protection. Typically, companies choose to file patent applications in the markets in which they intend to do business and/or where their competitors or potential partners do business.

**What about related disclosures and publications?** In most countries, you must file a patent application before disclosing the invention to the public. In Canada and the US, there is a one year grace period for applicant-derived disclosures.

**What should be patented?** Companies should seek patent protection for key products or features that are easy for competitors to reverse engineer, and which will be made public, such as in journals or at trade shows.

Patents can add value to a company, and a registered patent agent with can provide the technical and legal guidance to use patents to help you grow your business.

*Curtis B. Behmann is a professional engineer and registered patent agent with the Ottawa office of Borden Ladner Gervais LLP. He advises small and large clients, including cleantech and high-tech companies, on global patent strategy and portfolio management.*

## Researcher Profile: Junjie GU

Junjie Gu is an Associate Professor with Carleton University's Department of Mechanical and Aerospace Engineering. The scope of Dr. Gu's research is broad and encompasses transport phenomena in micro-scale processes; two-phase flow and heat transfer; heat pumps and refrigeration; automobile air conditioning systems; sorptive refrigeration; solar air conditioning; waste-heat refrigeration; waste-heat power generation; microbubble generation for biomedical purposes.

Dr. Gu completed his PhD in Mechanical/Chemical Engineering at the University of Kaiserslautern in Germany in 2000. From 2000-02, he was a Post-doctoral NSERC Research Fellow at the University of Toronto. He joined the Department of Mechanical and Aerospace Engineering at Carleton in July, 2002.

He has already received several awards including the 2006 Petro-Canada Young Innovator Award, a 2006 Research Achievement Award from Carleton, a 2005 Recognition Award from SAE, and a German Academic Exchange Service Scholarship from 1995-2000. He has published several articles in noted journals and written a book Simulation of an Adsorption Process for an Activated Carbon Column (original in German, Shaker Verlag, Aachen, Germany). He also has two patents to his credit.

Dr. Gu's work in the areas of energy and fluid flow areas has the potential to make a large impact in the cleantech sector. In early 2007, Dr. Gu submitted a proposal to the Ministry of Ontario's Ontario Research Fund (ORF) to establish a "Trans-critical Fluid Flow

and Heat Transfer" research group at Carleton University with a capability for heat transfer and fluid flow studies at sub-critical, near critical, trans-critical and super-critical conditions.

In addition, Carleton University's engineering department received \$99,000 from the Technology Development Fund to investigate and develop heat-driven refrigeration technology for use in home air conditioning, refrigeration and heat pump systems.

The four-stage project, scheduled for completion in March 2008, will produce a prototype based on a Double Mechanism Sorptive Refrigeration (DMSR) system. The DMSR system involves a solid-liquid-vapour heating process that uses significantly less electricity to lower cooling temperature than is possible in current refrigeration systems, which rely on a vapour recompression cycle. The advantages here are that this system can be powered using low temperature waste heat sources and do not involve refrigerants that can be hazardous to the environment.

Developing and commercializing new, energy-efficient ways to keep cool would help reduce Ontario's peak demand and increase system reliability, especially on hot summer days when Ontario's electricity peak demand is highest.

For more information on Dr. Gu or his projects, visit [www.carleton.ca](http://www.carleton.ca).

## Industry News

**December 13, 2007**

### Deadline set for big polluters

Ottawa has formally notified Canada's biggest industrial polluters they have six months to submit emissions data the government will use to set binding reductions target, Environment Minister John Baird said yesterday. [Full Story](#)

**December 4, 2007**

### Plasco wins big backer for garbage gasification

Tyler Hamilton, Toronto Star

Plasco Energy Group Inc., an

Ottawa-based company that turns municipal solid waste into electricity, has raised \$35 million in private funding and secured a commitment next year of another \$115 million from a major American fund manager. [Full Story](#)

**November 28, 2007**

### Google Sets Goal of Making Renewables Cheaper Than Coal

Source: Clean Edge News

Google recently announced a new strategic initiative to develop electricity from renewable energy sources that will be cheaper than electricity produced from coal. The

newly created initiative, known as RE<C, will focus initially on advanced solar thermal power, wind power technologies, enhanced geothermal systems and other potential breakthrough technologies. [Full Story](#)

**December 3, 2007**

### First reserve leads Plasco Energy equity funding

Plasco Energy Group Inc. ("PlascoEnergy" or the "Company") of Ottawa today announced that First Reserve Corporation ("First Reserve") of Greenwich, Connecticut, the largest U.S.-based

private equity firm that specializes in the energy industry, has led an equity issue by the Company with the purchase of C\$35 million in common shares. This issue of shares also triggers the exercise of outstanding warrants to purchase additional common shares for C\$14.3 million scheduled to be received on December 31, 2007. Total proceeds of these issues will be C\$54 million. [Full Story](#)

**December 3, 2007**  
**Canada rolls out \$1.5B biofuels initiative**

Source: David Ehrlich, cleantech.com

Producers of gasoline alternatives will be eligible for incentives of up to 10 cents per liter, with 20 cents for biodiesel. The Canadian government announced the details of a Cdn\$1.5 billion biofuels initiative today, offering producers in the country incentives for gasoline and diesel alternatives. [Full Story](#)

**October 26, 2007**  
**The Toronto Cleantech Forum in pictures**

By Dallas Kachan, cleantech.com

Couldn't make the Toronto Cleantech Forum? See what you missed. It was a cleantech event unlike any that Canada had ever seen, said participants. [Full Story](#)

**October 25, 2007**  
**SDTC Portfolio Reaches \$1 Billion in Cleantech Funding: \$30.3 million in new funding approved for 14 companies**

Canada's clean tech economy reached a major milestone today with Sustainable Development Technology Canada (SDTC) announcing that its SD Tech Fund(TM) investment portfolio has surpassed \$1 billion. [Full Story](#)

**October 24, 2007**  
**Plasco Energy Delivers Power to Hydro Ottawa Grid**

Plasco Energy Group Inc. ("PlascoEnergy") delivered electricity to Hydro Ottawa yesterday, generated by an engine fueled with PlascoEnergy syngas. "This is a very important milestone in bringing the PlascoEnergy facility into full operation," Rod Bryden, President and CEO said. [Full Story](#)

**October 2007**  
**Bridging the Clean-Tech Developing-World Divide**

Source: Ron Pernick, Cleanedge

The late Donella Meadows, a great environmental scientist, educator, and visionary, was one of a number of people to help put into context the state (and plight) of the modern world. She came up with an exercise that asked "what would the world look like if it were a village of

100 people." Her work on this concept is continued today by the folks at the [Miniature Earth Project](#). [Full Story](#)

**September 19, 2007**  
**Amyris pulls in \$70M for unique biofuel**

Source: David Ehrlich, cleantech.com

The California startup says its bio-gasoline is compatible with regular car engines and can be used at very low temperatures. [Amyris Biotechnologies](#), which announced \$70 million in Series B funding today, says it can make a biofuel that can run in regular car engines, not just diesel, and it can do it with current biofuel plant technology. [Full Story](#)

**September 13, 2007**  
**Canada launches \$500M fund for next-gen biofuels**

Attention all developers of technologies for producing next-generation biofuels, particularly cellulosic ethanol: Canada may invest up to \$200 million in your plant, as long as it's based on Canadian soil and can turn local biomass into renewable fuel. [Full Story](#)



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