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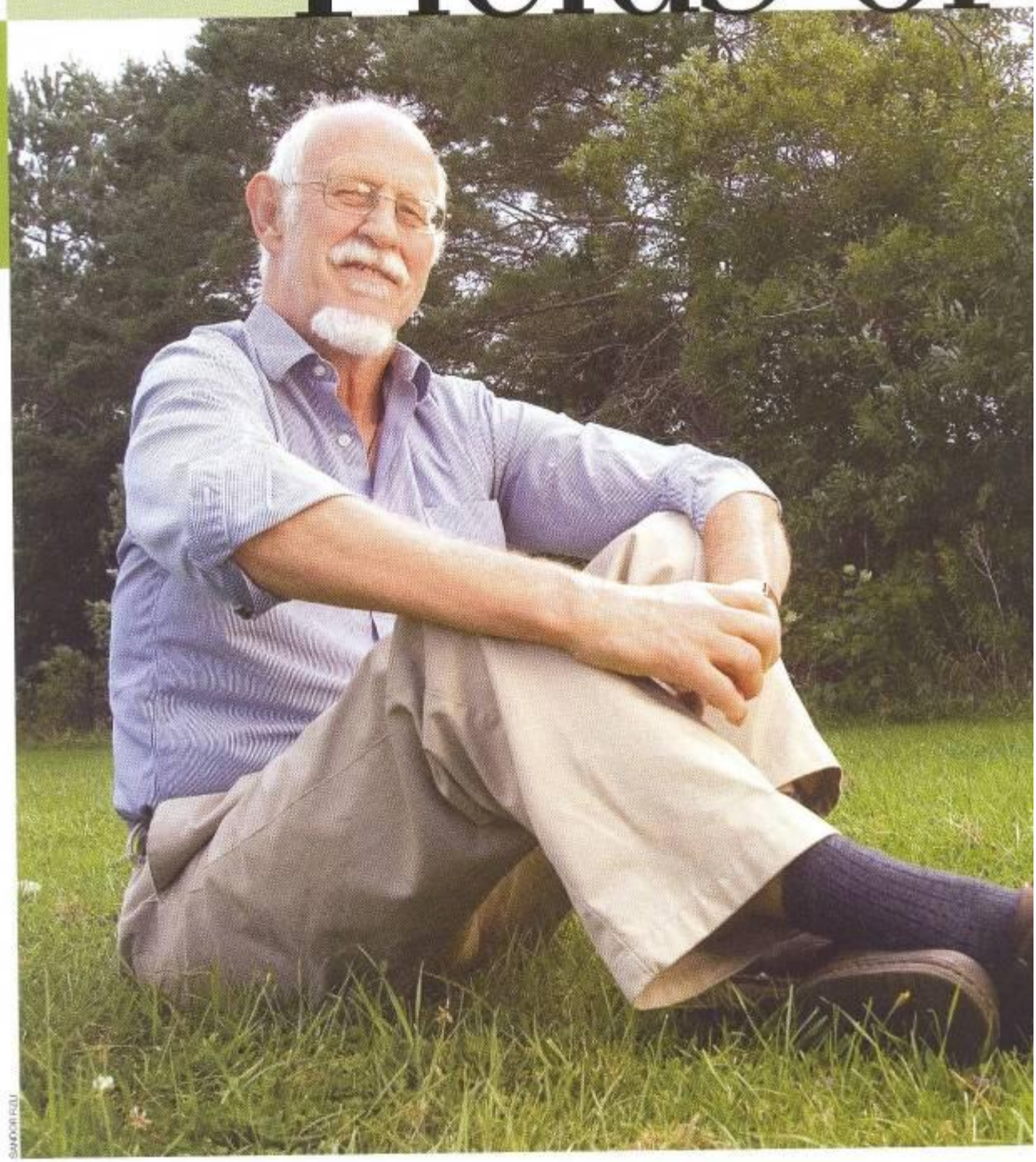

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green

Bob Maher: "The work being done here will raise Nova Scotia's global profile."

Applied research in tidal, wind, and solar power is raising the profile of green energy alternatives

by Allison Lawlor

Bob Maher has always cared about the environment. "It's important to reduce our impact on the planet," he says. "It's a philosophical thing." In his own modest way, Maher limits his ecological footprint on the Earth. When he can, he leaves his car at home and bicycles the 12 kilometres along winding country roads to his office in Middleton, in the heart of Nova Scotia's fertile Annapolis Valley. At home he tends a big garden, where he grows herbicide-free vegetables.

In 2000, after many years of hard work, opportunities to work on renewable energy projects began at the Applied Geomatics Research Group (AGRG) at the Nova Scotia Community College's Centre for Geographic Sciences (*agrg.cogs.nscc.ca*). Maher leapt at the chance to further pursue something he cared about both personally and professionally. "This builds on our previous strengths, like software development, and the application of geographically–based technologies,"

says Maher, the AGRG's senior research scientist. Consisting of 17 core staff members, his group is recognized for its use of geomatics tools in environmental research, such as geographic information systems, global positioning systems, and remote sensing.

The AGRG was founded with financial support from the Nova Scotia Research and Innovation Trust and the Canada Foundation for Innovation. "We're really a technology-integration department," says Maher. It's because of this technology that the AGRG is now working on three different renewable energy fronts: wind, solar, and tidal. In a province that has signalled that it wants to become greener, Maher sees a place for his research group in the growing alternative energy sector. Earlier this year, the province introduced regulations that require about 20% of its electricity to be generated by renewable energy by 2013. As a result of the new legislation, Nova Scotia Power has put out a tender for 130 megawatts of renewable energy; the company estimates that this will result in almost $300 million in new investments in the province.

"There is probably going to be a flurry of activity on the tidal front," predicts Maher. "The work being done here will raise our global profile." With the highest tides in the world, the Bay of Fundy, located between Nova Scotia and New Brunswick, has garnered a lot of attention for its green potential. Research from the Palo Alto, Calif.–based Electric Power Research Institute identifies that body of water as potentially the best site in North America for large-scale, grid-connected, tidal-energy generation.

With 100 billion tonnes of seawater flowing in and out of the Bay of Fundy each day, it has more than the combined flow of the world's freshwater rivers. When fully developed, estimates are that new tidal technology has the potential to generate 300 megawatts of emission-free energy from eight locations in Nova Scotia—that's enough energy to power close to 100,000 homes.

To help make that happen, Tim Webster, an AGRG research scientist, is working with ATEC Power Inc., a Windsor, N.S.–based company established in 2005 and a contender to develop tidal power in Atlantic Canada. "It seemed like a natural fit," says John Wightman, who is an owner of ATEC Power. "They're a leading facility doing this type of research in Canada," he adds, referring to AGRG's expertise in global positioning system and remote sensing.

Wightman and his organization want to have a better understanding of the nature of the Bay of Fundy's tidal currents, so Webster is amassing huge amounts of information on the bay, ranging from bottom type and currents, to the location of infrastructure such as power lines. After collecting digital maps and charts from various government agencies and research departments, Webster will use a computer-mapping system to produce one detailed map that will overlay all of the information, allowing it to be viewed simultaneously. He will then develop a website for ATEC Power, where the information can be posted.

Preliminary tidal-current studies conducted in 2005 by ATEC Power show the Minas Passage, an area about 12 kilometres long and five kilometres wide between Cape Split and Cape Blomidon, as the most favourable site for tidal power generation. Still, Webster says it's too early in his research to name a specific test site for ATEC to potentially locate its underwater hydrokinetic tidal turbine designed by Annapolis, Md.–based UEK Corp. Wightman will say that the Minas Passage is the prime location when it comes to tidal power: "We obviously want to be a player in that hot spot."

Webster is also working with the Geological Survey of Canada on another project in the Bay of Fundy, which uses LiDAR technology to collect topographical information. The technology works by mounting a piece of the

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equipment on an aircraft and sending a laser down to a specific area to collect data. Once the data is collected and modelled, the Geological Survey will combine it into its surveys, providing additional information for those interested in developing tidal power.

LiDAR technology is one of the ways the AGRG is distinguishing itself from other educational institutions, not only in Canada but also worldwide. To Maher's knowledge, there are only four other academic institutions in the world with this multimillion-dollar piece of equipment. Currently, the centre's LiDAR technology is being loaned to researchers in Alberta; flying over the glaciers in the Canadian Rockies, they will use it to map the area in precise three-dimensional detail. Concerned with the receding glaciers, the technology permits the scientists to go back the following year to get another picture, allowing them to draw detailed maps rather than rely on less accurate estimates. Maher predicts a growing demand for this technology—and the AGRG's ability to provide it.

Winds of change

When it comes to renewable energy, AGRG researchers are also working on wind and solar power projects. Research scientist David Colville has partnered with Yves Gagnon at the Université de Moncton to develop an online interactive wind atlas, for which the Nova Scotia government provided $78,000. "Folks interested in wind development will have a place to start," says Colville. "The primary value of the atlas will be for understanding the locations with the best potential wind power."

Gagnon has already developed wind atlases for New Brunswick and Prince Edward Island. The Prince Edward Island atlas allows users to zoom in to find detailed information on the wind resource in any particular area. Colville says that Nova Scotia's map will be similar; he is currently collecting weather, topography, and land-use data from governmental departments to use in the wind atlas. Gagnon developed the model for the atlas, and Colville and his research associate, Steve Bird, built an interactive website with the results. The site, launched in late September, is hosted by the Department of Energy.

Colville and Bird are also working with Green Power Labs Inc. on a solar-radiation project. In 2004 the Dartmouth, N.S.–based company released the Solar Energy Map for Nova Scotia, a GIS tool to demonstrate the economic feasibility of solar energy across the province. In late 2006, the company announced a partnership with the

Running on pure power

In a little over a decade, Nova Scotia hopes to be one of the cleanest and most sustainable environments in the world. The Environmental Goals and Sustainable Prosperity Act was introduced in late spring and approved during national Environment Week in early June. "This Act recognizes that a healthy environment contributes to a healthy economy and to our long-term prosperity," says Nova Scotia Premier Rodney MacDonald.

The Act includes more than 20 goals to help the province become cleaner and more sustainable by 2020. Some of those targets include: reducing greenhouse gas emissions by 10% less than 1990 levels; new emission standards for motor vehicles by 2010; new policies to prevent the loss of wetlands by 2009; and legally protecting 12% of Nova Scotia's land mass by 2015.

The Act follows a commitment to set a new standard for renewable energy in Canada by generating almost 20% of Nova Scotia's electricity through green sources such as wind, tidal, biomass, solar, and hydro by 2013. "Nova Scotians want more renewable energy generated here," says Minister of Energy Bill Dooks. "We are going to get cleaner, greener energy to power our homes and businesses in the most cost-effective way possible." With the new regulations in place, 100,000 more homes will be running on renewable energy in five years.

Working with the province to help achieve those goals is Cape Breton Power Ltd. After two years of preparation, nine wind turbines in Glace Bay, N.S., at the Lingan Wind Farm are up and running and will be producing 42 million kilowatt hours of electricity every year—enough energy to power 6,000 homes. According to Premier MacDonald, this project is proof that Nova Scotia has the policy, resources, and people to create a green economy. "This is an opportunity to use our wind resources to increase the supply of renewable energy for the entire province," says Luciano Lisi, the CFO of Cape Breton Power. "It's a small but important step toward integrating renewable energy into the existing mix of power generated in Nova Scotia."

Wind turbines stand as tall as a 12-storey building and are equipped with a triple-blade rotor that is 48 metres in diameter. The blades of the wind turbines capture the wind and convert it into energy. The Lingan turbines have no moving mechanical parts, making them quiet and more reliable than past models. The energy being produced at the Lingan Wind Farm is being entirely contracted to Nova Scotia Power Inc. By 2009 NSPI plans to generate 200 megawatts of renewable new energy, enough to power 70,000 homes.

"The Lingan Wind Farm project is the result of a lot of hard work by Cape Breton entrepreneurs who have invested significant sums to produce cleaner, greener power," says NSPI president and CEO Ralph Tedesco. "The dedication of this successful wind farm, together with other wind installations, means that Nova Scotia has more wind-generated electricity on the ground than any other Atlantic province." The company also estimates that roughly 12% of the electricity produced in Nova Scotia is made from renewable sources. — **HEATHER MACLEAN**

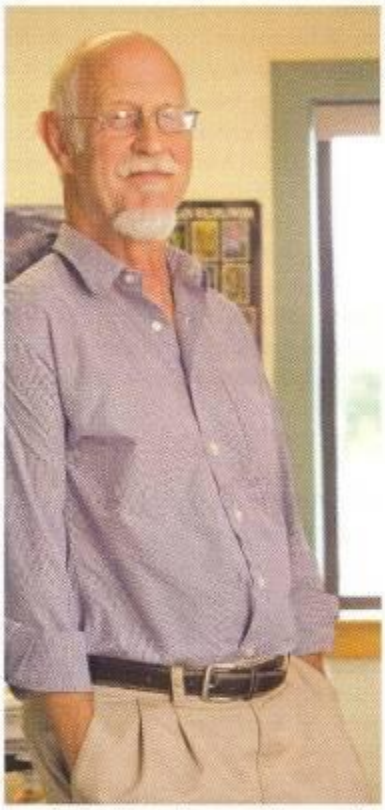
"We provide information to people in a way that they can understand"

Applied Geomatics Research Group to do a more advanced assessment of the Maritime region's solar-energy resource based on satellite imagery. "The college has a very strong applied geomatics research group," says Alexandre Pavlovski, the president of Green Power Labs.

Colville received about $30,000 from Nova Scotia Economic Development to facilitate the project, which will be completed in the spring of 2008. "We envision having a solar-radiation atlas for the Maritimes," he says. To collect the information, they are using GOES weather-satellite imagery provided by NASA. While GOES imagery has long been used to watch weather, Green Power Labs has developed a model to use the imagery with one-kilometre resolution, meaning that there is information for every one kilometre squared in the Maritimes. Using this imagery will allow researchers to map out where the clouds are and how much solar energy is getting through.

Colville and Bird are collecting data over a year-long period to build an accurate image of the maximum and minimum amounts of sunlight in a given area. Using this data, he and his team will determine the monthly and daily solar-radiation amounts for particular areas. "To make this happen," says Colville, "we are building software tools." But it's not just any software—it will be another valuable tool for Green Power Labs to better serve its clients, as well as a product it hopes to sell globally.

Maher is excited about future AGRG opportunities in the renewable-energy sector and sees a growing demand for this technology—and the AGRG's ability to undertake applied-research projects. He predicts possibilities for everything from monitoring buildings to allowing owners to



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see whether or not they are truly recycling water or reducing heat consumption to providing people with easily accessible detailed data about their local environment. Relying more on renewable energy makes good sense. "Nova Scotians as a whole have to meet their economic bottom line," says Maher. "Part of that is the sensible use of the resources they have."

With technology being increasingly relied upon to make better use of the Earth's limited natural resources, there's no question that the AGRG will continue to play a meaningful role. "Essentially, we provide information to people in a way that they can understand," says Maher. "It's all part of educating people about their environment." ■