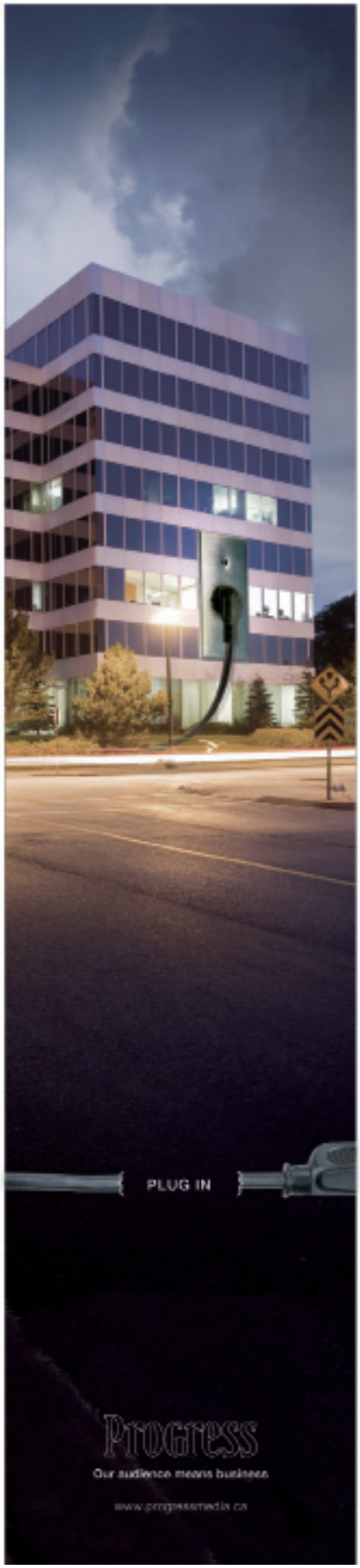
ICE in their VEINS

Global demand for energy, minerals, and metals has explorers turning to the Arctic. Punishing conditions and remoteness pose challenges to development, but operating in this new frontier represents opportunity for the pioneers of Newfoundland and Labrador's energy industry

BY ANDREW SAFER

When Scottish oil and gas company Cairn Energy was planning to drill wells in ice-prone waters off the coast of western Greenland this summer, it's no surprise the Edinburgh-based exploration-and-production outfit contracted a few companies in St. John's to help. They needed ice detection, ice management, and helicopter-support services, so why not go to the experts? After all, these service companies cut their teeth more than a decade ago on the Hibernia and Terra Nova offshore oil projects. With the Arctic likely the world's next energy frontier, now is the time to reap what they've sown.

PHOTO COURTESY PROVINCIAL AEROSPACE LIMITED



Mary Williams is an ice engineer whose experience in the Arctic dates back to the 1980s. Now director of the National Research Council's Institute for Ocean Technology, Williams points to ice navigation, ROV data collection, environmental monitoring, and the provision of support services to a host of exploration activities. For local companies that already have relationships as a result of the Newfoundland offshore (and onshore mineral) industry, expanding their array of services for new work in the Arctic is a natural progression for the industry.

Take C-CORE and Provincial Aerospace Ltd. (PAL), two of the specialists that are working with Cairn Energy in Greenland. For Robert Cadigan, it makes perfect sense; he cites C-CORE's innovative iceberg-towing process and PAL's expertise in ice management. "This is one of the harshest environments in the world for companies working in exploration and development," says Cadigan, an industry leader who heads Newfoundland and Labrador's Oil and Gas Industries Association (NOIA). "We're at the frontier in terms of technology development." He adds that the Hibernia gravity-based structure (GBS) was the world's first to be designed for an ice-prone area and to withstand the impact of a six-million-tonne iceberg. Further, he points to the "cut and run" method for quickly disconnecting a floating production, storage, and offloading (FPSO) unit from the sea floor when pack ice starts to descend. This system,

Due North

North of the Arctic Circle (66.6 degrees north latitude), the U.S. Geological Survey estimates there are 90 billion barrels of oil, 1,669 trillion cubic feet of natural gas, and 44 billion barrels of natural gas liquids, most of which is offshore. This represents almost one-third of the world's undiscovered gas and more than one-tenth of undiscovered oil.

Canada's North—including the Northwest Territories, Nunavut, and northern offshore regions within Canada's exclusive economic zone—is a vast region covering about five million square kilometres. It's estimated to contain 35% of the country's conventionally recoverable oil (excluding the oil sands) and one-third of conventionally recoverable natural gas. In addition, significant diamond, mineral, and metal potential has been identified.

In 2007 the federal government announced a Northern Strategy, which included asserting Canadian sovereignty, environmental protection, advancing social and economic development, and strengthening Northern governance. As David Scott pointed out at the Newfoundland and Labrador Oil and Gas Industries Association's Atlantic Canada Petroleum Show in St. John's in June, "The enormous economic potential of the North is beginning to be unlocked." Scott should know; he's the director of the Geological Survey of Canada's Northern Canada Division.

In order to exercise Canadian sovereignty within the extended continental shelf, the Government of Canada must file a scientific claim with the United Nations Commission on the Limits of the Continental Shelf. The purpose of this claim is to substantiate the definition of the foot of the continental slope in the offshore region. Private consultants such as St. John's-based Fugro Jacques GeoSurveys are assisting in this process. — A.S.

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developed for the Terra Nova project, is standard technology in the industry.

For 35 years C-CORE has specialized in ice engineering, detection, and management. Since March of 2009, the organization has been working on an environmental specification for sea ice, icebergs, and metocean conditions for western Greenland's offshore. Together with PAL, C-CORE will develop and execute an ice-management plan to support Cairn Energy's drilling operations. C-CORE is collecting iceberg and sea-ice data via satellite, plus providing data management and input to PAL's operational ice-data network. Using a net developed by C-CORE, PAL will coordinate the towing of icebergs to change their trajectory, preventing them from entering a designated protection zone around a drill site. Previously, C-CORE has supported similar Arctic operations in the Beaufort Sea and in Russia's Barents Sea and Sakhalin Island.

PAL has been providing ice-management services for Newfoundland and Labrador's offshore for more than 25 years. Carrie Young, the assistant operations manager of PAL's environmental services division, explains that work in western Greenland started with ground-truthing C-CORE's satellite iceberg data, based on iceberg sightings by observers. PAL's work progressed to coordinating ice management and communicating with observers on vessels to arrange a tow or otherwise manage icebergs in support of the drilling program. The company also offers dedicated ice reconnaissance via surveillance aircraft. PAL first applied its expertise in the Arctic in the early 1990s, when it conducted a regular ice reconnaissance of the Davis Strait.

"Newfoundland and Labrador is becoming the go-to place for cold region and Arctic service expertise" — Tony Mercer, president, IMVPA

A newer St. John's company carving a niche in the area of cold regions engineering is IMV Projects Atlantic (IMVPA), a subsidiary of Calgary-based IMV Projects, which is owned by Wood Group of Aberdeen. The St. John's office opened in 2004 and has conducted studies for the U.S. Minerals Management Service and major oil and gas operators to assess exploration and production options for regions such as the Beaufort, Chukchi, and Bering seas. The company is currently assessing costs for bottom-founded and floating structures, as well as subsea equipment and pipelines associated with oil and gas development in offshore Alaska.

Asked how St. John's has become a centre for Arctic expertise, IMVPA president Tony Mercer cites the luck of geography and history, pointing to the seal hunts and Captain Bob Bartlett's quest to help Robert Peary discover the North Pole.

"Newfoundlanders are surrounded by a harsh environment," he says. "People have pursued it in their careers, so there's leading-edge R&D taking place here. Newfoundland and Labrador is becoming the go-to place for cold region and Arctic service expertise and will help lead future project developments in such areas."

Another test program off Newfoundland is anticipated for spring of 2012, the 100th anniversary of the sinking of the *Titanic*. A century after that epic disaster, the danger of ships colliding with ice is still the focal point of research around the world. Bob Gagnon, a physicist at NRC's Institute for Ocean Technology (IOT), has conducted ice-collision experiments in the centre's ice tank and also in the field. This included a program using the Canadian icebreaker *CCGS Terry Fox* to conduct collision tests with house-size pieces of iceberg ice known as "bergy bits." Gagnon has since devised a new impact panel that mounts on the front of a ship and maps distribution pressure during impacts with small icebergs. "We have leading-edge technology to do this work," says Gagnon

NRC-IOT Ice Tank, at 90 metres the longest of its kind in the world.

NATIONAL RESEARCH COUNCIL-INSTITUTE FOR OCEAN TECHNOLOGY

Environmental monitoring and assessment

Meanwhile, the blowout of the Deepwater Horizon well in the Gulf of Mexico and the ensuing environmental disaster is affecting the pace of Arctic oil and gas exploration. During a presentation at NOIA's Atlantic Canada Petroleum Show in St. John's in June, director general Mimi Fortier of Indian and Northern Affairs' oil and gas branch announced a delay in the strategic environmental assessment for the eastern Arctic. "We need to pause, review the lessons learned, and understand what kind of strategic policy approach we need to take," she said.

Regardless of the BP catastrophe, Mary Williams notes that all projects in the Arctic require an environmental-impact assessment. "You can't build a woodshed up North without one," she says. Adds Bill Scott, a past president of

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the Newfoundland and Labrador Environmental Industries Association: "Environmental monitoring is going to be a major business area in the North, including atmosphere and weather, land and ice components, and the biology of land and water."

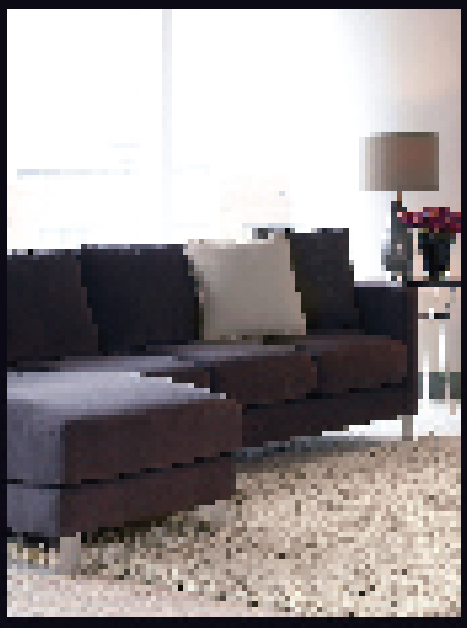
Scott suggests companies that want to do environmental work in the Arctic, such as remote data acquisition or accommodating climate extremes for equipment operations, work with the government on R&D. "All facets of the environment are different," he says. "They require specialized equipment and techniques. Companies that develop these will have a leg up in terms of knowing how to work there, knowing how things are done, and determining the lowest cost." He adds that companies that have experience with Labrador's winters have "a good springboard" into the Arctic. "For any company looking to provide harsh-climate ocean technology, the doors are wide open. On the environmental side, with ice packs receding and as climate change comes into play, there's going to be a significant effort required to understand what's happening."

Sikumiut is a case in point. After working on the Voisey's Bay nickel project, environmental scientist Bevin LeDrew of St. John's formed a company with Ron Webb and Gus Dicker, two Inuit land and sea specialists from Nain. In 2002 they established Sikumiut—Inuktitut for "people of the ice"—an environmental consulting firm that now has offices in Nain, Happy Valley–Goose Bay, and St. John's.

One of Sikumiut's projects was to solve Voisey's Bay's winter-shipping problem. Each month during winter, a ship would traverse a 72-kilometre solid-ice highway of land-fast ice. Voisey's Bay Nickel Company (VBNC) was responsible for providing safe crossing locations, but after a snowstorm the snow would insulate the ice from refreezing, resulting in slush. Sikumiut modified a pontoon to meet the climatic conditions and installed one at each crossing to serve as a bridge.

Sikumiut has conducted environmental monitoring and assessment projects in Northern Canada for such clients as Fisheries and Oceans Canada, Vale, the Nunatsiavut government, and the Lower Churchill project. Extending its expertise north of Labrador, Sikumiut has consulted on Arctic waste-management practices for the Inuit Tapiriit Kanatami and is currently working on an environmental-impact assessment of a proposed iron ore mine located on the northern end of Baffin Island.

Mary Williams points to the slow pace of development in the Canadian Arctic. "My impression is that there's a plug that needs to come out, and that will happen when the first major steps of a development project take place." Reflecting on Cairn Energy's work offshore Greenland, she adds, "Maybe that will be it." Whereas the Gulf of Mexico oil spill has impacted the current pace of development, Williams and others agree that "a good experience" will encourage activity. "Companies, governments, and regulators will be looking at the engineering projects that worked," she says. "They'll feel less nervous about approving projects, providing that all of the right safeguards are in place."



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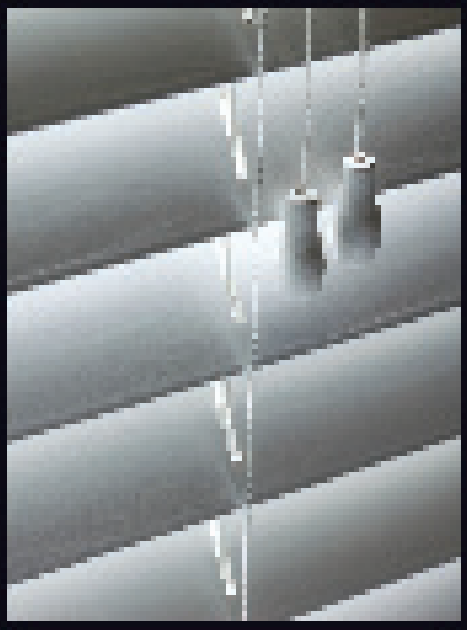

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