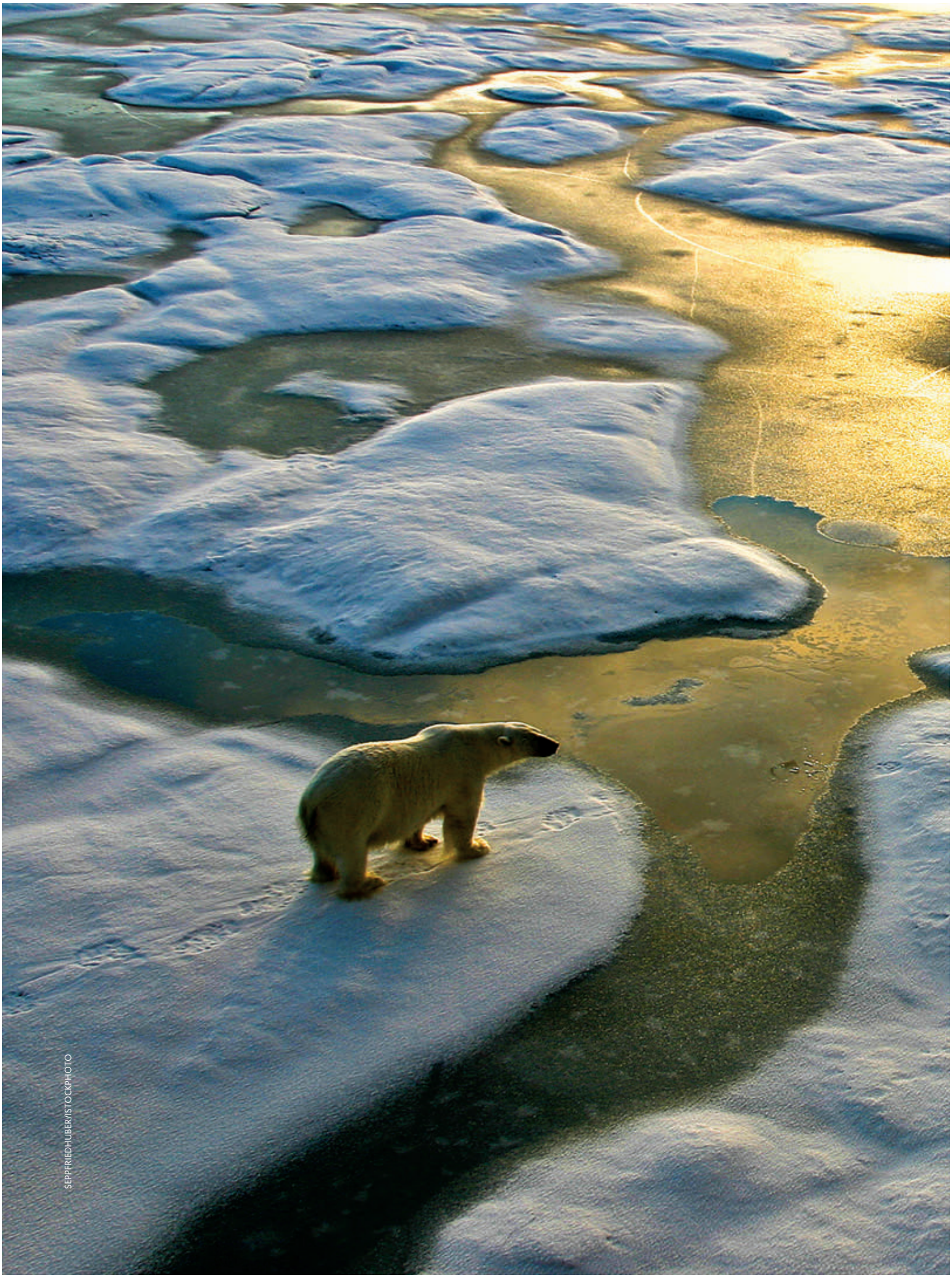

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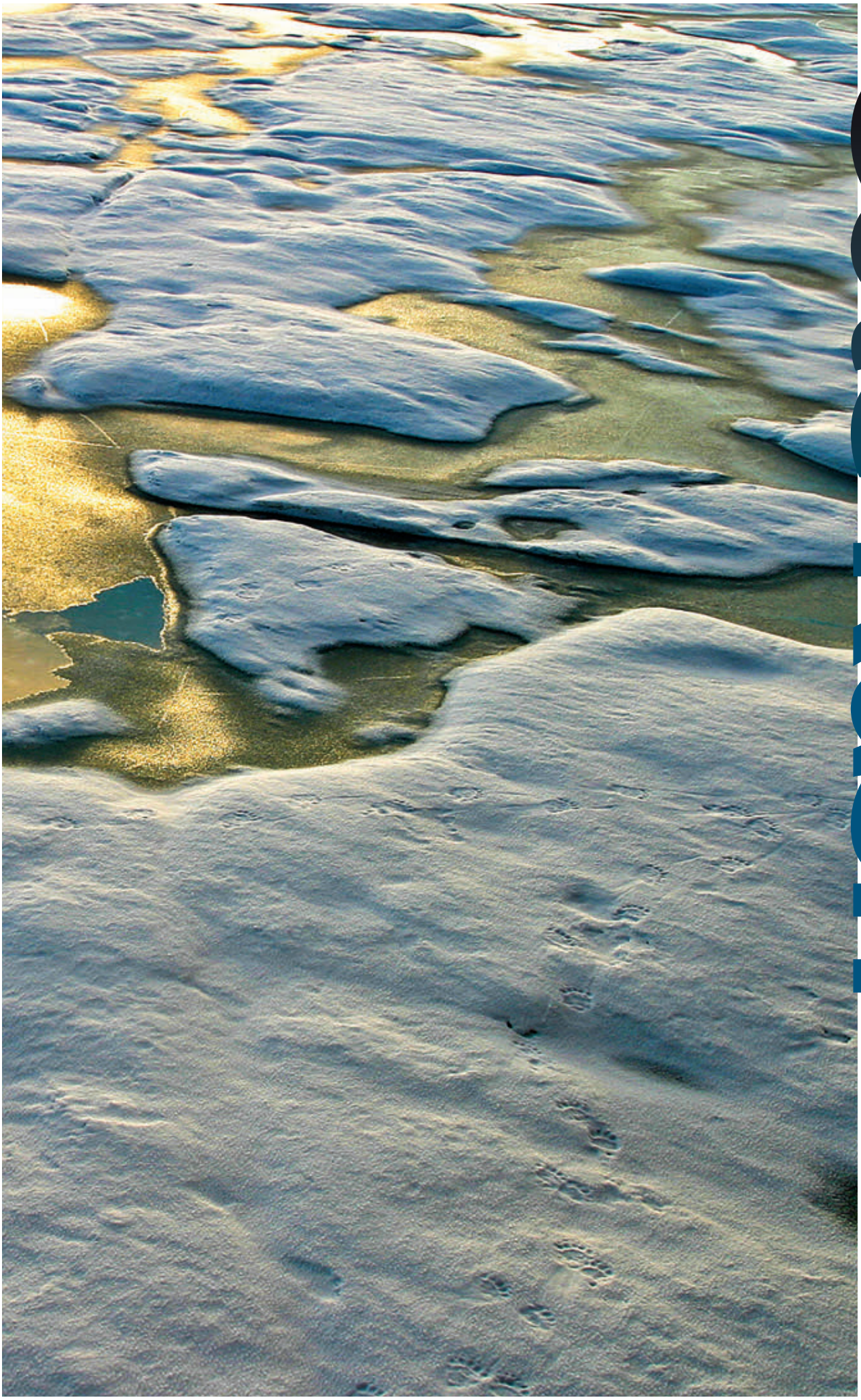

Cold Rush

Tapping the Arctic's frozen assets starts with navigating extreme risks.

BY MATT ALDERTON

A cargo ship travels near an iceberg in the Russian Arctic.

ZANSKAR/ISTOCKPHOTO

Massive oil, gas and mineral deposits lie under the Arctic's tundra. Until recently, these resources have proved too expensive to extract. But climate change is shifting the region's landscape, literally.

Arctic temperatures are climbing at double the rate of the planet as a whole, according to a 2016 report by the U.S. National Oceanic and Atmospheric Administration. That means ice is melting—and fast. So global oil and gas companies are rushing to complete Arctic projects before the competition.

"The Arctic is one of the last unexplored areas of the world," says Kjetil Kiste, PMP, a project management adviser in the Stavanger, Norway, office of German oil and gas company Wintershall. "So there are big expectations about the resources waiting there."

Governments have also entered the race to tap the Arctic's reserves. For example, Russia plans to invest RUB5 trillion on 150 Arctic projects by 2030, about half of which will be devoted to minerals processing. But projects on the northern horizon aren't limited to resource extraction. Tourism companies are also testing the Arctic waters: In September 2016, Crystal Cruises of Los Angeles, California, USA became the largest cruise line to complete a journey through the Northwest Passage.

"I've observed an increase in activities and projects in the Arctic over the past decade across different sectors," says Jennifer Mercer, PhD, PMP, program manager for Arctic research support and logistics at the U.S. National Science Foundation

in Arlington, Virginia, USA. Her program supports approximately 150 research projects in the Arctic every year. "We continue to see new commercial infrastructure and services implemented in areas where there were none, or only limited services, in the past."

The increased activity and investment is reminiscent of the 20th century space race, says Andrei Romaniuk, PMP, fellow, Canadian Energy Research Institute, Calgary, Alberta. "It is similar in greatness of challenge, efforts and investments. It's a competition not only between companies, but also between countries. Everybody wants to lead the way and be able to say they were first."

But blazing trails in the Arctic exposes pioneering teams to greater—and less predictable—project risks. That means Arctic projects tend to attract go-getters hungry for adventure and new knowledge, says Mr. Kiste. He spent four years working as project manager during the design and early construction phases of the recently completed Goliat construction project off the northern coast of Norway.

"We felt like pioneers. We were breaking barriers. It was new, it was exciting and it gave us new competencies to carry into the rest of our careers."

WEATHER ADVISORY

There's no getting around the obvious: The Arctic's harsh climate and severe weather are major obstacles for projects in the region, says Maksim Sonin, PhD, PMP, project manager, Caspian Pipeline Consortium, Moscow, Russia.

"There is intense cold for much of the year and long periods of near-total darkness," says Dr. Sonin.

Although temperatures are rising across the Arctic, the average still is a bone-chilling minus 13 degrees Fahrenheit (minus 25 degrees Celsius). Icebergs can make waters unnavigable. And icy surfaces can make ship decks treacherous. That means the cost of protective equipment and potential deployments of rescue vessels must be factored into project budgets.

The extreme Arctic environment also upends norms when it comes to equipment, scheduling and communication infrastructure. Mr. Kiste saw that

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firsthand while working on the Goliat project to build a floating oil production, storage and off-loading facility. To complete the six-year, NOK47 billion project sponsored by the Italian oil and gas company Eni, which concluded last year, teams had to find artificial lighting solutions during the Arctic's dark winters. Conventional lightbulbs don't work well in cold weather and sap a significant amount of energy, so the project team opted for LED lighting.

"The energy requirements for spotlights would have been extremely high and the light points a lot more if we'd used conventional lighting," Mr. Kiste says. "By selecting LED lighting we reduced our energy significantly and the light point density to one-fifth."

The weather takes its toll on the schedule as well, slowing or ceasing work altogether during the coldest months. "Everything takes longer in the Arctic," Dr. Mercer says. "If work is to be conducted outside, then time for warm-up breaks should be factored in. If work is to be conducted in high-wind conditions, extra time is required to secure everything."

Weatherproofing vessels, budgets and schedules force project managers working in the Arctic to dive deep into weather statistics and forecasting, Mr. Kiste says. That often translates to allocating extra time to climatic research during the planning phase.

During planning for the Goliat project, for instance, stakeholders instinctively exaggerated environmental risks. By collecting historical and projected weather data from expert sources, Mr. Kiste says, the project team was able to dismiss false assumptions and focus resources on the highest-priority risks.

Mr. Romaniuk suggests an even more proactive approach to managing weather-related risks: conducting original research. Weather satellites have notoriously poor coverage in the Arctic, and weather stations are few and far between. Mr. Romaniuk, who managed Arctic and sub-Arctic exploration projects for the Russian oil company Rosneft for a decade, says gathering primary data is usually required. Sending weather-monitoring drones around the project site, setting up base stations in water to monitor temperature and flows, and putting beacons on icebergs to track movement can offer a clearer picture of environmental risks.

"It requires a lot of investment and coordinated work of many contractors," he says. "Companies operating in the Arctic opt to do multiyear regional surveys, as well as establish their own control centers to monitor all weather-related information during operations."

EYES ON THE HORIZON

Project teams in the Arctic have to be ready to start from square one. Most locations lack even the most basic infrastructure—so necessities like ports, roads, housing or airstrips often have to be built from scratch.

These foundational needs can push project delivery dates and undermine the business case, so Dr. Sonin recommends siting projects near existing settlements whenever possible.

"It's better to construct terminals in the vicinity of local villages," where adequate housing for team members might already exist, he says.

Polar Plunge

Jennifer Mercer stands atop a tractor buried by snow drifts at Summit Station, Greenland. Top inset, she uses a satellite phone to communicate. Below, she poses with other team members.

There's a cold reality that comes with life on an Arctic project, says **Jennifer Mercer, PhD, PMP**, program manager, Arctic research support and logistics, U.S. National Science Foundation, Arlington, Virginia, USA.

My first Arctic experience was in Greenland, working as a navigator with three others. As part of a six-month project, the National Science Foundation tasked us with finding a route through a heavily crevassed 60-mile (96.6-kilometer) section of the Greenland Ice Sheet. The route was for heavy-haul tractors hauling large sled payloads of fuel and cargo to inland research stations. So there wasn't any room for error. We had to find a crevasse-free route in just five weeks while working—and living—in very harsh conditions.

We slept in tents, in March, when temperatures drop to minus 30 or minus 40 degrees Fahrenheit. Our camp had a large heated tent towed on a sled that we used for cooking and eating, and an outhouse. There were no showers, and there was no way to do laundry for weeks at a time.

When we were away from the camp during the day, the great outdoors were our only restroom facilities. There were no trees to go behind—and I was the only woman. During pit stops, we devised a system where I would go to the back of the tractor and the men would go to the front. Imagine doing your business in the snow, behind a running tractor, in bone-chilling cold with the wind howling around you. It isn't pleasant.

But the experience taught me plenty about good project management—in particular, about the need for solid planning and communication at all times. When vehicles break down due to cold temperatures and you can't hear each other easily on radio when the wind is howling, everyone gets tired quickly. Having a schedule detailing all tasks and clearly articulating thoughts and directions helps everyone do their job well.

It remains my favorite project team of all time. We not only found the crevasse-free route, but we made it enjoyable. I know we'd all jump at the opportunity to do it again.

FROM TOP, PHOTOS BY GREY DAVIS, ROBIN DAVIES/COURTESY OF JENNIFER MERCER

When that's not possible and new infrastructure must be built, he suggests organizations tread carefully. Project sponsors should base decisions on a detailed feasibility study that clearly quantifies the project's potential ROI—and outlines a realistic delivery timeline, says Dr. Sonin.

"The payoff period may vary from five to 20-plus years," he says. In that sense, organizations must understand that greenlighting a major Arctic project is "a strategic decision."

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—Maksim Sonon, PhD, PMP, Caspian Pipeline Consortium, Moscow, Russia

Taking a program- or portfolio-level perspective can help project sponsors justify extra front-end costs, he says. For example, Sabetta International Airport on Russia's Yamal peninsula was built by the country's government to service one project in particular: the US$27 billion Yamal liquefied natural gas plant now under construction, which is partly backed by the government. But a slew of future projects are expected to sprout in the surrounding northern Siberia region—further justifying the cost of the airport.

Of course, even with adequate infrastructure, the Arctic will always be remote. So project managers in the region should expect logistical challenges and complications, such as slower and less flexible supply deliveries. Everything from food to fuel is subject to shipping delays and limitations, which makes synchronized scheduling critical.

"The navigation period may be just a few months a year, so if there are critical items to be delivered, you need to ensure they're shipped on time and arrive on time," Dr. Sonin says. If shipments are delayed, getting must-have items can quickly drain contingency funds.

"If the navigation season is over, sometimes air transportation must be used" to get materials to the project site, he says. "That's more costly."

TAPPING LOCAL TALENT

While the Arctic is remote, project teams still need to be prepared to engage local residents, which is necessary from both a staffing and a stakeholder management perspective.

"Around 4 million people live in the Arctic. Some of them don't want [projects] there, but many of them do," Mr. Romaniuk says.

The key is to offer training and education, according to Tim Smith, PMP, director of maritime, Arctic and geospatial intelligence at Invictus International Consulting, a defense contractor in Alexandria, Virginia, USA.

"I can't emphasize enough the importance of having a robust training program," he says. "If I were managing a new project in the Arctic, I'd try to bring a core group of very experienced management personnel and team members, then hire a lot of the native population and begin training them immediately. Because you may have somebody from California who's willing to go up to Alaska for a year or two to work on the project, but at the end of the day you need to train someone who never plans on leaving to carry the torch."

Moreover, local Arctic residents possess critical local knowledge. "They know the land and they know the environment. That's invaluable to a project manager who's working in the Arctic," Mr. Smith says.

UNCHARTED TERRITORY

Risks are mitigated by applying relevant knowledge—but "if the knowledge isn't there, that can

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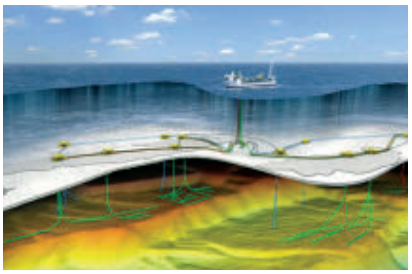
Project teams across sectors are expanding humanity's presence in the Arctic.



PROJECT: JOHAN CASTBERG

Sponsors: Statoil, Eni Norge, Petoro

Location: Barents Sea (Norway)

Budget: NOK60 billion

A team is planning the construction of a floating production, storage and off-loading vessel above the largest untapped oil field on the Norwegian continental shelf. The anticipated ROI? Up to 650 million barrels of oil. Completion is slated for 2022.

PROJECT: KVANEFJELD MINE

Sponsor: Greenland Minerals and Energy (GME)

Location: Kvanefjeld, Greenland

Budget: US$1.6 billion

This project to set up mining operations at Kvanefjeld will allow GME to extract at least 15 rare earth metals. But uranium deposits on-site have raised environmental and safety concerns, delaying regulatory approval. The team expects to be fully permitted by 2018.

PROJECT: FINNAFJORD HARBOR

Sponsor: Bremenports

Location: Langanesbyggd, Iceland

Budget: Unknown (ISK450 million is allocated for research and planning)

Currently in the planning phase, the project aims to develop a deep-water seaport to support trans-Arctic shipping and drilling by 2030.

PROJECT: CANADIAN HIGH ARCTIC RESEARCH STATION

Sponsor: Polar Knowledge Canada

Location: Cambridge Bay, Nunavut, Canada

Budget: CA$250 million

The station will host Canadian and international researchers. Along with already-completed residences, the facility will include a technology development center, laboratories and a warehouse. Completion is scheduled for later this year.

be a big, big challenge," Mr. Kiste says. So project teams should tap local expertise and look for benchmarks from projects conducted in the far north.

"I suggest looking at projects done in sub-Arctic areas," Dr. Sonin says. During his own Arctic projects, he's leveraged lessons learned on initiatives like the Sakhalin-1 and -2 oil and gas fields projects near Sakhalin Island, Russia.

The key to risk management on Arctic projects, Dr. Sonin says, is meticulous quantitative analysis during each phase. A risk register containing the cost and schedule impact for each potential pitfall illustrates to stakeholders exactly what's at stake at every turn. "Quantitative analysis isn't usually mandatory, but when it comes to the Arctic, I never skip it," he says.

Risk management never makes a project invulnerable. But in the Arctic in particular, diligent documentation can help lay a foundation for future success.

"You have to see the value of gaining knowledge and developing new technical solutions to use again later," Mr. Kiste says. "Success in the Arctic isn't only about the triple constraint. It's about solving problems." **PM**