

# espresso

ENERGY

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Cover Photo: Mukungwa Power Plant, Rwanda

# real-time mapping

## GEOMATICS SERVICES

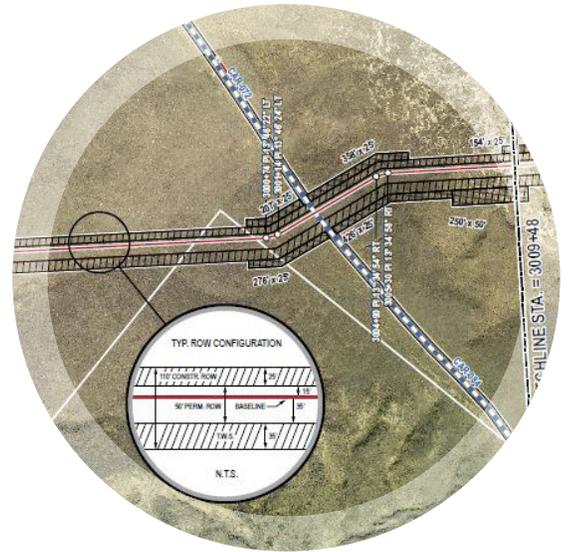
**G**eomatics (also known as geospatial technology or geomatics engineering) is the discipline of gathering, storing, processing, and delivering geographic or spatially referenced information. We offer a complete range of geographic information systems (GIS) and computer-aid design (CAD) services, and have the expertise and infrastructure to accommodate all facets of major cross-country projects including:

- geological mapping/mineral exploration
- land use/land cover mapping
- environmental assessment
- agriculture
- planning
- marine habitat mapping
- terrain analysis

We provide mapping, drafting, analysis, web applications, data management, reporting, digitizing, and much more. Using a wide variety of sensing and mapping technologies, like side scan sonar (for sea bottom), seismic refraction/reflection (for subsurface geologic structure), and satellite image or synthetic aperture radar (for land use/land cover and surface geologic structure), gives **exp** a competitive advantage in several ways.

In the energy industry, remote sensing technologies, such as thermal infrared sensors and airborne gamma-ray spectrometry, are used for detecting and mapping near-surface features such as buried pipelines, and superficial geology/soil mapping. These technologies can be used for the planning and construction of oil and gas pipelines.

The core strength of **exp**'s GIS services comes from maximizing project-wide communication and ensuring that the latest information is readily available to all project disciplines.





# nuclear safety and security

## POINT LEPREAU, NEW BRUNSWICK

**E**xp has been involved with various projects at the aging 660 MW CANDU nuclear generating station, originally commissioned in 1983. This station underwent a major shutdown and refurbishment by Atomic Energy of Canada between 2008 and 2012. This refurbishment was completed to extend the service life with a primary focus on replacing the 280 calandria tubes.

The shutdown during refurbishment, increased safety and security regulations in recent years, and the 2011 tsunami at the Fukushima Daichi nuclear power plant in Japan have created many smaller projects. Fukushima-related projects are driven by plant safety and reliability in the event of a flood. **Exp** Fredericton studied this issue and provided a flood assessment report.

We currently have one of our mechanical engineers seconded full time for the past year working as a project lead on various fire protection and Fukushima-related upgrades.

A new fire truck storage facility and fire protection pump

house ventilation system are currently under construction.

**Exp** provided electrical, structural, and mechanical design services for both these facilities.

An offsite emergency operations center was also designed.

**Exp** provided electrical, structural, mechanical, geotechnical, civil and architectural design services for this facility.

Some of the security upgrades designed in the Fredericton office included new high security fencing and a check point for entrance to the plant.

The Fredericton team also worked in parallel with a U.S. supplier for the installation of multiple Wire Energy Absorbing Rope restraints to reduce the vibration being transmitted from the main steam line to the superstructure. Building structural design upgrades were provided along with both mechanical engineering and project management support.

This project was rewarding for all involved and highly successful for **exp**.

# environmental pipeline support

## CRYOGENIC PROCESSING PLANT IN SOUTHEASTERN NEW MEXICO

**E**xp Energy Services is working with Navitus, a new midstream company located in The Woodlands, Texas. The partners are all previous owners of Copano Energy, a successful firm recently acquired by Kinder Morgan. Their current financial backing is in excess of \$1.5B and they are very aggressive in getting their footprint in key shale plays. The development of the permian basin shale in New Mexico and Texas is key to future energy independence for the United States.

The Delaware Basin Natural Gas Cryogenic Processing Plant & Pipeline Project, in Southeastern New Mexico, predominantly on Bureau of Land Management (BLM) and State lands, will consist of a high pressure trunkline and two smaller diameter laterals, which will connect production gas to the trunkline. The trunkline will deliver the natural gas to a cryogenic processing plant for processing/extraction of natural gas liquids (NGLs). In addition to the cryogenic processing plant and pipelines, our client proposes to install 6 compressor stations, additional aboveground facilities to accommodate pigging operations, block valves for safety, and meter stations

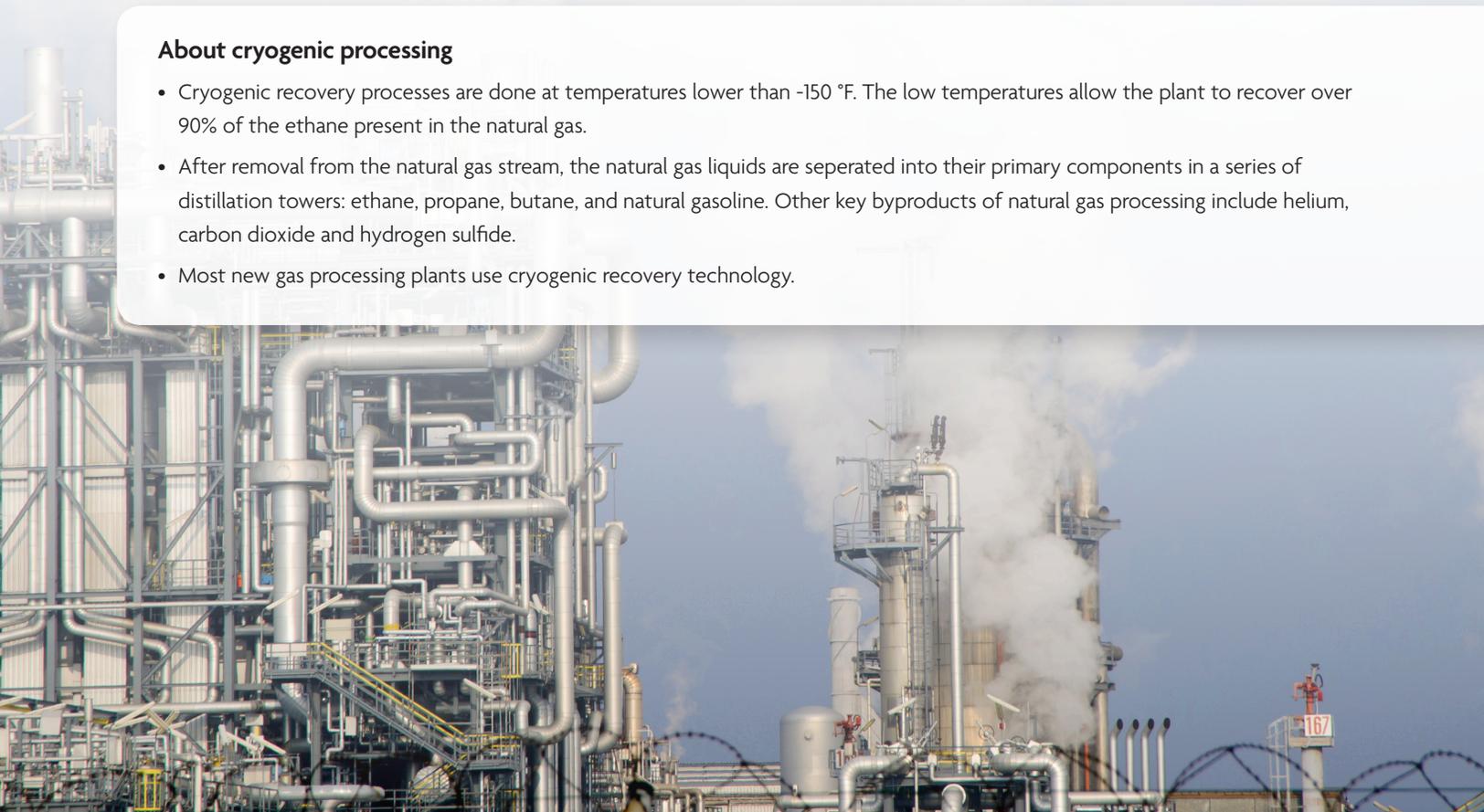
for measurements. Since the project crosses BLM lands, they will serve as the lead agency for the project.

Our team is leading all environmental permitting, and Pipeline and Hazardous Materials Safety Administration (PHMSA) compliance and management. Our scope of work includes:

1. Preparing and submitting a Right-of-Way application for the construction and operation of a cryogenic processing plant, and the installation of gathering lines;
2. Management of the Plan of Development outlining the construction techniques to be used in accordance with BLM best management practices;
3. Environmental permitting, Pipeline and Hazardous Materials Safety plans and inter-agency coordination;
4. Mapping and data management for route development, the field surveying, and environmental reporting;
5. Management of all environmental and cultural field teams;
6. Environmental monitoring during construction; and,
7. Finalization of close-out documentation.

### About cryogenic processing

- Cryogenic recovery processes are done at temperatures lower than -150 °F. The low temperatures allow the plant to recover over 90% of the ethane present in the natural gas.
- After removal from the natural gas stream, the natural gas liquids are separated into their primary components in a series of distillation towers: ethane, propane, butane, and natural gasoline. Other key byproducts of natural gas processing include helium, carbon dioxide and hydrogen sulfide.
- Most new gas processing plants use cryogenic recovery technology.



# turning a hundred-year-old dam into a power plant

CHARLO, NEW BRUNSWICK



Built around 1920, the 13-km long watermain ran through hills and under railways, rivers and roads to deliver water from the Charlo dam to the Dalhousie water treatment plant.

In the 1990s, **exp** worked on the replacement of the five sections of the original line that were made of strips of wood braced together by metal hoops, resembling those used for the construction of buckets or barrels.

This 125-year old technique is still used for the construction of water pipelines that run through fragile ecosystems.

**P**reviously used by AbitibiBowater to supply one of its pulp and paper mills, the aging installations and watermain of the Charlo dam were turned over to the New Brunswick government in 2009.

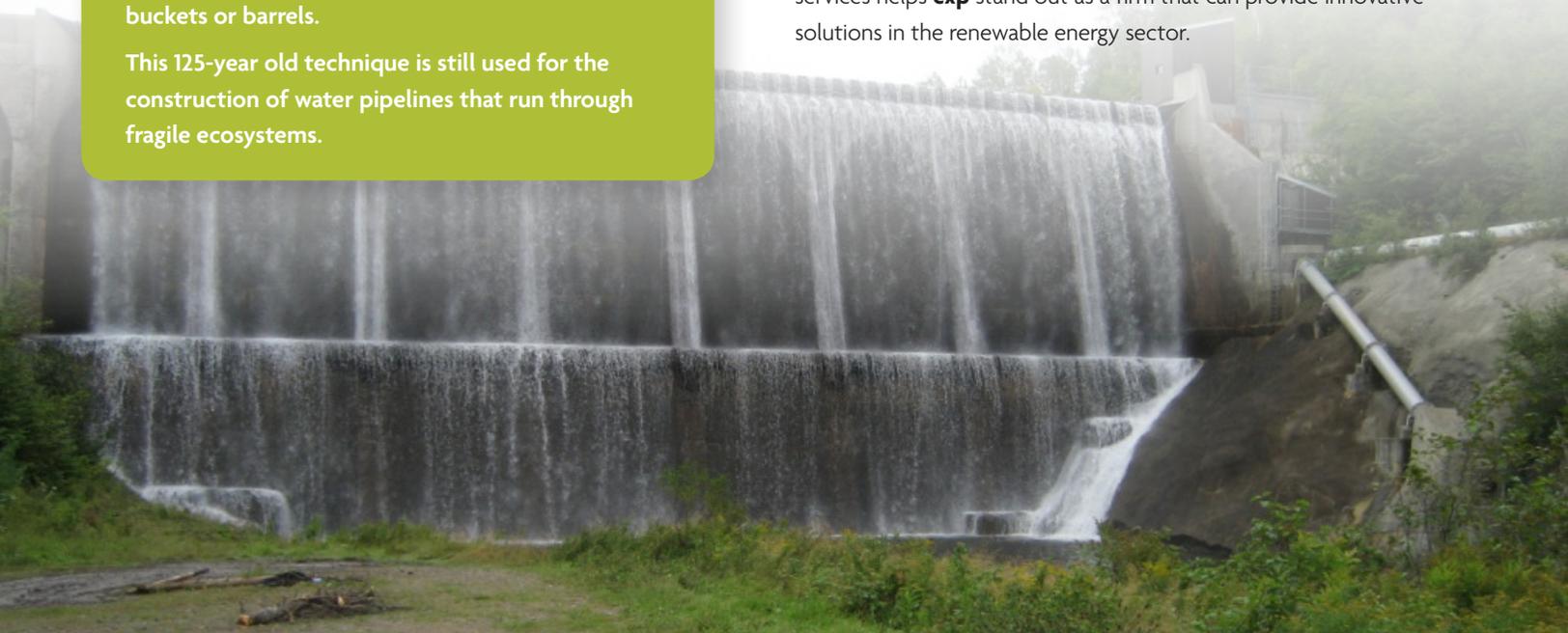
Because of its lack of knowledge on these hundred-year-old installations, the government turned to our experts, who had been involved in the refecton work previously conducted on the dam. The initial contract called for the preparation of a work plan to assess the stability and condition of the waterline currently used to supply drinkable water to the town of Dalhousie.

Further to the technical evaluation conducted on the dam, Boris Allard, our Fredericton office water production specialist, noted that pipe failure caused an unusually large pressure loss. He then solicited help from Benoit Roquemaurel, expert in electricity generation from power plants and member of our Quebec energy team.

Benoit and Boris worked together to design a plan to upgrade and transform the dam into a hydroelectric facility that could be used to supply power to the water treatment plant, while recovering energy from the existing infrastructure.

*“By replacing a valve with a rotating machine, otherwise wasted hydraulic energy can be transformed into mechanical power using a turbine, and then into electricity by connecting an alternator to the turbine. Projects using renewable energy (on existing infrastructure) allow for a quick return on investment;” Benoit explained.*

Although **exp**'s proposal is still being examined, the Dalhousie project demonstrates that promoting our multi-disciplinary and interregional services helps **exp** stand out as a firm that can provide innovative solutions in the renewable energy sector.





Advances in exploration and production have helped to locate and recover oil supplies from major reserves across North America. But supply (crude oils) and demand (oil producers) are not necessarily concentrated in the same place.

As oil producers are looking to get their products to other markets, maximizing pipeline infrastructure has become a priority in the North American energy industry.

# upland pipeline and energy east pipeline system

## CONNECTING NORTH DAKOTA TO SASKATCHEWAN

Over the last several years, oil production in the Bakken Formation which crosses through parts of Montana, North Dakota, and Saskatchewan has grown and there is increasing demand for crude oil transportation. The Upland Pipeline is a proposed 240-mile, 20-inch diameter pipeline designed to provide crude oil transportation from multiple points in North Dakota and to interconnect with the Energy East Pipeline System, in Saskatchewan. **Exp** has been awarded the prime role for the project.

We're responsible for front-end engineering and design (or FEED), environmental and regulatory compliance, land acquisition, safety, and project management. Our ground-based survey crews collected a variety of data, including environmental, anthropological, sociological, archaeological, and land use/land cover data, for a 500-foot wide and 163-mile

long corridor. Given the preliminary nature of the initial route and the project timeline, a remote sensing program was initiated to support field data collection. In addition to the high resolution aerial orthophotography routinely collected for **exp** pipeline project work, high resolution satellite and LiDAR image data were acquired for a 3-kilometer corridor.

In the U.S., we will utilize our own in-house resources for all services, with the exception of land acquisition. In Canada, our client has retained independent resources for environmental/regulatory compliance and land acquisition services, which will be managed by **exp**. Total fees for our scope of work currently exceed \$20M, and do not include detailed engineering or construction management services. Discussions to add those services to our scope are currently underway.

# going outside our comfort zone!

## REHABILITATING A POWER PLANT IN RWANDA

Building and upgrading power plants is something that **exp** teams have been doing for decades. However, when one of our Quebec teams was asked to work on the complete rehabilitation of a power plant in Rwanda, that was a first!

Following an international call for tenders, our colleagues were given the opportunity to bring their expertise overseas to work on the Mukungwa power plant project, awarded by the Rwanda Energy, Water and Sanitation Authority (EWSA). The project calls for the complete rehabilitation of this key power plant, as it generates a significant part of the country's electricity supply. Our team has been hard at work for several months now, upgrading the 12 megawatt plant located 150 km outside of Kigali, the Rwandan capital, in the northern part of the country, at the foot of the volcanos and near the Republic of Congo border.

Work includes:

- Repairs to hydro-mechanical elements—gates, grid and weir, turbines, wheels, servomotors, regulators, pipes;
- Repairs to electromechanical elements—alternators and their components, exciters, bearings, brake and cooling systems;

- Repairs to electrical elements—medium and high voltage circuit breakers, transformers, low voltage distribution, metering devices, protections, insulators and arresters, wiring;
- Civil engineering repair work—structures in the dam area and water intakes, pipes, buildings.

The **exp** team conducted a condition assessment study, recommended upgrades, established budgets and prepared the bid documents. Work is being carried out by a Franco-Belgian group, under direct supervision from an **exp** resident engineer supported by our Montreal design team.

Our recognized and well established expertise have paved the way to the good working relationship currently observed between the project's Rwandan stakeholders and **exp** staff. For our team, the challenge was to put local expertise to work in another part of the world. "Although the project is being carried out in an unfamiliar setting, working with familiar equipment in the plant has made things easier", says Hervé Rémy, Manager, Production / Power Plants, from our Montreal office.

## Electricity in Rwanda

- 68.4 MW of installed generating capacity
- 27 MW of hydroelectricity
- 16% of households connected to the power distribution network

## Mukungwa plant

- 12 MW
- Commissioned in 1985



# harnessing alaska's energy

## LIQUEFIED NATURAL GAS

**T**he Alaska Gasline Development Corporation, BP Alaska LNG LLC, ConocoPhillips Alaska LNG Company, ExxonMobil Alaska LNG LLC, and TransCanada Alaska Midstream LP plan to construct one integrated LNG project with interdependent facilities for the purpose of liquefying supplies of natural gas from Alaska, in particular in the Point Thomson and Prudhoe Bay production fields, on the Alaska North Slope.

The Alaska LNG Project will be composed of a liquefaction facility in south central Alaska; an approximately 800-mile, large diameter gas pipeline (mainline); a gas treatment plant (GTP) in the North Slope area; a gas transmission line connecting the GTP to the Point Thomson gas production facility; and a gas transmission line connecting the GTP to the Prudhoe Bay gas production facility. The project is now in the early regulatory stages that will result in the completion of pre-front-end engineering design (pre-FEED) work and major regulatory filings by the end of 2016. Regulatory reviews will take place through 2018, with construction starting in 2019.

**Exp** Energy Services has been contracted by ExxonMobil to serve as the owner's Environmental and regulatory compliance representative. This entails overseeing the work conducted by URS (environmental field surveys) and Paragon

Partners (land access and civil surveys), as well as being responsible for project permitting, agency coordination, development of strategic permitting and regulatory road map plans and documents, educating the partnership (group of companies involved) on the regulatory strategy, completing the Federal Energy Regulatory Commission (FERC) Environmental Report (ER) and obtaining all federal and state permits in support of the project. In addition, **exp** has created and maintains the project's GIS database for all environmental and engineering contractors working on the project. Using ESRI products, **exp** has created a web-based mapping tool for the client and contractors to securely view and work with the project database. This includes incorporation of immersive video and imagery collected on the ground during surveys. **Exp's** work scope for 2014 totals \$8 Million and it is expected to bring in \$10-\$12 Million per year for 2015 and beyond.

**Exp** has expanded its Anchorage office to help manage this important project. Working closely with the client, **exp** is challenged to educate and help direct the 5 entities that make up the "client", as well as all of the federal and state agencies and borough entities, to successfully permit this project over the next 4 years.





# from gust to light

## WIND FARM IN ST-DAMASE, QUEBEC

**Exp** provided detailed engineering for the 34.5/120 kV converter station of a 24-megawatt wind farm with ten 2.35 megawatt wind turbines, located in St-Damase, Quebec. In addition to conducting studies and providing electrical and civil detailed engineering for the station, our teams have been in charge of developing and programming the supervisory control and data acquisition systems (SCADA) for the whole wind farm. Since 2005, **exp** has been providing complete services to the wind energy sector in Quebec, and has been involved in the province's vast majority of wind farm projects, acting either as project designer or client engineer.

For our experts, a particularly interesting aspect of working on wind farm projects comes from the fact that municipalities are now getting involved in the projects, from beginning to end. Since 2009, wind energy projects are becoming community projects, developed through a collaborative approach between municipalities and promoters.

In addition to offering renewable energy engineering services, two of our Quebec experts have developed unique expertise

for wind farm certification. For a wind farm to meet Hydro-Québec standards, the certification process must be carried out by an independent engineer and show production from at least 80% of the farm's wind turbines, for an uninterrupted 48-hour period. The certification process allows for validation of technical information through the collection of actual data, and includes the preparation of a certification report and the issuance of a certificate. The **exp** approach to the certification process was presented to and approved by Hydro-Québec. We continue to work with Hydro-Québec teams to update certification methodology to reflect the energy carrier's technical requirements.

Our experts now provide internal training on the certification process and act as independent engineers for the certification of wind energy projects. In Quebec, where getting certification is a necessary step for wind farm promoters, **exp** is proud to be the firm to have carried out the greatest number of certifications.



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