



WIND ENERGY





QUALITY WORKMANSHIP
AT A FAIR PRICE



Leading the way in wind energy construction.

With 23 wind farms either completed or in progress, producing over 2000 megawatts of power across Canada, Black & McDonald leads the way in Canadian Wind Energy construction management and execution. From tender to closeout, our business processes and operating systems provide a synergized approach throughout the entire project to achieve the desired results.

Black & McDonald's dedication to safety, quality, and performance maximizes project safety and management efficiency while minimizing exposure to risk. Backed by our multi-trade Single Source accountability, we continue to generate wind farm construction and maintenance business from our existing clients.

Black & McDonald consistently delivers:

- *A high level of expertise*
- *Specialized equipment*
- *Immediate manpower availability*
- *Rapid, dependable emergency response*

By leveraging our national purchasing strategy, we are able to promote outstanding, quality workmanship at a fair price. Our well-organized, professional approach was established in 1921 and has been a cornerstone of our electrical, utility, mechanical, fabrication, technical services, and facility management and operations resources. Black & McDonald remains committed to our founders' philosophy to "do the job right ... regardless".



A SYNERGIZED APPROACH WITH SINGLE SOURCE ACCOUNTABILITY

Making a complex job look easy

Constructing a wind farm is no easy undertaking. Black & McDonald can provide a specific scope or full service solutions. Aspects include access roads, foundations, turbine erections, switching, substation(s), out buildings, overhead or underground transmission and distribution lines, SCADA systems, fiber optics, testing, commissioning and maintenance. Despite the multitude of stages and tasks involved, Black & McDonald excels.

We have the knowledge and resources to meet the challenges again and again. Our strong project management capability ensures the smooth coordination and scheduling of the many trades and varying stages of work involved in such a demanding project.

Long before wind turbines are erected, Black & McDonald's crews take the lead by clearing the turbine sites, installing entrance culverts, building bridges, and creating access roads. They use appropriate materials that suit varying soil and property conditions. Once completed, drainage tiling and silt fencing are installed for dewatering.

When access roads are safe to use for large and heavy equipment, fencing and site services secure the sites and the excavation and grading of the turbine foundations and underground trenching areas begin. With the foundation's rebar fabrication and bolt cage done, a steady stream of concrete trucks begin pouring – weather permitting. Once cured, the site is backfilled to the foundation in preparation for the next steps.



OUTSTANDING CAPABILITIES, HIGHLY SKILLED CREWS



EFFECTIVE & EXPERIENCED
PROJECT MANAGEMENT





Satisfying critical specifications

Once the foundations are set and ready, massive cranes arrive at the sites in preparation to raise the turbine sections for the tower, nacelle, and rotors. These wind turbine components are brought onto the site either directly from the manufacturer or from extensive laydown areas where components are stored prior to assembly.

Using our extensive wind farm experience, Black & McDonald's team of highly skilled trades people assemble each section of the wind turbine with expert precision and alignment. As soon as the first tower section is set in place, grout is poured at specific temperatures to ensure that it is securely bonded to the foundation below. Before proceeding with the other sections, grout samples are tested to confirm that the binding meets critical specifications.

EXTENSIVE
WIND FARM EXPERIENCE



Next, crane operators lift the second and third tower sections and nacelle into place. Black & McDonald trades people guide the progress and check key components.

Once the nacelle is secured in place, connections are made to cables that run hundreds of feet down to the base of the tower. The rotor blades are attached to the hub at ground level, then, the entire rotor assembly is lifted up into place and attached to the nacelle.

Network Installation and Programming Support

Black & McDonald's highly trained and experienced Network Solutions Group of Communication Specialists and Technicians construct the communication backbone for the wind farm from turbines to substations and

interconnections to the grid, or transmission system operator. They splice, test and install the fiber optic network to the substation SCADA system and communication with the System Operator.

Services include:

- *Installation and Programming Support*
- *SCADA Control Systems and Networks*
- *Programmable Logic Control*
- *Design, Installation, and Programming*
- *Wireless Network Installations*
- *Certified Fiber Optic and Copper Cable Systems Installation*
- *Network Distribution Racks, Panels, and Active Hardware*
- *Certification Testing*
- *Commissioning & Documentation*



EXPERT ASSEMBLY & PRECISION ALIGNMENT

Connecting the project with minimal disruption

A wind farm can include hundreds of kilometers of both underground and overhead collector lines that span the private property of landowners as well as the public right of way. From turbines to transmission towers, Black & McDonald knows the importance and benefits of using specialized equipment and experienced crews. They ensure that steady project progress, minimal disruption to residents and public traffic, and safety are the top priorities for everyone involved.

Black & McDonald's overhead and underground cabling and collector systems include pole and tower installations, duct-banks, cabling and fiber optic systems, and pad mounted transformers. Our services

include high voltage line splicing and termination up to 230 kV. Our skilled technicians meet the requirements of IEEE, NETA, CSA and ANSI to ensure system peak performance and reliability.

Substation Services include the full spectrum of procurement, installation, testing and commissioning, retrofit, repair, and maintenance.

Key aspects of substation work include:

- *Civil Work: Access Roads, Excavation and Grading for Equipment, and Trenching*
- *Foundation Forming and Pouring*
- *Structural Steel Fabrication and Installation*



TESTING & COMMISSIONING BY OUR HIGHLY SPECIALIZED TECHNICIANS

- *Underground Conduit and Pre-cast Trench Systems*
- *Power Transformer Assembly, Installation, Testing, and Commissioning*
- *Installation of Switchgear, Circuit Breakers, Protection, and Controls*
- *Interconnection to the grid or transmission system operator*

To ensure that site remediation will leave each turbine and the substation with safe access and a minimal footprint, safety and environmental considerations remain top of mind right up to project completion.

Then, once all testing and commissioning are complete, the wind turbine systems are fully energized and power generation begins!



SPECIALIZED EQUIPMENT & EXPERIENCED TRADES





RETURNING THE LAND
TO ITS ORIGINAL USE



Finishing up with responsibility & accountability

Once Black & McDonald has completed construction of the turbines, substation(s), and the maintenance building, activities that are performed on a regular basis throughout the project's life include: monitoring and analyzing performance, and executing planned maintenance and repairs on the turbines and other components of the system.

Lands adjacent to the access roads and turbine sites that were utilized in the construction phase will be restored and ready for use by the landowner. These areas were critical in allowing trucks with long loads to pass through, and for massive cranes to achieve the broad turn radiuses

necessary to get into position safely. With the exception of small areas around each turbine and the access roads to them, Black & McDonald effectively restores this land so that crops can once again be planted by the landowners.

As our crews move on to the next wind farm project, the land surrounding the turbines will once again be harnessed to yield its produce, while the turbines peacefully harness the energy from the wind – a 21st Century Pastoral View.



WIND ENERGY – PART OF THE PASTORAL LANDSCAPE

There's only one way at Black & McDonald. The right way.

Black & McDonald is a privately-owned Canadian company that provides an integrated, multi-trade prime contracting service to governments, institutions, industry, and commerce throughout Canada, the United States and Bermuda. Founded in 1921, William John McDonald established a foundation of principles and beliefs that are the very core of the company:

- *Do the job right... regardless*
- *Talk to the customers regularly, confirm their satisfaction*
- *Make the price fair and reasonable*
- *A deal is a good one, only when it is good for both parties*
- *Live up to your promises*
- *Treat employees with respect*
- *Complete jobs promptly*
- *Invoice promptly, fairly, and in detail*

As a result, Black & McDonald is known as a reliable and flexible contractor. With a team of over 5,500 strong, Black & McDonald lives and breathes the ultimate in safety, quality and high performance along with engineering excellence, best of class fabrication, and unprecedented customer service. Delivering the right solution in the right way at the right price is driven by an ongoing attitude of unwavering integrity and proud tradition.

Everyone at Black & McDonald knows that continued success depends on the ability to deliver innovation and exceed client expectations. It continually rests on the shoulders of each and every member of the team.

Anything less is not the Black & McDonald way.



Black & McDonald

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Toronto, ON

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Goose Bay, NL

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