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April 22, 2013

**VIA E-MAIL & COURIER**

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
2300 Yonge Street
27th Floor, Box 2319
Toronto, ON M4P 1E4

Dear Ms. Walli:

**Re: K2 Wind Ontario Limited Partnership;**
**Reply Submissions;**
**Board File Number: EB-2012-0458**

We are writing on behalf of K2 Wind Ontario Limited Partnership ("**K2 Wind**") to file K2 Wind's reply submissions to the April 15, 2013 submissions of the Residents Group (the **"Residents Submission**") on K2 Wind's motion to strike ("**Motion**"). For the reasons described below and in its submissions of April 8, 2013, K2 Wind submits that the Motion should be granted and the affidavits of Michael Leitch (the "**Leitch Affidavit**"), Ross and Darlene Brindley (the "**Brindley Affidavit**") and Marianne and Paul Bollinger (the "**Bollinger Affidavit**") should be struck out.

**The Leitch Affidavit**

The Submission of the Residents Group asserts that the "reliability and quality of the electricity service encompasses issues of safety pertaining to the design and construction of the proposed line."[1] This is overly simplistic and would result in any evidence that purports to address design and construction issues being automatically admissible. K2 Wind submits that is necessary to examine the specific evidence that the Leitch Affidavit purports to provide.

The Leitch Affidavit discusses the content and the application of particular design and construction standards promulgated by the Canadian Standards Association ("**CSA**") and the Electrical Safety Authority ("**ESA**"). The Board can certainly require an applicant to comply with applicable CSA and ESA requirements as a condition of any leave to construct order it issues. The Board has done so in many leave to construct decisions.[2] The Board may not, however, prescribe specific standards of electrical design or construction. This jurisdiction lies exclusively with the ESA.

[1] Residents Group, Submission on Motion to Strike Out Evidence Filed by the Residents Group, April 15, 2013, EB-2012-0458, p. 2.
[2] Grand Renewable Wind, LP, Ontario Energy Board Decision and Order, December 8, 2011 (EB-2011-0063), pages 7 and 11, Book of Authorities, Tab 5.

The Residents Group submits that the limitation of the Board's jurisdiction, as described above, means that the Board, in theory, would be obligated to accept an application "with a line on the back of a napkin." K2 Wind disagrees. The Board requires a minimum level of information about the facilities that it is being asked to "approve" by way of a leave to construct order, however constrained its section 96 jurisdiction may be. This requirement is reflected in Chapter 4 of the Board's *Filing Requirements for Electricity Transmission and Distribution Applications* (June 28, 2012). K2 Wind's Application includes all of the information stipulated in these Filing Guidelines. It comprises 760 pages and includes detailed information about the design configuration and mode of installation of the Proposed Facilities, including the technical specification of the major transmission equipment, the proposed layout of the transformer station and the substations, cross-sectional diagrams of the transmission line, schematics of electrical interconnections, single line diagrams of the transformer station and the substation and a table of applicable codes, standards and regulations that K2 Wind has or will comply with. In sum, K2 Wind's Application is hardly a paper napkin.

The fact that K2 Wind characterizes the design of the Proposed Facilities as "preliminary" as opposed to "final" simply reflects the way in which large non-utility projects of this kind are developed. The preliminary design is determined before an Engineering Procurement and Construction ("**EPC**") contractor is selected. The EPC contractor is responsible for completing the detailed final design of the project as well as for carrying out activities related to procurement, installation, interconnection, testing and commissioning. The EPC contractor would not receive notice to proceed until after the project had met certain threshold requirements, including the receipt of a leave to construct authorization. Ultimately, it is the EPC contractor who will certify that the final design is in compliance with all applicable codes and standards.

The Residents Group point to proceeding EB-2007-0034 ("**Wolfe Island**") as an example of a proceeding where the Board received and considered evidence on the design parameters of electricity transmission lines. In fact, the transcript excerpts from that proceeding underscore the limits of the Board's jurisdiction under section 96 of the *Ontario Energy Board Act, 1998* ("**OEB Act**"), namely considerations of reliability and quality of electricity service. The evidence from the Wolfe Island proceeding had to do with the impacts of the project on neighbouring electricity distribution systems and the customers connected to these systems.[3] This evidence considered whether the applied-for transmission line would negatively affect the local electricity distribution company (Utilities Kingston) as a result of potential induction effects. Utilities Kingston had intervened in the proceeding to express concerns about this issue.

By way of contrast and as stated in K2 Wind's submissions on the Motion, the local distributor, Hydro One Networks Inc. ("**Hydro One**"), has <u>not</u> intervened in this proceeding to express concerns about potential induction effects or otherwise. Moreover, the System Impact Assessment and Customer Impact Assessment that were filed by K2 Wind demonstrate that the Proposed Facilities will not affect the reliability and quality of the service provided by proximately located electricity transmission systems.

The Wolfe Island transcript evidence upon which the Residents Group relies also describes the proponent's cable protection plans. This evidence was provided as part of the proponent's

[3] EB-2007-0034, Sept 24, 2007, Transcript of Hearing on an Application by Canadian Renewable Energy Corporation, p. 30.

description of the applied-for facilities and was not at issue in the proceeding. There was no discussion, as there is in the Leitch Affidavit, about the application of specific CSA and ESA codes. Interestingly, the EB-2007-0034 Decision and Order did not discuss applicable codes and standards but, rather, directed the applicant to "obtain all necessary approvals, permits, licences, certificates and easement rights required to construct, operate and maintain the Project" and to satisfy reasonable requirements of the local distributor and municipality.

As to the issue of the expertise of Mr. Leitch: while the Residents Group asserts that Mr. Leitch has "vast personal experience" regarding the issues discussed in his Affidavit,[4] there is only a single sentence on the subject describing Mr. Leitch's employment experience as involving the "design of high voltage hydro lines". The Leitch Affidavit does not disclose the precise nature of this involvement or the level of Mr. Leitch's responsibility in this regard. Finally, the Leitch Affidavit does not demonstrate that Mr. Leitch possesses the special knowledge, educational and professional experience about the issues he discusses so as to qualify as an expert in the matter.

The Residents Group's assertion that K2 Wind is "unable" to identify the persons responsible for designing the Proposed Facilities is incorrect.[5] K2 Wind objected to producing this information on the grounds that it was not relevant. It is K2 Wind who is responsible for the safe design, construction and operation of the Proposed Facilities, not the individuals who provide advice to K2 Wind in this regard. Nevertheless, in order to allay the concerns of the Residents Group about the design of the Proposed Facilities, we are enclosing a copy of the *curriculum vitae* of Mr. Byron Nicholson, Senior Electrical Engineering Specialist at AMEC. Mr. Nicholson, on behalf of K2 Wind, was responsible for the preliminary design of the Proposed Facilities. As can be seen from the enclosed *curriculum vitae*, Mr. Nicholson has extensive experience in the area of high voltage transmission design and has given expert testimony in OEB proceedings, including in the Wolfe Island proceeding discussed above.

**The Brindley Affidavit**

The Brindley Affidavit discusses the potential induction effects of facilities that are not related to the Proposed Facilities and which have a different electrical configuration from the Proposed Facilities. In fact, the Brindley Affidavit does not even assert that the Proposed Facilities will or are likely to cause any impact on the Hydro One distribution system or on its customers. For all of these reasons, the Brindley Affidavit should be struck out.

**The Bollinger Affidavit**

Notwithstanding the submission of the Residents Group, K2 Wind does not understand the purpose of the Bollinger Affidavit *vis-à-vis* the matters that are properly at issue in this proceeding. It would appear that the Residents Group is offering the Bollinger Affidavit as evidence that some members of Ashfield-Colborne-Wawanosh ("**ACW**") Council did not agree with certain statements included in a K2 Wind letter to local residents. ACW Council is not an intervenor in this proceeding and has not registered any concerns about the Proposed Facilities in this proceeding. Moreover, the letter attached to the Bollinger Affidavit deals with the wind farm itself and covers topics such as land use, property values and compensation,

[4] *Supra*, note 1, p. 2.
[5] *Supra*, note 1, p. 7.

environmental issues and the effect of wind turbines on human health – all issues that have nothing to do with the Application or this proceeding. The Bollinger Affidavit is, accordingly, not relevant and should be struck out.

**Conclusion**

In sum, K2 Wind respectively requests the Board strike out the Affidavits for the reasons set out in its April 8th submissions:

(a) the issues of electrical safety and construction practices that are raised in the Leitch Affidavit do not appear to be related to the "reliability" and "quality of electricity service" under section 96 of the OEB Act, as these terms have been interpreted by the Board in numerous prior decisions on leave to construct applications;

(b) the issues of electrical safety and construction practices that are raised in the Leitch Affidavit; would require the Board to engage in matters within the exclusive jurisdiction of the ESA pursuant to Part VIII of the *Electricity Act, 1998*;

(c) the construction activities and health issues that are raised in the Leitch Affidavit and the Brindley Affidavit, are outside the scope of this proceeding, as delineated in Procedural Order No. 1;

(d) the stray voltage issues that are raised in the Brindley Affidavit relate to an entirely different project that is unrelated to the Proposed Facilities;

(e) the Bollinger Affidavit describes what transpired at a particular ACW Township Council meeting without explaining the relevance of the description to the matters at issue in this proceeding; and

(f) to the extent that the Leitch Affidavit purports to offer expert evidence in this proceeding, the deponent has not demonstrated that he is properly qualified.

Yours very truly

**Dentons Canada LLP**

***(signed) Helen T. Newland***

Helen T. Newland
HTN/ko
Encls.

cc: Maureen Helt
Leila Azaiez
Ontario Energy Board

Boris de Jonge
Capital Power Corporation

Paula Lukan
IESO

Paul F. Wendelgass
K2 Wind Ontario Inc.

Anita & Paul Frayne
ACW Residents Group

# Byron Nicholson, P.Eng.

**Senior Electrical Engineer and Protection & System Study Specialist**

## Professional summary

Byron has over 35 years of experience in high-voltage substation, transmission line, cogeneration, combined-cycle generation, thermal generation, wind generation, petrochemical and oil refinery projects. His experience includes transmission and distribution lines from 13.8 kV to 500 kV, transformers up to 2100 MVA and 500 kV, and generation from 5 MW to 1750 MW.

## Professional qualifications / Registration(s)

Professional Engineers Ontario, Canada (PEO), #34024018, 1977
Association of Professional Engineers of the Province of Nova Scotia, #8970, 2009

## Education

B.Sc. (Engineering Physics), Queen's University, ON, Canada, 1975.

## Languages

English

## Employment history

AMEC, Various Positions, Oakville, Ontario (1975 to present)
AMEC, Manager, Electrical & Instrumentation Department, Oakville, Ontario (1998 to 2003)
Saskmont Engineering, Electrical Designer, Regina, Saskatchewan, (1973 to 1975)

## Summary of core skills

Core skills include conceptual design, detailed design, specifications, engineering audits, electrical system integration and analysis studies, system protection and coordination; cost estimating, construction supervision, commissioning, equipment performance testing, permitting, and project management.

## Representative projects

### Wind Generating Facility – Dufferin Wind

Dufferin Wind, Ontario, Canada (2012)
Preliminary system design and regulatory applications for the interconnection of the Dufferin Wind project to the transmission system, including preliminary design of a 230 kV transformer station, a combined overhead and underground 230 kV transmission line and a 230 kV interconnection station.

### Generator Black Start Study - Kearl Project

Imperial Oil, Alberta, Canada (2011)
Technical support for a Steam Turbine Generator Black Start Study in order to determine the feasibility and requirements for starting the generator after loss of the grid supply.

### Preliminary Engineering and Bid Preparation - Hearn SS Replacement Project
Hydro One Networks Inc., Ontario, Canada (2011)
Preliminary engineering and specification preparation for the replacement of the HONI 115 kV Hearn SS, including protection and control, ancillary equipment including new 138 kV station service supplies, and new and re-routed 138 kV overhead and underground transmission lines.

### Grid Interconnection Study - Detour Lake Project
*Detour Gold, Ontario, Canada (2010 – 2011)*
Produced two regulatory required System Impact Assessments (SIA) for the connection of a new 115 MW mining facility into the provincial electrical grid. The SIAs included short circuit studies, load flow studies under various contingencies, system stability studies under various transient conditions and recommendations for plant design necessary to meet grid operator reliability requirements.

### Combined Cycle Power Plant - Tufts Cove #6
*Nova Scotia Power, Nova Scotia, Canada (2008 – 2011)*
Electrical lead for detailed design of a 58 MW steam generator, two associated once-through steam generators and connection to the 138 kV grid.

### Grid Interconnection Design - Hinkley Point C and Sizewell Point C GSs
*EDF, United Kingdom (2010)*
Detailed design of single line drawings for 1750 MW generator, unit, station and generator transformers, and 400 kV connections to National Grid (NG) substations, including specification of generator, transformers and transmission line protection systems.

### Grid Interconnection Study - Young-Davidson Project
*Northgate Minerals, Ontario, Canada (2008 – 2009)*
Produced a regulatory required System Impact Assessment (SIA) for the connection of a new 25 MW Mining facility into the provincial electrical grid. The SIA included short circuit studies, load flow studies under various contingencies, system stability studies under various transient conditions, design of reactive power requirements to resolve steady state and transient contingencies and recommendations for plant design necessary to meet grid operator reliability requirements.

### Combined Cycle Power Plants
*Competitive Power Ventures, Ontario, Canada (2008 – 2010)*

- Nanticoke Energy Centre technical support for preliminary design of a 1,500 MW gas fired generating facility and its interconnection to the 230 kV grid, and
- North Dumfries Energy Centre support for regulatory application, system impact studies, preliminary design and cost estimating of a 410 MW gas fired generating facility, 230 kV switching station and interconnection to two 230 kV transmission lines.

### Wind Generating Facility – Leader WF
*Enbridge, Ontario, Canada (2008)*
Protection and control support for a 200 MW wind generating facility substation and interconnection to two 230 kV transmission lines.

### Wind Generating Facility - Port Alma WF
*Kruger, ON, Canada (2008)*
Protection and control support for a 100 MW wind generating facility substation, one 230 kV transmission line and the interconnection to two 230 kV transmission lines.

### Emergency Generation - Pickering NGS

*Ontario Power Generation, Ontario, Canada (2006 – 2008)*
Support of electrical design and commissioning of two simple cycle 54 MW gas turbine generators at a nuclear power plant, including protection and coordination studies, generator performance monitoring during emergency operation, and commissioning.

### Wind Generating Facilities

*AIM PowerGen, Ontario, Canada (2006 – 2008)*
Preliminary system design and regulatory applications for numerous 10 MW wind generation facilities, including support for the interconnection of four 10 MW wind generation facilities to 27.6 kV distribution systems.

### Wind Generating Facilities

*Capital Power Corporation (EPCOR), Canada (2002 – 2010)*
Work on numerous wind farm projects, including:

- Produced BC SIS application for connection of 145 MW Tumbler Ridge WF into 230 kV transmission line,
- Preliminary design and estimating for the Tumbler Ridge (145 MW) and Klo (105 MW) wind generating facilities in BC, including 230 kV and 138 kV transmission system connections,
- Support of validation testing of the Vestas V80 wind turbine generator,
- Detailed design of the Kingsbridge II 34.5-500 kV substation, 34.5 kV collector system, and 500 kV transmission system connection for a 160 MW wind generation facility; project postponed after 70% of the detailed engineering was completed,
- Preliminary design, estimating and regulatory applications for a 300 MW wind generating facility and 500 kV transmission system connection in Ontario,
- Detailed analysis to determine equipment ratings and system constraints for the Kingsbridge I, 40 MW wind generation facility, as well as support for regulatory interface issues,
- Feasibility study, preliminary design, estimating and regulatory application for a 54 MW wind generating facility and two 27.6 kV distribution system connections in Ontario, and
- Feasibility study, preliminary design, and regulatory application for an embedded 7 MW wind generation facility.

### Wind and Hydraulic Generating Facilities

*TransAlta (Canadian Hydro Developers), Ontario, Canada (2003 – 2007)*
Work on numerous wind and hydraulic generating facility projects, including:

- Expert witness at Ontario Energy Board hearing for a new 230 kV underground transmission line associated with the 200 MW Wolfe Island wind generation facility,
- Consultant on detailed design and interface with IESO and Hydro One for the 69 MW Phase 1 Melancthon wind generation facility,
- Feasibility study, preliminary design, estimating, regulatory application, and regulatory System Impact Assessment (SIA) for a 240 MW wind generation facility and 230 kV underground transmission connection to HONI Gardiner TS. The SIA included load flow studies under various contingencies, system stability studies under various transient conditions and design of reactive power requirements to resolve steady state and transient contingencies,
- Preliminary design, estimate, and regulatory application for generating station with two 12 MW hydraulic units, 115 kV transmission line and 115 kV interconnecting switching station,

- Feasibility study, preliminary design, and regulatory application for a 36 MW wind generation facility and 44 kV distribution system connection,
- Feasibility study, preliminary design, and regulatory application for a 200 MW wind generation facility and 230 kV transmission system connection, and
- Feasibility, preliminary design, estimate and regulatory applications for two 4.5 MW hydraulic generating stations and associated 44 kV distribution system connections.

### Wind Generating Facility - Port Burwell WF

*AIM PowerGen, Ontario, Canada (2005)*
Detailed system analysis to determine equipment ratings and system constraints for the 115 kV connection of a 99 MW wind farm generating facility.

### Biofuel Generating Facility

*Weyerhaeuser, Ontario, Canada (2004 – 2005)*
Preliminary design, review of IESO and Hydro One connection assessment process, and regulatory System Impact Assessment (SIA) for an 85 MW biofuel power plant and 115 kV transmission system connection. The regulatory SIA included load flow studies under various contingencies, system stability studies under various transient conditions and determining generator reactive power requirements to resolve steady state and transient contingencies.

### Combined Cycle Power Plant – PEC GS

*Portlands Energy Centre, Ontario, Canada (2003 – 2004)*
Owner's engineer for electrical and interconnection conceptual design and development of a 550 MW combined-cycle generating facility, including support in obtaining regulatory approval and auditing EPC bids.

### Co-generation Power Plant

*Northern Cross Energy, Ontario, Canada (2002 – 2004)*
Owner's engineer for the feasibility study of a 50 MW gas fired cogeneration facility, including IESO and Hydro One connection assessment requirements.

### Pharmaceutical Power Distribution - West Point

*Merck, PA, USA (2000 – 2004)*
Project manager and electrical lead for the addition of a third 34.5 kV feeder from the local utility, including protection upgrades on two lines, addition of a load shedding scheme, modification of an on-site generation "islanding" scheme, and complete plant load flow, short circuit and protection coordination analysis, including three onsite gas turbine generators.

### Co-Generation Facility - Kingston

*AES Kingston, Ontario, Canada (1999 – 2004)*

- Preparation, submittal and review of the IESO connection assessment for a 60 MW co-generation facility and a 550 MW combined cycle generating facility, and
- Owner's engineer for study and conceptual design of a system to maintain critical service loads during an open-before-close transfer between supplies from 230 kV and 115 kV station service transformers.

### Oil Refinery Projects - Nanticoke

*Imperial Oil, Ontario, Canada (1985 – 2004)*
Project Manager and electrical lead for numerous assignments, including:

- Addition of a new PRISM process unit's critical service motors into a motor re-acceleration scheme,
- Upgrading a transfer trip system for two generators to make it redundant,
- Addition of the FCCU Saturn critical service motors into the motor re-acceleration scheme,
- Addition of CS&VU AVIN critical service motors into the motor re-acceleration scheme,
- Replacement of single 125 Vdc and 120 Vac UPS systems with redundant systems,
- Upgrade and expansion of a reacceleration scheme for critical service motors,
- Addition of a re-acceleration scheme to re-start critical service motors that tripped due to momentary electrical system disturbances,
- Design audit of the protection and control systems after a major system failure of two 10 MW steam turbines and the 27.6 kV interface with the local utility, and
- Protection, control, and power system studies.

### Wind Generating Facility – Huron WF

*Vestas, Ontario, Canada (2002 – 2003)*
Detailed design of a 9 MW wind farm, 27.6 kV collection system and interconnection with Hydro One's 44 kV distribution system, including protection and control systems.

### System Studies - St. George Campus

*University of Toronto, Ontario, Canada (1998 – 2002)*
Project manager and electrical lead for various studies, including:

- Distribution system study and analysis of future load growth alternatives for 80 MVA, including review of a proposed new 13.8 kV substation as well as providing two alternative options and cost estimate,
- Short-circuit fault study for four scenarios related to upgrading the campus electrical system,
- Feasibility study of a back-up diesel-generator in the central steam plant, and
- Feasibility study for a 1.5 MW black-start and peak-shaving gas-fired generator, including changes required to the 27.6 kV protection and control interface with the local utility.

### Co-generation Power Plant - Sarnia

*Imperial Oil, Ontario, Canada (2001)*
Owner's engineer for a 100 MW cogeneration facility, including the internal 27.6 kV and external 230 kV connections, providing conceptual design and development and support in obtaining regulatory approvals.

### Chemical Plant Substation – Kingston

*DuPont, Kingston, Ontario, Canada (1999 – 2001)*
Project manager and electrical lead for expansion of the main switching station at a chemical plant, including 44 kV bus tie circuit breaker, 53 MVA transformer and indoor 13.2 kV switchgear, as well as 44 kV incoming line protection upgrades.

### Chemical Plant Projects – Maitland
*DuPont, Maitland, Ontario, Canada (1992 – 2001)*

- Project manager and electrical lead for expansion of the main 44 kV switching station, including installation of a 53 MVA transformer and indoor 13.2 kV switchgear as well as a new 13.2 kV powerhouse indoor substation and hydrogen peroxide 13.2 kV walk-in substation to provide back-up supply for the existing overhead plant feeders,
- Project manager and electrical lead for the addition of the nylon plant intermediate indoor 13.2 kV substation, including re-supplying twelve existing process substations; and for replacement of a 2.4 kV outdoor pump house substation with a 4.16 kV walk-in substation, and
- Protection and control design, commissioning and start-up for a 37 MW cogeneration plant with 44 kV switching station, five 44 kV distribution lines and utility interface.

### Co-generation Power Plant
*Confidential, MI, USA (1994)*
Feasibility study for a combined-cycle power plant

### Co-generation Power Plant
*York University, Ontario, Canada (1994)*
Cogeneration plant feasibility study, as well as protection, control and power systems studies.

### Co-generation Power Plant - Tunis GS
*Potter Power, Ontario, Canada (1994)*
Protection and control of a 45 MW combined-cycle plant, 115 kV transmission line and utility interface.

### Co-generation Power Plant - Cardinal GS
*Sithe Energies, Ontario, Canada (1993)*
Design and commissioning of protection and control system for a 235 MW cogeneration plant, including two 115 kV switching stations, three overhead and cable transmission lines and utility interface.

### Chemical Plant Transformer Station - Sarnia
*DuPont, Sarnia, Ontario, Canada (1991 – 1992)*
Design and commissioning support of protection and control systems for a 40 MVA substation, two 230 kV transmission lines and utility interface at a chemical plant.

### Transformer Station - Halton TS
*Ontario Hydro, Ontario, Canada (1989)*
Design of protection and control systems for a 100 MVA, 230 - 27.6 kV substation and feeders for a new transformer station.

### System Studies, including Protection and Control
*Various Clients (1987-1995)*
Protection and control consulting and technical support, with direct responsibility for power system studies including field data collection, short-circuit, voltage drop, load flow, motor reacceleration, protection schemes, protection coordination and protection settings, on numerous projects including:

- South Porcupine gold plant Placer Dome, ON, Canada
- Smooth Rock Falls pulp mill, Malette Kraft, ON, Canada
- St. Lawrence Seaway Authority, ON, Canada

- Holyrood thermal power plant, Newfoundland and Labrador Hydro, NL, Canada
- Toronto Island airport, Transport Canada, ON, Canada
- 115 kV transmission line and substations in Belize, including interface with the Mexican grid
- Connaught Laboratories cogeneration plant, ON, Canada
- Kingston oil refinery, Petro Jamaica, Jamaica.

### Co-generation Power Plants - Kapuskasing and North Bay GSs

*TransCanada Pipeline, Ontario, Canada (1991)*
Feasibility studies for two combined-cycle generating plants.

### Oil Refinery Projects

*Imperial Oil, Canada (1985 – 1991)*
Electrical lead for design, equipment and construction specifications, and system protection and coordination for refinery retrofit and upgrade projects in Ontario, Nova Scotia and British Columbia.

### Oil Refinery Projects - Nanticoke

*Texaco, Ontario, Canada (1983 – 1985)*

- Electrical design, equipment and construction specification preparation and cost estimating for numerous refinery expansion and modernization projects.
- Electrical lead for analysis, design, equipment and construction specifications, inter-discipline coordination, construction and commissioning of the conversion of a compressor steam turbine to a 13.2 kV, 8,850 hp electric motor and associated transformer, circuit breaker and of correction capacitors for a KGO hydrofiner.

### Oil Fired Generating Station – Lagos GS

*Nigerian Power Authority, Nigeria (1983 – 1984)*
Design audit of generator and power distribution equipment, controls and protection of a 6 x 220 MW oil- and gas-fired power station and 330/132 kV substation and transmission lines, as well as commissioning of a 33/11 kV substation.

### Petrochemical Plant Projects - Sarnia

*Petrosar, Ontario, Canada (1981 – 1983)*

- Electrical construction supervision and commissioning of a 40,000 bpd vacuum distillation unit at a petrochemical plant.
- Responsible for the hydrocracker and amine/sulphur units at a 25,000 bpd heavy oil upgrader, including specifications for large motors, power transformers, MV switchgear and UPS equipment, and cost estimating. Project deferred.

### Coal Fired Generating Station - Thunder Bay Units 2 & 3 GS

*Ontario Hydro, ON, Canada (1975 – 1981)*

- Construction supervision, scheduling and commissioning of generator protection and control, power distribution and 115 kV switchyard and transmission lines for 2 x 150 MW coal-fired generating units.
- Detailed design and major electrical equipment specifications for 2 x 150 MW coal-fired generating units.

**Coal Fired Generating Station - Boundary Dam No 6 GS**
*SaskPower, Saskatchewan, Canada (1973 – 1974)*
Assisting in the electrical design and CPM scheduling for a 300 MW coal-fired generating unit.

## Publications and presentations

“An overview of the Ontario transmission system and the requirements and constraints in connecting wind generation to Ontario transmission and distribution systems”, Canadian Wind Energy Workshop, 2004.