

## **Project List**

**For Charles F. Henville**

**Henville Consulting Inc.**

### ***Consulting projects***

- Preparation of remedial action scheme catalogue for BC Transmission Corporation
- Protection impact study for series capacitor reinforcement of 220 kV transmission lines for Transpower New Zealand
- Technical advisor for Aspen Inc.
- Protection review for Churchill Falls (Labrador) Power Corporation Ltd. 230 kV transmission line protection
- Protection review for Fortis BC for various transmission line protection systems
- Protection review for Catalyst Paper (Powell River). 138 kV line protection, transformer and generator protection systems.
- Protection review and coordination study for Yukon Energy Corporation 69 kV transmission line protection
- Technical advisor for a major oil company lawsuit regarding reliability of power supply
- Preparation of protective relay settings for a variety of transmission lines and substation equipment with voltage rating of 240 kV – 69 kV. Review of conceptual protection design for 240 kV phase shifting transformer. for AltaLink L.P
- Chair, Technical Advisory Board to BC Hydro for reliability of power supply to 2010 Olympics
- Protection consultant for BC Hydro- variety of project work including the application and setting of protection systems for a wide variety of projects.
- Protection leader in design of special protection system for Saudi Electric Company, Central Region Branch. Prepared conceptual design and technical specification for a special protection scheme to increase the transmission capacity from the Eastern region to the Central region from 1800 MW to 2500 MW.(2002-2003)
- Technical advisor for Hartford Insurance in \$35M lawsuit for damages allegedly caused by an electrical short circuit.(2002)
- Protection specialist for Yukon Energy Corporation in preliminary engineering study for Mayo GS to Dawson City Transmission Project.
- Protection leader in feasibility study for new 500 kV substation for Aquila Networks Canada for interconnection into BC Hydro 500 kV transmission circuit at Vaseux Lake in BC(2002)
- Protection leader in review of protection application and coordination for Maxus Southeast Sumatra LLC. This work involved review of settings and protective relay application for the complete generation and distribution system to supply approximately 20 substations for supply of power to oil well pumps. Total system load approximately 70 MW, approximately 7 interconnected 34 kV submarine cable circuits and 50 interconnected and radial 13.8 kV submarine cable circuits (1999-2001)
- Overall Technical Coordinator in contract for Tenaga Nasional Berhad, Malaysia, regarding analysis and recommendations related to system blackout on 3 August, 1996.

### ***Training Projects***

- Protection and Aspen OneLiner combined training for Newfoundland and Labrador Hydro
- Protection and Aspen OneLiner combined training for Siemens PTI
- Protection and Aspen OneLiner combined training for ITC Transmission Group
- Aspen OneLiner and Aspen Relay Database for Transco Abu Dhabi

- Protection Training for IEEE Vancouver Section
- Protection training for Eskom south Africa
- Continuing education training in short circuit analysis for Association of Professional Engineers of BC
- Protection training for Gonzaga University
- Technical reviewer for protection training project for Yukon Energy Corporation
- Protection training for University of Wisconsin, Madison

## ***BC Hydro Projects***

### Protection

- Protection application leader in project to integrate newly refurbished 1.6 MVA hydro generator with existing 800 KVA hydro generator interconnected with a 25 kV feeder (with tapped load) to a 2MVA diesel generator plant (Clayton Falls expansion project).
- Protection application leader in project to integrate a 3.5 MVA diesel substation to the BC Hydro integrated transmission system with a 174 km 138 kV transmission circuit. Tapped loads of 6 MVA and 1 MVA were supplied from this transmission extension (1988-1989).
- System design and settings for remedial action schemes for control of voltage, frequency, and stability, such as overload protection for 500 kV submarine cables 5L29 and 5L31 (1996-1998), load shedding protection to prevent voltage collapse(1993-1995), controlled islanding protection against dynamic swings during high imports(1998).
- Protection application leader for project to connect two 50 MVA hydro-generators to the BC Hydro 60 kV subtransmission system (Stave Falls Generation). Conducted protection application studies for generator and transformer protection systems.
- Protection application leader in project to build new 138 kV distribution substations at Oyster River and Qualicum Beach on Vancouver Island. Conducted protection application and coordination studies for transformer, distribution bus and distribution feeder protection.
- Leader of project to replace obsolete (type HZ) distance protection relays on 155 transmission line protection systems in British Columbia. Participated in this project by conducting application and coordination studies and preparing settings sheets for 49 systems, of which 20 were for transmission lines operating at 138 kV or higher. Of the 20 systems rated 138 kv or higher, 7 were rated 230 kV. (1986 - 1992)
- Participant in project to provide special protection system for thermal overload protection for two 500 kV submarine cable circuits from mainland of British Columbia to Vancouver Island. Participated in this project by conducting application studies and coordination studies with thermal overload capability, and calculating required settings. (1996 to 1999)
- Leader and participant in project to modify nine 500 kV shunt reactor protection systems at three substations in British Columbia to prevent tripping of associated transmission lines when the circuit switcher used to energize the reactor did not close all three poles simultaneously. Conducted application studies to design protection modifications. (six months, 1997-1998)
- Participant in project to replace 230 kV shunt reactor at Ingledow Substation in British Columbia. Conducted protection application study to determine whether existing protection would be suitable for new reactor. (two months 1994)
- Participant in project to provide a special protection system for automatic load shedding to prevent voltage collapse in the Lower Mainland and Vancouver Island areas of British Columbia. Conducted protection application study and prepared relay setting sheets for voltage and reactive power protective relays at six 230 kV substations and one generating station and one HVDC terminal station. (two years, 1993 - 1995)
- Participant in project to add a 12 kV shunt reactor to the tertiary winding of a 500-230 kV auto transformer at Cranbrook substation in British Columbia. Conducted protection application and coordination studies and prepared relay setting sheets. (one year, 1993)

- Participant in project to construct a new 500 kV transmission line from Williston to Kelly Lake substations in British Columbia. Conducted protection and application studies for associated transmission line and station equipment protection systems and prepared relay setting sheets. Transmission line protection system was first application in BC Hydro of digital protection for 500 kV line protection. Protection systems included features for high resistance ground fault protection, single phase tripping and reclosing, synchronised switching to reduce surges, and tolerance for in line series capacitor. (three years, 1992 to 1994).
- Participated as protection specialist in interconnection impact studies and interconnection facilities studies for numerous generators ranging in size from 1 MW to 225 MW.
- Participant in project to replace obsolete (type KD) electromechanical relays on 80 transmission and subtransmission lines (1999-date)
- Specified and applied the first overload protection devices that included accurate thermal models for transmission lines and transformers (1998 – 2000)
- Specified and led the application of the first non conventional instrument transformers on the BC Hydro system for protection purposes (NXTPhase optical current and voltage transducers applied in monitoring mode for protection of 230 kV, 125 Mvac shunt capacitor and 145 Mvar Shunt reactor.
- Protection application leader in project to interconnect 230 kV and 60 kV transmission of Aquila Networks Canada to BC Hydro's Kootenay Canal generating station (2001 – 2003)

### Commissioning and Acceptance

Commissioning and acceptance engineer for the following types of BC Hydro projects.

- Generator installation of a 25 MW gas turbine driven generator at Keogh Generating station in Port Hardy.
- Various diesel generator commissioning projects at diesel generating stations in Stewart, Bella Bella, Fort Neslon.
- Commissioning power equipment such as transformers and circuit breakers at numerous BC Hydro substations and generating stations.

### ***Commissioning engineer GEC Gas Turbines***

- Commissioning 15000 HP gas turbine driven gas compressors for Trans Canada Pipelines in Saskatchewan and Manitoba. Also for British Gas in Kings Lynn, England.
- Commissioning 11 - 44 MW gas turbine driven generators in Zambia, Canada, Qatar, Abu Dhabi, Sweden, and associated power equipment at various sites in England.