RESUME of Charles F. Henville

Date of Birth: 11, May, 1948 **Nationality:** Canadian

Skills

- Modelling of electric power systems in steady state, during short circuits and during other transients.
- Application and setting of power system protective relays
- Design of special protection systems and power system emergency controls
- Application and type testing of protection systems
- Disturbance analysis
- Training in power system protection

Academic Qualifications:

Bachelor of Arts (Electrical Sciences), University of Cambridge, England, 1969
Master of Arts, University of Cambridge, England, 1974
Master of Engineering, University of British Columbia, 1996,

Professional Associations:

- Member Association of Professional Engineers and Geoscientists of BC
- Member Association of Professional Engineers and Geoscientists of Newfoundland and Labrador
- Member Association of Professional Engineers and Geologists and Geophysicists of Alberta
- Fellow, IEEE, (member, Power Engineering Society)
- Member IEEE Power System Relaying Committee (PSRC)
- Chair PSRC, Past Chair Substation Protection subcommittee, PSRC
- Member several IEEE PSRC working groups
- Past Chair, Vice Chair, Secretary, Treasurer, Chapter Chair, Education Chair, Awards Chair, Membership Committee Chair, IEEE Vancouver Section
- Past member CIGRE working group on "Protection Against Voltage Collapse" for Study Committee 34
- Technical paper reviewer for IEEE Transactions on Power Systems, IEEE Transactions on Power Delivery, IEEE letters to PE Review, and IEEE Power Engineering Society conferences.
- Past member, Western Electricity Coordinating Council, Remedial Action Scheme Reliability Task Force.

Specialization Courses and Academic Activities:

- Adjunct Faculty, University of Wisconsin, Madison, and Institute Nationale Polytechnique de Grenoble, France, for short course “Advanced Topics in Power System Protection”.
- Sessional Instructor, University of British Coumbia (BC). Teaching undergraduate course in Power System Protection.
- Adjunct Faculty gonzaga University, teaching graduate course in Power System Protection.
- Post graduate courses at the University of BC (1991-1996, Part of Master of Engineering Program Listed above) Advanced Power System Control and Dynamics, Wave Propagation in Multiconductor Transmission Circuits, Advanced Power Systems Analysis, Network Analysis and Simulation, High Voltage Engineering parts I and II, Power Electronics Control, Computer Applications in Power Systems, Power System Protection.

- Undergraduate course Economic Evaluation of Engineering Projects (University of BC 1992)
- Advances in Microprocessor Based Protection and Communication - IEEE Tutorial, July 1996.
- Certified trainer for ASPEN OneLiner ™ Short Circuit and Relay Coordination software.

Languages: English (native), Spanish (small amount)

Experience:

- Principal, Henville Consulting Inc. Providing expert services in application and setting of protective relays and power system protection to Canadian and international utilities and industries. Client list includes,
  Yukon Energy Corporation, Fortis BC, BC Hydro, BC Transmission Corporation, AltaLink, Newfoundland and Labrador Hydro, Churchill Falls (Labrador) Corporation Ltd., Catalyst Paper, Aspen Inc. Tesoro Refining and Marketing Company Inc., Abu Dhabi Transmission and Despatch Company, Transco New Zealand, Eskom South Africa
- System protection engineer for a major Canadian Utility (1977 to January 2005). Extensive and continuous experience in:
  - ⇒ Short circuit studies (classical, and including load flow and transient components using electromagnetic transients programs (emtp))
  - ⇒ Protective relay application and coordination studies for rotating and static electric power equipment (voltages ranging from 0.6 to 500 kV) and for small and large electric power systems.
  - ⇒ Calculation of protective relay settings
  - ⇒ Economic and reliability analysis of protective relay applications.
  - ⇒ Electric Power System Disturbance analysis
  - ⇒ Power system and equipment and protective relay computer modelling.
  - ⇒ Testing of protective relays
  - ⇒ Interconnection of generators with transmission and distribution systems
- Leader or participant in analysis of complex system disturbances, including Malaysian Peninsular disturbance August 1996, and various disturbances in the BC Hydro network. Analysed complex disturbances using protective relay disturbance records or fault recorder data. Recreated disturbances on appropriate models of the electric system
- Leader or participant in specification and implementation of type tests for new designs of protective relays such as digital distance relays, digital transformer protection relays and digital generator protection relays to check for suitability of application (1977 to date).
- Leader or participant in short circuit studies on large electric power systems (up to 1500 busses). Specific skills in operation of PTI PSS/E load flow and short circuit program, and ASPEN One Liner ™. Uses hand calculations to determine unbalanced short circuit quantities in simple systems. Uses electromagnetic transients programs (EMTP) in multi-frequency analysis of short circuits and other system abnormalities (1977 to date).
- Prepared project justifications for protective relay upgrade and replacement projects valued up to US $4,000,000. Evaluated risks associated with retaining existing systems. Evaluated benefits associated with upgrading projects.
- Commissioning and acceptance engineer for a major Canadian utility. (1974-1977). Checking correct construction and installation of power electrical equipment. Field testing of circuit breakers, automatic reclosers, power transformers, power capacitor and reactors, and diesel generators. (Equipment rating ranges from 2.4 kV to 500 kV).
- Commissioning engineer for gas turbine driven generators and compressors (1970-74). Checking correct construction and installation of power electrical and mechanical generating and pumping equipment. Commissioning and troubleshooting instrumentation, protection

and control equipment for power rotating equipment (capacity up to 44 MW, voltages up to 13.8 kV).

- Professional Engineering apprenticeship, Associated Electrical Industries, Trafford Park, Manchester England. Assisted in the manufacture and testing of large power equipment such as generators and transformers (1964-1970).

Present position:
President, Henville Consulting Inc.

Years of Professional Engineering Experience:
Thirty eight (38) Years

Employment History:

2005 to Date	President and principal engineer, Henville Consulting Inc.
1977-2004	System Protection engineer with BC Hydro, Vancouver, BC (starting as intermediate engineer, retiring as principal engineer)
1974-1977	Commissioning and acceptance engineer with BC Hydro, Vancouver, BC
1970-1974	Commissioning Engineer, GEC Gas Turbines, Whetstone, Leicester, England.
1966-1970	Professional Engineering Apprenticeship, Associated Electrical Engineering, Manchester, England.

Publications authored or co-authored
"Back to Back Switching of Large 230 kV, Grounded Wye Capacitor Banks, Field Tests, Analysis of Results and Application Guidelines", 1983, Canadian Electrical Association
“Protection of the BC Hydro High Power Laboratory”, 1985 Western Protective Relay Conference, Spokane, WA.
"Type Tests on Distance Relays", 1987, Western Protective Relay Conference, Spokane, WA.
"Spreadsheet Help for the Protection Engineer", 1989, Western Protective Relay Conference, Spokane, WA.
"Discover Relay Design and Application Problems Using Pseudo-Transient Tests", 1990, IEEE PES Winter Power Meeting. 1990 Georgia Tech Protective Relaying Conference.
“The Effects of Solar Magnetic Disturbances on Protective Relaying”, IEEE Special Publication No 90 TH 0357-4-PWR, 1990
"Relay Replacement and Upgrading Projects", 1991, Canadian Electrical Association and 1991 Western Protective Relay Conference, Spokane WA.
"Combined Use of Definite and Inverse Time Overcurrent Elements Assist in Transmission Line Ground Relay Coordination", 1992 IEEE PES Summer Meeting, and 1993 Western Protective Relay Conference, Spokane WA.
"Survey of Generator Protection Practices", IEEE Power System Relaying Committee report, 1993
"System Protection and Voltage Stability", IEEE Power System Relaying Committee Special Publication No. 93 THO 597-7-PWR
“Computer Based Relay Models Simplify Relay Application Studies”, 1993, Western Protective Relay Conference, Spokane, WA
“IEEE Tutorial on the Protection of Synchronous Generators”, IEEE Power System Relaying Committee Special Publication No. 95 TP 102.
“The Effects of GIC on Protective Relaying”, IEEE Power System Relaying Committee Paper No. 95 SM 430-9 PWRD, presented at the IEEE Power Engineering Society Summer meeting, 1995.
“Relay Performance Testing”, IEEE Power System Relaying Committee Special Publication No.96 TP 115-0. 1996.

"Low Level Testing of Protective Relays", Canadian Conference on Electrical and Computer Engineering, University of Calgary, May, 1996
"Digital Relay Reports Verify Power System Models", IEEE Transactions on Power Delivery Vol. 13, No. 2, April 1998, p.p. 386-393
"Voltage Collapse Mitigation", IEEE Summer Power Meeting 1997, Western Protective Relaying Conference, 1997, and Georgia Tech Relay Conference, May, 1997.
"Protection Against Voltage Collapse", CIGRE SC34.08 Report, Electra, Volume 179, page 110-126 - 1998.
"Transmission Line Relay Loadability", IEEE Power System Relaying Committee report presented to Western Protection Relaying Conference, 2001, and other technical conferences.
"Wide Area Protection and Emergency Control" IEEE Power System Relaying Committee report
"Protective Relay Impacts on Power Quality - and Vice Versa", IEEE PES Summer Meeting, Vancouver, BC, July, 2001
"System Protection and PQ Go hand in Hand", Power Quality Magazine, December 2001.
Standard C37.95-2002 "IEEE Guide for Protective Relaying of Utility-Consumer Interconnections"
Standard C37.113-1999 "IEEE Guide for Protective Relay Applications to Transmission Lines"
"Software Models for Relays" IEEE Power System Relaying Committee, IEEE Transactions on Power delivery, 2001
"EMTP Applications to Power System Protection, IEEE Power System Relaying Committee Tutorial and special publication, IEEE PES Summer Meeting, Seattle 2000, Vancouver 2001.
"Dynamic Simulations Challenge Protection Performance", Western Protective Relaying Conference, October, 2003
"Early Experiences with Protection Applications of Optical Current and Voltage Transformers" ", Western Protective Relaying Conference, October, 2003
"Design of a Special Protection System to Maintain System Security at High Import", IEEE Power Engineering Society Summer Meeting July, 2003, Toronto, Canada.
"Real Consequences Follow Imaginary Power Deficiences", Western Protective Relaying Conference, October, 2004
"Performance of Generator protection during major system disturbances" IEEE Transactions on Power Delivery, Volume 19, Issue 4, Oct 2004 Page(s):1650 - 1662
"Wide Area Protection and Emergency Control", Proceedings of IEEE, Volume 93, Number 5, May 2005, pp 876-890.
"How Low Can You Go – More on Sensitivity of Transmission Line Protection", Western Protective Relaying Conference, October, 2005.
"RAS and Strectched Power Systems", Western Protective Relaying Conference, October, 2006.
"A Trial Application of Optical Transducers for Protective Relaying", IEEE Power Systems Conference and Exposition, 2006.
"One Utility's Experience in Justification and Implementation of Relay Replacement projects". IEEE Power Systems Conference and Exposition, 2006.
"An Out-of-Step Event in the Peruvian Power System", Western Protective Relaying Conference, October, 2007
"Blackout Experiences and Lessons, Best Practices for System Dynamic Performance, and the Role of New Technologies", IEEE Task Force Report, May 2007
IEEE Standard C37.109 "Guide for the Protection of Shunt Reactors", 2008
"Secondary Arc Extinction and Detection – Real and Simulated", IET 9th International Conference on Developments in Power System Protection (DPSP 2008)
"SIPS and Stretched Power Systems" Carilec conference July, 2008
"Main 1 and Main 2 Protection – Same or Different?", Western Protective Relaying Conference, October, 2008

"Application of Overvoltage Protection to the Peruvian power system" , Western Protective Relaying Conference, October, 2008

Awards

- Recipient BC Hydro, Outstanding Accomplishment award, 1992
- Chairman, IEEE Power System Relaying Committee Working Group "Protection Aids to Voltage Stability" which won the IEEE Power Engineering Society 1997 and Power System Relaying Committee 1996 outstanding working group awards.
- Recipient of IEEE Power System Relaying Committee 1998 prize paper award for paper entitled "Digital Relay Reports Verify Power System Models" and IEEE Power Engineering Society 1999 prize paper award for the same paper.
- Recipient Association of Professional Engineers and Geoscientists of BC President's Year 2000 Award for Professional Service.
- Recipient IEEE Millenium medal award, 2000
- Recipient IEEE Canada Outstanding Engineer Award, 2003
- Appointed Fellow IEEE January 2004 "for contributions to power system protection"