Q. Mr. Budgell indicates on page 11, lines 18 to 27, that any number of alternatives may be brought forward under a general request for generation proposals. Explain the process to be followed to procure new generation. Address, specifically, the following:

(a) The least cost planning process including the assessment of options such as demand management, energy efficiency, and innovative rate alternatives.

(b) The competitive procurement process.

(c) The role of Newfoundland Power and Newfoundland and Labrador Hydro; i.e., will these entities be allowed to bid, and if so, as regulated or unregulated entities? Can Hydro or Newfoundland Power participate in generation projects that have not been specifically identified in a competitive procurement process? Address, specifically, the Fortis Inc. arrangement with Abitibi-Consolidated to develop additional capacity at Abitibi Consolidated's hydroelectric plant at Grand Falls-Windsor and to redevelop the forestry company's hydroelectric plant at Bishop's Falls.

(d) The role of the Board and the public in the competitive procurement process.

A. (a) & (b) The following is a description of Hydro's Least Cost Resource Planning Process as it applies to the Island Interconnected System.

General Methodology Considerations

The planning process is an orderly development and comparison of all relevant system costs for all technically acceptable alternatives to determine which is least cost. These principles are applied to both transmission and generation planning. Least cost resource and transmission planning utilize current engineering and economic concepts and procedures, advanced computer software and the expertise and experience of utility system planners and consultants. Inputs to these planning processes include comprehensive data, definitions for the existing systems load and generating capability, planning criteria and future resource options.

Using a combination of deterministic and probabilistic techniques, the load forecast for the overall system is compared against system data to identify conditions in which capacity and/or energy deficits are expected to occur. Alternative resource scenarios are developed based upon technically acceptable and achievable options in order to satisfactorily address these conditions. These alternative scenarios are then compared in order to identify which combination of resources produce the least cost plan for addressing the identified need. Three key elements of this process are: 1) the identification and timing of additions; 2) the identification of resource options; and 3) the process by which plans are compared.

<u>Identification and Timing of Additions</u>

The timing and need for additional supply is based on an analysis comparing the total Island load forecast with the capability of all existing generation utilizing established planning reserve criteria. Included in this comparison are considerations for the lead time required to bring each new resource into service and the size of the resource relative to the increment of additional load to be served.

For resource planning on the Island Interconnected System, Hydro utilizes a forecast which includes demand and energy for the Island system expected to be met by Hydro and all its customers' generation facilities. The system's capability used for this purpose reflects Hydro's and its customers' existing and committed resources (see Schedule IX, H.G. Budgell).

Since electrical load consists of two components, capacity and energy, it is necessary to plan so that the production of both components provide a given level of reliability. Hydro's planning criteria, which have been filed with the Board on a number of occasions, are established for the purpose of setting the minimum level of reserve capacity and energy installed on the system and is stated as follows:

Energy – The Island Interconnected System should have sufficient generating capability to supply all customer firm load requirements with firm system capability.

Capacity – The Island Interconnected System should have sufficient generating capacity to satisfy a loss of load expectation (LOLE) target not more than 2.8 hours per year based on a probabilistic assessment.

Comparing the Island generation capability with the load forecast provides the means of identifying the timing and need for additional supply. Negative energy balances or LOLE indices greater than 2.8 hours per year indicate deficits in supply and establish the time frame in which additional supply is required (see Schedule X, H.G. Budgell).

The above process and criteria identify the timing for resource additions, and establish the constraints within which various resource scenarios must operate. Once these alternative plans are developed, they must be compared in order to identify the least cost resource option.

<u>Identification of Options</u>

Once the timing and magnitude of resource requirements have been identified, plans are assembled composed of different combinations of resource options in order to address the requirements. Resource options can be either utility or non-utility in origin, with a wide variety of technical and cost characteristics. These variations permit development of plans suited to the unique requirements of the system.

There are a variety of means by which the various options available for inclusion in plan development may be identified. In recent years Hydro has relied upon Requests for Proposals (RFPs) for identifying the field of options available for inclusion with its own options for the development of resource plans. In certain instances, however, other means of identifying options may be used, including: use of Hydro's own options only, use of competitive bidding versus Hydro's best option, use of utility options only, or use of selective bidding (bidding from a select group of possible developers). Irrespective of the method chosen however, the options identified are to be compared on a fair and consistent basis in order to ensure that consumers are provided least cost power.

Plan Comparison

The method used to evaluate the cost effectiveness of a particular expansion plan is to compare on a present worth basis its incremental investment and system operating costs with alternative system expansion plans over a planning horizon (normally 30 to 60 years). This permits an examination of the effect a proposed project has on the plant currently in service and the plant that will likely follow. Sensitivity studies are included in the comparison of plans to test the effects of the variations of such factors as load growth, fuel prices, discount rates, investment costs, etc.

The main economic criterion used to compare various expansion plans is the discounted value of all costs at a chosen discount rate. In practical application, Hydro represents this criterion as the minimization of annual revenue requirements.

It is important to note that the transmission planning often proceeds in parallel with resource planning in order to address the requirements to transmit energy from new generation facilities through the Island grid. Initial analysis may only include the interconnection cost to the grid, but later expands into determining whether other modifications are required to other portions of the grid for each resource scenario. Thus, the optimum plan is one that considers both generation and transmission.

The above description covered supply side options on the basis of minimization of annual reserve requirements. The resulting plan can be used to calculate system avoided costs, which then can be used to screen demand side management (DSM) options. These are screened for technical, economic and market potential. (eg. As per SRC Report of July 1991. Please refer to response to CA-106.)

(c) Under the *Public Utilities Act,* any person that sells power and energy to a public utility, but not to the public, does so outside of the jurisdiction of the Public Utilities Board. In the event that a regulated public utility sells power to any person, the sale of that energy is subject to the jurisdiction of the Public Utilities Board. While any process that seeks to determine and select least cost power projects may include a solicitation of bids from non-utilities, there would be no reason to exclude public utilities from that process. The compensation to be received by those utilities would, however, be subject to the jurisdiction of the Public Utilities Board.

The participation of a company affiliated with Fortis Inc. in the enhancement of the hydro-electric generation facilities at Bishop's Falls and Grand Falls is specifically exempt from the jurisdiction of the Public Utilities Board under the *Public Utilities Act* pursuant to a regulation promulgated under section 4.1 of that Act and from the jurisdiction of the Public Utilities Board under the *Electrical Power Control Act, 1994* pursuant to a regulation promulgated under section 5.2 of that Act.

(d) The role for the Public Utilities Board in power project planning arises under the *Electrical Power Control Act, 1994.* There is also, ultimately, a role for the Board under the *Public Utilities Act* in so far as the rates to be paid by the public are set by the Board. The competitive procurement would be open to the public. The public's role in the regulatory process is a matter to be determined by the Public Utilities Board.

Q. What is the basis for the generation reliability criterion for the Isolated Rural Systems (page 12, lines 20 to 22 of Mr. Budgell's Prefiled testimony)? Have customers indicated a willingness to pay for this level of reliability?

A. The basis for the generation reliability criterion for the Isolated Rural Systems is historical in nature and goes back to the initial involvement by Hydro in rural electrification within the province in 1954, which at that time, it is reasonable to assume, included the experience of other Canadian utilities. Today, Canadian utilities with responsibility for the provision of electrical service in the isolated rural areas of their province, that share the same criteria as Hydro are:

- Hydro One (Ontario);
- ATCO Electric (Alberta); and
- BC Hydro.

Also see Hydro's response to NP-184 (d) and the attached Hydro survey report which contains information regarding the generation reliability criterion of other Canadian utilities that operate in isolated rural areas.

Hydro has no information with respect to customer views on the specific issue of willingness to pay the level of reliability established by the criterion.

Q. Schedule II of Mr. Budgell's Prefiled Testimony indicates that actual transmission losses on the Labrador Interconnected System in 1992 were 83% higher than forecast in the 1991 PUB filing. In addition, between 1992 and 2000, actual transmission losses increased by 98%, and represented 12% of the total energy requirement on the Labrador Interconnected System (versus 4% forecast in the 1991 PUB filing). What are the reasons for Hydro's poor performance in this area?

A. See response to LC-14. Transmission losses of 12% on the Labrador Interconnected System in 2000 are not an issue of poor performance. This loss rate reflects the incremental losses on this transmission system, reflecting both the line's original design and its present utilization.

Q. Schedule XII of Mr. Budgell's Prefiled Testimony indicates that the 46 MW of Interruptible Load is included in the peak load forecast and used in the determination of LOLH. How is it included in the LOLH determination and how are consumers ensured that they are receiving equivalent benefit for the reduced revenue derived from interruptible customers?

A. The 46 MW Interruptible Load is included in the peak load forecast for Abitibi Stephenville (i.e. the 46 MW is not netted off of the Abitibi Stephenville peak load forecast). In Hydro's models of the Island Interconnected System it is treated as a dispatchable resource (subject to the provisions of the contract) available to meet the load of the system. Therefore, when simulating the operation of the system out over time, the value of the contract is reflected in the results of the system simulations (we could say "through lower LOLH values" – but this then begs the question: How much lower?)

Please refer to the response to CA74(c) for a discussion of the benefit for reduced revenue derived from interruptible customers.

Q. Hydro is forecasting strong growth in demand for the next two years, yet demand growth has been relatively flat since Hydro’s last filing. What are the drivers behind the higher demand forecast for the next two years and how has “judgment” impacted on the forecast?

A. The significant drivers behind Hydro’s Interconnected Island higher demand forecast in 2001 and 2002 include increased sales to Newfoundland Power attributed to a return-to-normal weather assumption (relative to recent years of below normal heating degree days) coupled with modest growth expectations. As well, increased sales to Corner Brook Pulp and Paper Limited are associated with an increase in Power-On-Order as anticipated by the customer (see NP-158).

The impact of “judgment” on the operating load forecasts has been to slightly lower industrial energy sales requirements relative to the customers’ corporate forecasts.

Q. Provide resumes of the Hydro staff who undertook the Conditions Survey of Holyrood Units 1 and 2 and the Hardwoods and Stephenville Gas Turbines, and the Avalon Upgrade of Transmission Lines. In addition, provide the Condition Surveys (Roberts Prefiled Testimony, page 12, lines 6 to 31, and page 13, lines 1 to 2).

A. Please refer to the attached resumes for the following who completed the referenced studies:

<u>Holyrood Generation Station</u>

R. Jerrett, P. Eng, Senior Civil Engineer, Generation Engineering
R. Kaushik, P. Eng., Senior Electrical Engineer, Generation Engineering
R. Leggo, P. Eng., Senior P&C Engineer, Generation Engineering
J. Mallam, P. Eng., Senior Mechanical Engineer, Generation Engineering

<u>Gas Turbine Stations</u>

D. Hicks, P. Eng., Electrical Engineer, Transmission & Rural Operations
G. Lundrigan, P. Eng., Senior Civil Engineer, Transmission & Rural Operations
J. Mallam, P. Eng., Senior Mechanical Engineer, Generation Engineering
C. Warren, P. Eng., P&C Engineer, Transmission & Rural Operations

Avalon Upgrade of Transmission Lines

Dr. Asim Halder, P. Eng., Specialist Engineer, Transmission and Distribution, Transmission & Rural Operations.

Please refer to the response to NP-59 for the reports on the Condition Surveys.

Resume of Robert Jerrett, P.Eng.

Education:
1973 - Bachelor of Engineering Degree (civil) from Technical University of Nova Scotia

1973 to present – numerous technical and management courses

Professional Membership:
APEGN

Experience:

<u>2000 to Present: Senior Projects Engineer and Supervising Civil Engineer, Generation Engineering</u>

Managed the Civil Section, together with a variety of projects including studies, capital cost estimates and budget proposals, design, contract preparation, tendering, contract management and project management for the Holyrood Generating Station, as well as, the other major hydroelectric generating stations.

<u>1980 to 2000 Senior Projects Engineer and Project Engineer</u>

Cat Arm and Upper Salmon Hydroelectric Developments – assigned full time to the Owners' Team to monitor the civil activities of the design, construction, schedule, costs and project completion.

Project managed numerous capital and operating projects such as:

- New diesel plants at Mary's' Harbour, Port Hope Simpson and Hopedale;
- New Head Office Building at St. John's
- New Waste Water Treatment Plant at Holyrood
- Civil works for the new Gas Turbine at Happy Valley

<u>1973 to 1980 Project Engineer (on several major projects in Nfld, N.S. and Alberta)</u>

Provided supervision and construction management for several major projects such as:

- New mining site development at Lingan, N.S.
- New Facilities at CFB Greenwood, N.S.
- 3 power development sites in Alberta – Spray Lake, Horseshoe Dam, Sundance
- Numerous marine projects in Nfld and N.S.
- Mall Expansion at Sackville, N.S.

Publications

"Cat Arm Development – General Description and Special Features" - co-authored with engineers from Cat Arm Consultants for the CEA conference in Montreal, 1984.

Resume

Name: Raj Kaushik

Address: 27 Wedgeport Road
St. John's, NF A1A 5A5

Telephone: 709-726-1275 (H) 709-737-1216 (W)

Education: Bachelor of Engineering (Electrical)
R.E.C.K. India (1973)
Masters of Engineering (Electrical)
TUNS, Nova Scotia (1981)
First Year MBA Courses
Memorial University (1982-88)
A number of short courses in Electrical Engineering
And Project Management

Professional Membership: APEGN

Experience:

(i) May 2000 – Present — Granite Canal Hydroelectric Project Team
Project Electrical Engineer

Responsible for reviewing electrical engineering details prepared by Consultants and Contractors.

(ii) April 1995 – May 2000 — Generation Engineering
Supervising Electrical Engineer

Duties involved the supervision of other engineers in providing electrical engineering and technical support for the operation and maintenance of hydroelectric and thermal plants.

(iii) Sept. 1985 – April 1995 — Churchill Falls (Labrador) Corporation
Senior Electrical Engineer

Duties involved the supervision of other engineers in providing electrical engineering and technical support for the operation and maintenance of Churchill Falls hydroelectric generation facilities and associated transmission and distribution system.

(iv) April 1981 – Sept. 1989 Systems Planning
Generation Planning Engineer

Duties included collection and analysis of data and performing various computer simulation studies of existing and future electrical systems of the Island.

(v) July 1979 – April 1981 WBA Consulting Engineers
Electrical Engineer

Duties included electrical design and layout of buildings electrical system, lighting, motor control centers, low and medium voltage switchgear etc.

RESUME

Name: Richard W. Leggo

Address: Newfoundland & Labrador Hydro
P. O. Box 12400
St. John's, Newfoundland
A1B 4K7

Education: Bachelor of Engineering (Electrical)
Memorial University of Newfoundland (1977)

A number of short courses primarily involving protection & control

Memberships: APEGN

Work Experience:

(i) April 1995 – Present — Generation Engineering
Supervising Engineer. Protection & Control

Duties involve the supervision of other engineers in providing design and technical support for the generating plants. Projects involve protective relaying, instrumentation, control systems and other electrical equipment.

Involved in major projects including the exciter replacements at Bay D'Espoir and Holyrood, the governor replacement on Unit 1 at Holyrood and the controls aspects of the Water Treatment and Wastewater Treatment Plants at Holyrood.

(ii) March 1992 – March 1995 — Senior Protection & Control Engineer
Engineering & Construction

Duties involved the supervision of other engineers in providing design and technical support for the generating plants, terminal stations, and diesel plants. Project involved protective relaying instrumentation, control systems and other electrical equipment.

Involved in the replacement of the boiler and burner management controls on Unit 3 at Holyrood, the protection and control design for several diesel plants, protection design for transmission lines and the writing of a specification for the replacement of the gas turbine control systems at Hardwoods and Stephenville.

(iii) March 1982 – March 1992 System Performance & Protection Engineer

Duties involved providing design and technical support on protection & control issues for the transmission system including terminal stations.

Involved in the Protection and Control aspects of the SCADA system installed for the Energy Management System. Researched and wrote the trouble reports for problems that occurred on the system involving transmission lines, gas turbines, hydro plants and thermal plants

(iv) June 1979 – March 1982 Protection & Control Engineer Engineering & Construction

Duties involved the design of protection & control systems for capital projects in the terminal stations. This involved protection and control design for a number of new stations.

(v) August 1977 – May 1979 Graduate Training Program

Assignments during the Graduate Training Program were with System Planning, Telecontrol and System Operations. These were of short duration to learn about different departments within Hydro.

Resume of John Mallam P.Eng.

Education:
1975 - Bachelor of Engineering Degree (Mechanical) from Memorial University of Newfoundland

1976 to present – numerous technical and management courses

Professional Membership:
APEGN, Canadian Electrical Association

Experience:
80-03-19 to Present: Senior Mechanical Engineer and Senior Supervising Engineer, Generation Engineering

Managed the Mechanical Section implementing a variety of projects encompassing feasibility studies at all levels, capital cost estimates and budget proposals, design, contract preparation, tendering, contract management, construction management of Hydro forces and contractors, project management, claim negotiation, management of consultants and all other aspects of large multi faceted projects.

77-10-03 to 80-03-19 Mechanical Engineer, Projects

Bay D'Espoir Unit 7 - Participated in the final stages of construction supervision. Performed the final inspection, testing and commissioning of all mechanical equipment and participated in the testing and commissioning of the turbine and generator.

Holyrood Unit 3 - seconded to the consultant as a site contract manager for the early mechanical, condenser, high pressure piping and fire protection systems contracts. Assisted with the management of the turbine, generator, boiler and other mechanical contracts. Prepared the performance test procedures for turbine and generator and prepared the draft performance test procedure for the boiler. Supervised the performance test, analyzed the results and wrote the test report for the turbine and generator.

75-05-05 to 77-10-03 Mechanical Design Engineer, Operations

Provided technical support to Hydro's interconnected generating plants. Provided site inspection, contract supervision, commissioning and testing of mechanical equipment at the newly constructed Hardwoods and Stephenville Gat Turbines and prepared the performance test procedures, participated in performance acceptance tests and analyzed results.

Selected project list:

Cat Arm project design
Upper Salmon project design
Condensate polishers for three units at Holyrood
Ebbegunbaeg Control Structure modification and upgrading
Holyrood Unit 4 project design, construction, commissioning
Holyrood Unit 3 synchronous condenser starting drive
Rebuild of Holyrood gas turbine
Paradise River project design
West Salmon Spillway upgrading
Holyrood uprate project
Holyrood wastewater treatment plant design
Happy Valley Gas Turbine
Holyrood warm air makeup system
Holyrood combustion air heating system
Numerous capital and operating studies and cost estimates for System Planning for gas turbine, steam turbine, hydro turbine, wind and diesel plants
Numerous technical studies and reviews

Canadian Electrical Association Involvement
Member of the Hydraulic and Alternate Energy Workgroup of the Generation Research and Development Committee from 1983 to 1987; Chairman from 1985 to 1987. Rejoined the committee in 1994.
CEA Liaison to EPRI hydraulic research and development group
Member of the Publisher's Advisory Board of "Hydro Review" magazine
Technical Advisor to contractors performing several research projects
Reviewed, assisted in selection and administered numerous research projects.
Currently Chairman of the Thermal Generation Interest Group

Publications

"Engineering and Environmental Challenges of Siting a Coal Fired Power Plant in Newfoundland" - co-authored with engineers from Bechtel for the ASME POWERGEN conference in New Orleans, 1989

"Uprating of Holyrood Units 1 and 2" - co-authored with General Electric and Combustion Engineering for presentation at the Fall 1990 CEA conference

"The Uprating of the Holyrood Generating Station", Canadian Power Engineer Magazine, 1994 Fall Issue

"Bay D'Espoir Runner Replacement", Power Generation Technology, Spring 1995 Issue

Resume of David Hicks, P. Eng.

Education:

1991 - Bachelor of Engineering Degree (Electrical) from Memorial University of Newfoundland.

1992 - Present - Numerous technical and professional development courses.

Professional Membership

Association of Professional Engineers & Geoscientists of Newfoundland.

Experience:

January 1992 Present: Electrical Design Engineer - Engineering Design Dept.

Electrical design engineering associated with all aspects of project design related to terminal stations, diesel plants, gas turbines, and other utility facilities. Work involves the preparation of specifications, contracts, and technical design for construction tenders and for equipment supply contracts. Inspections and factory acceptance of utility equipment. Preparation of budget proposals and cost estimates. Investigations of operations equipment failures and system operating problems, and preparation of reports and development of solutions. Condition assessments of operating equipment and reports and recommendations on upgrades and life extension strategies. Research and technology watch of EMF phenomena of HV transmission systems and participation on CEA committee on same. Engineering standards development and committee work on various engineering standards committees. Supervision and management of Engineering Coop students.

Selected Project List:

Hardwoods and Oxen Pond capacitor bank installations.
Station service upgrades - Mary's Hr diesel plant.
Terminal station upgrade project at L’Anse au Loup diesel plant.
Hopedale, Harbour Deep & McCallum diesel plant rebuild projects.
Condition Assessment of the Grand Falls & Corner Brook Frequency Converter installations.

Investigations and condition assessment of 230kV Breaker failures at Bay D'Espoir.
Condition assessments of Hardwoods and Stephenville Gas Turbines.
Development of database and analysis techniques for dissolved gas in transformer oils.
Come By Chance 230kV breaker replacement project.
Compressor replacement projects at Grand Falls and Corner Brook frequency converters.
Refurbishment of 45MVA, 230kV power transformers for Wabush terminal station.

Canadian Electrical Association Involvement

Member of CEA - EMF Working Group

Publications:

Not Applicable

RESUME

Name: George W. Lundrigan

Address: Newfoundland & Labrador Hydro
P.O. Box 12400
St. John's, NF
A1B 4K7

Education: Bachelor of Engineering (Civil)

A number of short courses primarily involving Civil Engineering and Construction and Project Management

Professional Membership: APEGN

Experience:

1) October 1999 to Present — Supervising Engineer – Civil
TRO Engineering

Duties involve the supervision of other engineers and technicians in providing design and technical support for the operation and maintenance of terminal stations, regional offices, diesel plants and fuel storage facilities.

Duties also include the provision of design and inspection and project management services for the construction of new facilities and for the expansion of existing facilities.

2) December 1996 to October 1999 — Senior Engineer – Civil
TRO Engineering

Duties were the same as for the Supervising Engineer – Civil.
Job title was revised.

3) July 1991 – December 1996 — Senior Construction Engineer – Civil
Construction and Project Services
Engineering and Corporate Services

Duties involved the supervision of other engineers and technicians in the provision of inspection and project management services for the construction of new facilities and for the expansion to existing facilities. Terminal Stations, transmission lines, distribution lines, regional depots, diesel plants, fuel storage facilities and generating plants were the facilities involved.

4) December 1981 – July 1991 Superintendent of Construction
Construction and Project Services
Engineering and Corporate

Duties were the same as those for Senior Construction Engineer – Civil. Job title was revised.

5) October 1977 – December 1981 Project Engineer
Construction and Project Services
Engineering and Corporate Services

Duties involved the supervision of field staff in the provision of inspection and contract management services for the construction of access roads, transmission lines and distribution lines for the Hinds Lake and Upper Salmon Development Projects. Also Shift Engineer for construction of sections of the Hinds Lake side hill canal, main dam and control and spillway structures.

6) May 1974 – October 1977 Civil Engineer
Civil Department
Engineering and Construction

Duties involved the design of, and the supervision of others in the design of, and construction of terminal stations and diesel plants. Duties also included contract management and some direct construction inspection.

<u>Selected Projects</u>

1996 to Present

Project Manager responsibilities for the following projects:

- New diesel plants at Nain and McCallum (both scheduled to be in service by end of 2001)
- New fuel storage facilities at La Poile, McCallum, Recontre East

- Upgrading of fuel storage facilities at Stephenville and Hardwoods Gas Turbine Generating Stations and Davis Inlet, Postville, Rigolet, Charlottetown, St. Brendan's, Harbour Deep and Petites diesel generating plants.
- Cleanup of PCB contaminated soils at Hardwoods and Oxen Pond Terminal Stations
- Co-ordination of the provision of technical advice to Project Manager, Davis Engineering and Associates Ltd. for the design and construction of a new diesel plant and distribution system at Natuashish
- Upgrading of various terminal stations, regional depot buildings and properties, fuel storage facilities and diesel generating plants.

In addition to the above, supervised the civil design and construction components of projects managed by others. Also provide input into numerous budget estimates.

December 1981 – July 1996

Provided construction management for the following:

- 230 Transmission Line Construction
  - Holyrood to Hardwoods (27 km)
  - Bay D'Espoir to Upper Salmon (51.31 km)

- 138 kV – Transmission Line Construction
  - Howley to Hinds Lake (14.8 km)
  - Sunnyside to Salt Pond (155 km)
  - Seal Cove to Bottom Waters (36 km)
  - Bottom Brook to Grandy Brook (123 km)
  - Grandy Brook to Hope Brook (33 km)
  - Berry Hill to Daniel's Harbour (86 km)
  - Daniel's Harbour to Plum Point (110 km)
  - Plum Point to Bear Cove (26 km)
  - Bear Cove to St. Anthony Airport (51 km)

- 69 kV Transmission Line Construction
  - Roddickton to St. Anthony Airport (63 km)
  - St. Anthony Airport to St. Anthony (48 km)

- New terminal stations were constructed at all locations associated with these transmission lines, with the exception of Holyrood, Hardwoods, Howley, Sunnyside, Salt Pond, Seal Cove and Berry Hill, where upgrading was completed.

- Installation of subsea power cables to Fogo/Change Islands and Gaultois

- A member of Owner's team which assisted engineering consultants in designing and managing a program of subsea plowing of three alternative cable routes across the Strait of Bell Isle and the preparation of a multi volume report documenting and interpreting information obtained.

Project Manager responsibilities for the following:

- In house design and construction of the 138 kV transmission line from Bottom Brook to Hope Brook Mine Site and associated terminals station (see above).

- Owner's liaison with the engineering consultant's design and project management team for the Roddickton Woodchip Fired Generating Plant.

- In-house design and construction of major modifications to ring bus at Bay D'Espoir, Western Avalon and Stoney Brook Terminal Stations.

October 1977 – December 1981

Owner's site representative and supervised a field staff for the construction of:

- A 25 km access road from Howley to the Hinds Lake Hydro Generating Site.
- A 14 km 138 kV Transmission Line from Howley to the Hinds Lake Hydro Generating Site
- 25 kV distribution line from Hinds Lake Generating to Hinds Lake Dam Site
- A 53 km access road from Long Pond to the Upper Salmon, Hydro Generating Site
- A 51km 230 kV transmission line from the Bay D'Espoir Generating Station to the Upper Salmon Hydro Generating Site.
- Seconded to consultant (Shawmont/Fenco) for one year and acted as construction engineer on construction of Hinds Lake side hill canal and the Hinds Lake main dam with its associated control and spillway structures

May 1974 – October 1977

- Provided on site inspection for the civil construction associated with the building of a 50 MW gas turbine generating plant at Stephenville NFLD. This included construction of a new site, generating unit foundations, control building, terminal station and fuel storage facilities.

- Designed (civil aspects) and provided construction management for new diesel generating plants and associated fuel storage facilities at Rigolet, Postville and Black Tickle, Labrador.

- Associated with the design and construction inspection of a number of upgrades to existing terminal station facilities.

Resume of A. Craig Warren, P.Eng.

Senior Protection & Control Engineer
System Performance & Protection
T.R.O. - Engineering
N&L Hydro

EDUCATION

1987 - Bachelor of Engineering Degree (Electrical) from Memorial University of Newfoundland.

1988 - Completed various technical courses relating to industrial software and hardware applications.

Specific Course/Seminar History:

- ABB INFI-90 DCS Maintenance and Configuration Training Course
- ABB Symphony – Transition to Composer Software Training Course
- Gas Turbine, Co-Generation, Combined Cycle Seminar (EPIC)
- Modicon Monitor Pro – Version 6.6 Training Course
- Modicon Level 2 Modsoft Training Course
- GEC Protective Relaying Course
- Western Protective Relay Conference
- Western Power Delivery Automation Conference
- Various seminars on project management

EXPERIENCE

March 2000 – Present: Senior Protection & Control Engineer, T.R.O. – Engineering
June 1987 – April 2000: Protection & Control Design Engineer

Member of System Performance and Protection section. Duties include but not limited to: detailed design of protection and control schemes; development of electrical schematics and wiring diagrams; budget preparation; project management; power transmission system engineering support including fault analysis and resolution; system engineering support for gas turbine and automation technologies (DCS and PLC); equipment specification and procurement; research and development into new technology applications to utility substations; troubleshooting and revisions to gas turbine controls as required; preparation of research reports on emerging technologies directly related to work classification; supervision of engineering work term students as required.

Specific major project history (in descending chronological order):

Oxen Pond Substation Automation (Phases 1 and 2)

Developed graphical interface using automation software for operator console. Developed database for communication to data concentrator. Purchased data concentrator and developed data collection scheme for digital relays and associated devices. Designed schematics for installation. Purchased all equipment and prepared commissioning package for operations staff. Coordinated work schedule and managed project. Supervised installation and commissioning of new system. Attended engineering configuration training on development software.

Sunnyside / Bay D'Espoir Remote Relay Interrogation System

Assisted in this project in the design stages but solely completed the testing and commissioning. Designed schematics for installation of devices and integration of relays. Developed data organization within relays and collection devices. Visited sites to perform testing.

Stephenville Gas Turbine Controls Replacement

Reviewed existing control and interface schematics in preparation of contract for new control system (ABB INFI-90). Scheduled installation, training and commissioning. Managed project at all levels including technical specification development and administration, supply payment review and approval, scheduling and detailed design. Collected detailed technical data on gas turbines for controls designer to ensure correct operating parameters and procedures. Designed schematics to interface the new distributed control system to the existing gas turbine auxiliary systems. Attended Factory Acceptance Test on control system. Supervised installation and commissioning of control system. Arranged training session for operations staff.

Hardwoods Gas Turbine Controls Replacement

Reviewed existing control and interface schematics in preparation of contract for new control system (ABB INFI-90). Scheduled installation, training and commissioning. Attended engineering configuration training on new system. Managed project at all levels including contract development and administration, supply payment review and approval, scheduling and detailed design. Collected detailed technical data on gas turbines for controls designer to ensure correct operating parameters and procedures. Designed schematics to interface the new distributed control system to the existing gas turbine auxiliary systems. Attended Factory Acceptance Test on control system. Supervised installation and commissioning of control system. Arranged training session for operations staff.

EXPERIENCE (continued)

Holyrood 4160/600V Station Service Controls Refit

Reviewed existing control and interface schematics in preparation of contract for new control system. Attended various project management meetings at site to coordinate work and materials supply in conjunction with outages to thermal generating units. Attended engineering configuration training on new system (Westinghouse WDPF). Scheduled installation, training and commissioning. Managed project at all levels including contract development and administration, scheduling and detailed design. Designed schematics to interface the new distributed control system to the existing 4160V and 600V controls. Supervised installation and commissioning of control system. Arranged and conducted training session for operators.

Various other projects undertaken or participated in as listed:

- 230kV back-up protection modifications
- Stony Brook recloser PLC refit
- Bishops Falls fire system PLC installation
- Massey Drive transformer replacement
- Plum Point / Bear Cove voltage control (PLC)
- Hardwoods B1B2 breaker installation
- Happy Valley capacitor bank controls
- Happy Valley fuel tank farm controls
- Holyrood warm-air make-up system
- Bay D'Espoir data acquisition system
- Miscellaneous P&C panel installations at various terminal stations

Associations

Member of Association of professional Engineers and Geoscientists of Newfoundland (A.P.E.G.N.).

Served on organizing committee for Newfoundland Electrical and Computer Engineering Conference (NECEC) for several years.

CURRICULUM VITAE
OF
ASIM HALDAR, PH.D., P.ENG.

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St. John's, Newfoundland
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EDUCATION

Bachelor of Civil Engineering	1969	University of Calcutta Calcutta, India
M.Eng. (Structural Engineering)	1977	Memorial University of Newfoundland, St. John's, Newfoundland
Ph.D. (Ocean Engineering-Offshore Structures)	1985	Memorial University of Newfoundland, St. John's, Newfoundland

Professional Affiliations

- Association of Professional Engineers of Newfoundland - Member
- Canadian Electricity Association (Transmission Section) - Member
(Nominated by Newfoundland and Labrador Hydro)

Special Appointment

2000 -	Adjunct Professor, Faculty of Engineering Memorial University of Newfoundland St. John's, Newfoundland

Committee Work (Present)

- Member, Task Force, Ice Management Committee, Newfoundland & Labrador Hydro, (1999-)
- Member, CEA Ice Storm Mitigation Interest Group (1999-)
- Member, Towers, Poles and Conductor Subcommittee, Transmission & Distribution Committee of IEEE (1994-)

- Member (Corresponding), CSA Can C 22.3 M95, Overhead System, (1994-)
- Member, IEEE Task Force 1368, Guide For Conductor Vibration Measurements (1993-)
- Member, CIGRE WG07 (Foundation), Study Committee 22 on Overhead Lines (1996-)
- Delegate, Canadian National Committee-IEC (International Electrotechnical Commission), Technical Committee No.11 on Overhead Lines (1992-)
- Technical Reviewer, IEEE Transaction on Power Delivery, Conductor Dynamics Related Topics (1997-)
- Chairman, Transmission Standard Review Committee, Engineering Standard Review Committee, Newfoundland & Labrador Hydro (1993-)
- Participant (Corresponding), ASCE 7 Sub Committee on Ice Load on Structures, Atmospheric Icing of Overhead Lines, (1994-)

Committee Work (Past)

- Organized one day seminar on Life Extension of Existing Transmission Line which also included Chairing a Panel Discussion session on April 30, 1996, Montreal, CEA Annual Spring Meeting, E&O Division;
- Chairman, Overhead Line Design Subsection, Transmission Section, Canadian Electrical Association, (1994-96)
- Chairman, CEA Task Force (ST331), Wind and Ice Loads On Transmission Lines, (1992); Organized a one day task Force Meeting to develop a Terms of Reference for the CEA Wind & Ice Load Monitoring Project which was subsequently undertaken by Newfoundland & Labrador Hydro, Ontario Hydro and Hydro Quebec through Ecole de technologie superierre of Montreal;
- Chairman, Line Design Committee, Line Security and Ice Accretion Subsection, CEA E&O; Division (1991-94);
- Chairman, Ice Accretion Committee, Line Security and Ice Accretion Subsection, CEA E&O Division (1988-90);
- Vice Chairman, Transmission System R&D Committee, Canadian Electrical Association (1993-94);
- Member, Transmission System R&D Committee, Canadian Electrical Association (1990-94);
- Member, CEA Task Force (ST431), Refurbishment of Existing Transmission Lines, (1994)

- Member, IEEE Meteorological Task Group, (1994-95);

- Member of The Organizing Committee, International Workshop on Atmospheric Icing of Structures (IWAIS, 1996), sponsored by University of Chicoutimi.

Employment Record (Present)

Newfoundland and Labrador Hydro

2000 - present	Specialist Engineer, Transmission and Distribution Engineering Design Transmission & Rural Operations Division
1991- 2000	Senior Engineer Technical Support, Engineering Design Transmission & Rural Operations Division

Responsibility: Supervision of two to four professionals including three work term engineering students per year.

Churchill River Project

Special Project Assignment in 1998 to Develop a Feasibility Study on EHV Transmission Lines in Labrador; work involved development of a Terms of Reference and co-ordination with TransÉnergie, Hydro Quebec as well as Rousseau Sauve & Warren (RSW Consultants) of Montreal; Acted as Project Manager to develop the full feasibility study report completed in March, 1999; Follow up work continued in the remaining part of the year to develop the Terms of Reference for Detailed Engineering Study.

Special Project Assignment in 1998 to Update the Cost Estimate of ± 400 kV HVDC Inter-tie to the Island; work involved co-ordination with Teshmont Consultants of Winnipeg;

Hydro Internal Study

- Reliability Assessment of Aging Wood Pole Lines on the Avalon Peninsula (1991 -)

- Assessment of Foundation Corrosion Problem with Respect to Tower Grillage Foundation (1999 -)

- Upgrading Study of a Double Circuit Wood Pole Transmission Line (work includes review of consultant's work, 2000 -)

- Reliability Study of Transmission Lines on The Avalon and Connaigre Peninsulas;

- Control of Galloping on 25KV Burgeo Distribution Line;

- Technical Support To Upgrade and/or Rebuild of 20 Km of 138KV Transmission Line, TL212, Sunnyside to Linton Lake;

Research & Development (1991 – 1999)

- *Initiated a Comprehensive Budget Proposal in 1991 for Carrying out Long Term Developmental Work On Wind And Ice Loads on Transmission Line, Conductor Vibration and Testing of Directly Embedded Pole Foundation;*

- Development of Hawke Hill Test Facility and Subsequent Operations For Monitoring Wind & Ice Loads On A Test Line; This project also included calibration of various Icing Models **(CEA contract No. 331T991)**, Wind Models and TOWER Model.;

- Development of Field Measurements of Aeolian Vibration on TL217 Near Witless Bay Line and on TL219 near Bay Largent; (This led to further work on Full Damper Protection Plan For TL217 which was subsequently implemented by Operations; Part of this Project was also jointly carried out with Ontario Hydro and FARGO, the Damper Manufacturer- **Refer To Publication No.15 (Paper)**);

- *Development of Field Testing Program For Various Types of Stockbridge Dampers on TL217 Line;*

- Development of Field Testing Program For Various Vibration Recorders (Currently Available in the market) On TL217 Line; This part of the project provided input directly to the **IEEE Task Force 1368, Guide for Conductor Vibration Measurements.**

- Development of Full Scale Foundation Testing Program for Directly Embedded Steel Pole Foundation; a collaborative project with Faculty of Engineering as part of **CEA contract No. 384T971;**

- Development of Test Bench For Vibration Measurements On Various Types Of Conductors (ACSR, Trapezoidal & Self Damping) At MUN; collaborative project with Faculty of Engineering as part of **CEA Contract No. 319T883**;

- Development of Full Scale Testing Program to study the effect of Mechanical fuse ("Weak Link") on transmission tower. Full scale testing was carried out at MUN;

- Development of a Wood Pole Testing Program at MUN (Full Scale as well as Non-Destructive Methods)

- Full Scale Testing of Grillage Foundation under Vertical and Inclined Uplift Loads.

Newfoundland & Labrador Hydro

1985 – 1990 Senior Specialist
Structural Analysis & Design
Transmission Line Design Department,
Engineering And Construction Division

Responsibility: Supervision of 1 Junior Engineer and one engineering work term student.

Project Manager

- Upgrading work on TL228, East of Grand Lake Crossing, Buchans Plain;
- Preparation of a Study Report which Included thorough Investigation of Various Failures of TL228 Line Over Buchans Plain and Recommendations for Subsequent Upgrading Work in 1990 & 1991; Report entitled "Probabilistic Assessment of the Upgrading and Design work For An Existing 230 KV Transmission Line"; Report # 3-2-51, TL Design Department **(Refer To Publications No. 20 (Paper) & Report No. 8);**
- Uprating Study of a 138 kV Transmission Line From Churchill Falls to Happy Valley-Goose Bay; a joint project between Transmission Line Design (Asim Haldar) and Planning (Mr. Jim Haynes), Consultants: Power Technology Inc. & Black Veatch;
- Upgrading work on TL217, Western Avalon To Hardwood;
- Design and Construction of A 138KV Transmission Line, TL219, Sunnyside To Salt Pond;
- Full Scale Foundation Tests At Sally's Cove As part of TL259 Design Check For Foundation Strength, (Refer to Publication No. 6 under Reports);
- Design and Construction of 138KV Bottom Brook-Hope Brook Transmission System;
- Upgrading work on TL201, Western Avalon to Hardwood;

1979 – 85 Transmission Line Design Engineer
Transmission Line Design Department
Engineering and Construction Division
Newfoundland & Labrador Hydro

Responsibility: Development of various computer software as well as carrying out of numerous design assignments for Transmission Line Projects.

- Development of various Computer Programs such as, CATLDP (Computer Aided Transmission Line Design Program), TOWER (Structural Analysis & Design of Lattice Tower; Rigid & Guyed-v) H-Frame (Analysis of H-Frame Wood Structure) etc;
- Technical Input To the Feasibility and Cost Estimate Study of Early Labrador Infeed (ELI) - ± 400 kV DC Transmission Line System as part of Lower Churchill Development;

- Technical Input To The Design of 230 KV Transmission Line, TL242, Holyrood To Hardwood;
- Actively Participated and Provided On-Going input To The Design of CAT-ARM Transmission System, TL247 & TL248, which Included Design Criteria such as Line Loadings, Review of Analysis of Guyed-V Tower etc;
- Design of 69KV Transmission Line System, TL251 & TL252, Howley-Hampden Jacksons Arm;
- Design of 138KV Transmission Line System, TL239, Deer Lake To Berry Hill Campground (Gros Morne National Park);
- Provided Design Input To The Structural Modification of TL214, Transmission Line, Bottom Brook To Doyles;
- Input To The Design of TL259, Berry Hill To Rocky Harbour, at various stages;
- Design of 69 KV Roddickton Transmission Line System;

Employment Record (Past)

1974 - 79 Graduate Student
Faculty of Engineering
Memorial University of Newfoundland
St. John's Newfoundland, A1B 3X5

1975 - 76 Structural Design Engineer
Shawmont Newfoundland Limited
P.O. Box 9100, St. John's, Newfoundland, A1A 3C1

Structural Analysis & Design of Reinforced Concrete Powerhouse For A 75MW Generating Unit;

PUBLICATIONS

Reports:

1. *HALDAR, Asim, PON, Craig, and McCOMBER, P., 1998. "Validation of Ice Accretion Models for Freezing Precipitation Using Field Data", CEA Project 331T992, Report Published by Canadian Electricity Association, May.*

2. HALDAR, Asim, PON, Craig, and McCOMBER, P., 1998. "Beta Testing of Icing Models", CEA Project ST331-C, Report Published by Canadian Electricity Association, April.

3. HALDAR, Asim, CHARI, T.R., and PRASAD, Yenumula, 1997. "Experimental and Analytical Investigations of Directly Embedded Steel Pole Foundations", CEA Project 384T971, Report Published by Canadian Electricity Association, December.

4. MUNASWAMY, K. and HALDAR, Asim, 1997. "Mechanical Characteristics of Conductors with Circular and Trapezoidal Wires", CEA Project 319T883, Report Published by Canadian Electricity Association, December.

5. HALDAR, Asim, 1995. "Reliability Study of Transmission Lines On The Avalon and Connaigre Peninsulas", Report Prepared for Engineering Design, TRO Division, Newfoundland and Labrador Hydro, Report # 3-2-54.

6. HALDAR, Asim, AL-KOURAISHI, Ali, 1994. "Full Scale Field Tests of Wood Pole Structures". Report prepared for Transmission Line Design Department, Engineering & Construction Division, Newfoundland and Labrador Hydro.

7. HALDAR, Asim, 1992. Working Document on "Monitoring of Wind and Ice Loads and Vibration on a Test Line" – Report prepared for Transmission Line Design Department, Newfoundland and Labrador Hydro.

8. HALDAR, Asim, 1989. "Probabilistic Assessment of the Upgrading and Design Work for an Existing 230 kV Transmission Line". Report # 3-2-51, Transmission Line Design Department, Newfoundland and Labrador Hydro, June (The content of this report, entitled as "230 kV Line Failures Due to Ice in Newfoundland", was also presented (slides presentation) to Canadian Electrical Association Spring Meeting (Transmission Section), Toronto, March).

9. HALDAR, Asim, 1983. "CATLDP - Computer Aided Transmission Line Design Program". Program Manual prepared for Transmission Line Design Department, Newfoundland and Labrador Hydro, p.

10. HALDAR, A.K., 1982. "Stress Analysis of a Gravity Platform to Iceberg Impact". Report prepared for Newfoundland Petroleum Directorate, Government of Newfoundland and Labrador, 58 p.

11. HALDAR, A.K., 1981. "Full Scale Structure tests for 138 kV and 230 kV Transmission Lines". Report prepared for Transmission Line Design Department of Newfoundland and Labrador Hydro, 130 p., Report # 3-2-53.

12. REDDY, D.V., and HALDAR, A.K., 1981. "Feasibility Study of a Cold Ocean Test Structure (COTS)". Report published by Centre for Cold Ocean Research Engineering (C-Core), Memorial University of Newfoundland, St. John's, Newfoundland, Canada, C-Core Publication No. 81-6, pp. 118-208.

Papers and Presentations:

1. HALDAR, Asim, 2000. Analysis of Foundation test Data for RBD Using Bayesian Updating Procedure; Technical Presentation to CIGRE 22-07 Working Group Meeting in Gdansk, Poland, May.

2. HALDAR, Asim, 2000. Corrosion of 230 kV Grillage Foundation. Technical Presentation to CIGRE 22-07 Working Group Meeting in Gdansk, Poland, May.

3. HALDAR, Asim and PRASAD, Yenumula, 2000. Directly Embedded Pole Foundations: Part 1, Experimental Investigations. Paper under Preparation for Submission to ASCE Journal of Geotechnical Engineering.

4. HALDAR, Asim, and PRASAD, Yenumula, 2000. Directly Embedded Pole Foundations Part 2 Analytical Investigations. Paper under Preparation for Submission to ASCE Journal of Geotechnical Engineering;

5. MUNASWAMY, K and HALDAR, Asim, 2000. “Fatigue, Stress-Strain, and Creep Characteristics of Conductors with Circular and Trapezoidal Wires”. Paper was reviewed and to be Re-submitted for Publication in IEEE Transaction On Power Delivery .

6. HALDAR, Asim, DIGIOIA, A. M., Jr., PRASAD, Yenumula, and MOJAR, John, 2000. “Reliability Based Upgrading of an Existing 230 kV Steel Lattice Tower Transmission Line”, Paper under Preparation for possible submission to IEEE Transactions on Power Delivery.

7. HALDAR, Asim, PRASAD, Yenumula, and CHARI, T.R., 2000. “Full Scale Tests on Directly Embedded Steel Pole Foundation”, Canadian Journal of Geotechnical Engineering, Vol. 37, No. 2, p.p. 414-437.

8. MUNASWAMY, K and HALDAR, Asim, 2000. “Self Damping Measurements of Conductors with Circular and Trapezoidal Wires”, IEEE Transaction On Power Delivery. Paper No. PE-005-PRD (01-2000)

5\. HALDAR, Asim, PRASAD, Yenumula, and CHARI, T.R., 1999. “Moment Rotation Behaviour of Steel Pole Foundations”, Paper Presented to CIGRE SC22 WG 07 on Foundation, Barcelona Meeting, April 7-9.

6\. HALDAR, Asim, PON, Craig and McCOMBER, P., 1996. "Calibration of Various Ice Accretion Models" Proc. 7th International Workshop On Atmospheric Icing of Structures, Chicoutimi, Quebec, July.

7. PRASAD, Y., HALDAR, Asim, CHARI, T.R., and PHILIPS, R., 1996. “Centrifuge Modelling of directly Embedded Steel Pole Foundations”, Geotechnical News, Vol. 14, No. 4, Dec., pp. 34-36.

8. MARSHALL M.A, HALDAR A.K, GARDINER T.J, and YOUNG C.J, 1994. “Hydro's Remote Ice Growth Detector (RIGD)". NECEC-IEEE'94 Workshop, Memorial University of Newfoundland, IEEE Chapter St. John's, Newfoundland.

9. MARSHALL M.A and HALDAR A.K, 1994. "An application of MATLAB To Monitor Wind and Ice Loads on a Test Transmission Line", NECEC-IEEE '94 Workshop, Memorial University Of Newfoundland IEEE Chapter St. John's, Newfoundland.

10. HALDAR, Asim, MARSHALL, M.A, NUGENT, W.T., HEMEON, B.C., and GARDINER, T.J. 1994. "Newfoundland and Labrador Hydro's Wind and Ice Load Monitoring Test Facility"; IEEE Canadian Review - spring, No.19, p 15-18.

11. MARSHALL, M.A, NUGENT, W.J., HEMEON, B.C and HALDAR, Asim 1994. "Applying C and MATLAB To Monitor Wind and Ice Loads On A Test Transmission Line", Proceeding Canadian Conference on Computer & Electrical Engineering, Halifax, September, Vol.I, Paper No.94TH8023, 6p.

12. PRASAD, K.S.R., SWAMIDAS, A.S.J and HALDAR, Asim. 1994. “State-Of-The-Art On Direct Embedment Foundations For Pole Structures”. Transaction, CEA E&O Meeting, Transmission Section, Toronto.

13. HALDAR, Asim, MARSHALL, Mervin, and VAN Cauwenberghe, R. 1993."Wind and Ice Load Monitoring on a Test Line", Proceeding 6th International Work Shop on Atmospheric Icing of Structures, Budapest, Hungary, September 20-23, 7p.

14. HALDAR, Asim, MARSHALL, Mervin, and GARDINER, Terrence J. 1993. "Monitoring Wind and Ice Loads on a Test Transmission Line I:-Overview", NECEC -IEEE '93 Workshop, Memorial University of Newfoundland, St. John's, Newfoundland.

15. HALDAR, Asim, PON, Craig and TORAK, John, 1992. "Vibration Monitoring on an Existing 138 kV Wood Pole Line with Alloy Conductor." Transaction, Canadian Electrical Association, Line Security and Ice Accretion Subsection, Vancouver, March.

16. YIP, T. S. and HALDAR, Asim, 1991. "Estimating Wind Speed over Complex Terrain," Line Security and Ice Accretion Committee Meeting, CEA Transaction, May, Toronto.

17. HALDAR, Asim and LIND, N.C., 1991. "Probabilistic Upgrading of Existing Transmission Lines". Abstract - Third International Symposium on Probabilistic Methods Applied to Electric Power Systems, London, U.K., July.

18. HALDAR, Asim, REDDY, D.V. and AROCKIASAMY, M., 1990. "Foundation Shakedown of Offshore Platforms", Computers and Geotechnics, vol. 10, pp. 231-245.

19. HALDAR, Asim, 1989. “Optimum Reliability Based Design of Transmission Lines”. 16th INTER-RAM Conference for The Electric Power Industry, Monterey, California, May 30 – June 2, pp. 422-426.

20. HALDAR, Asim, 1990. "Failure of a Transmission Line Due to Ice in Newfoundland". Proc. 5TH International Workshop for Atmospheric Icing of Structures, Tokyo, Oct.-Nov. 1, 6p.

21. HALDAR, Asim, 1990. "Wind and Ice Loading Study in Newfoundland". Presented to Line Security and Ice Accretion Subsection of Canadian Electrical Association, Fall Meeting, Victoria, Nov. 4 - 7.

22. HALDAR, Asim, 1988. "Reliability Based Design of Transmission Lines". Proc. Second International Symposium on Probabilistic Methods Applied to Electric Power Systems, Electric Power Research Institute (EPRI), Oakland, September, 13 p.

23. HALDAR, Asim, MITTEN, P., and MAKKONEN, L., 1988. "Assessment of Probabilistic Climatic Loadings on Existing Transmission Lines". Proc. 4th International Conference on Atmospheric Icing on Structures, Paris, September. pp. 19-23.

24. HALDAR, Asim, 1988. "Wind and Ice Load Study in Newfoundland". Transaction, Canadian Electrical Association Spring Meeting, Transmission and Distribution Section, Montreal, 17 p.

25. HALDAR, Asim, 1986. “Structural Reliability Analysis of a Transmission Tower Using Probabilistic Finite Element Method”. Proc. 1st International Symposium On Probabilistic Method Applied to Electric Power Systems. Pergamon Press, pp. 41-51.

26. HALDAR, A.K., REDDY, D.V., and AROCKIASAMY, M., 1982. "Offshore Platform Foundation Shakedown Analysis". Proc. Third International Conference on the Behaviour of Offshore Structures (BOSS'82), August 2-5, M.I.T., pp. 313-333.

27. *HALDAR, A.K., REDDY, D.V., and AROCKIASAMY, M., 1982. "Shakedown Analysis of Fluid Saturated Foundation Soil". Proc. Fourth International Conference on Numerical Methods in Geomechanics, May 31 - June 4, Edmonton, Alberta, Canada, pp. 965-973.*

28. HALDAR, A.K., and REDDY, D.V., 1981. "Shakedown Analysis Application to Foundation Problem". Proc. Conference Past, Present and Future of Geotechnical Engineering, M.I.T., September 24-25.

29. HALDAR, A.K., REDDY, D.V., AROCKIASAMY, M., and BOBBY, W., 1980. "Finite Element Nonlinear Seismic Response Analysis of Submarine Pipe-Soil Interaction". Proc. International Symposium of Soils under Transient and Cyclic Loading, (Edited by: G.N. Pande and O.C. Zienkiewicz), Swansea, U.K., pp. 867-877.

30. HALDAR, A.K., AROCKIASAMY, M., and REDDY, D.V., 1979. "Stochastic Seismic Soil Structure Interaction of Gravity Platform". Proc. Third ASCE Specialty Conference on Engineering Mechanics, September, Austin, Texas, pp. 840-843.

31. BOBBY, W., AROCKIASAMY, M., HALDAR, A.K., and REDDY, D.V., 1979. "Finite Element Analysis of a Wave-Pipe-Soil Interaction". Proc. Second International Conference on the Behaviour of Offshore Structures (BOSS'79), London, England, pp. 503-506.

32. HALDAR, A.K., REDDY, D.V., and AROCKIASAMY, M., 1979. "Stochastic Seismic Response of a Reactor Building-Foundation-Soil System" Proc. Seventh Canadian Congress of Applied Mechanics (CANCAM), June, Sherbrooke, Canada, pp. 337-378.

33. HALDAR, A.K., and REDDY, D.V., 1979. "Dynamic Finite Element Formulation for Fluid Saturated Porous Medium". Proc. Seventh Canadian Congress of Applied Mechanics (CANCAM), June, Sherbrooke, Canada, pp. 901-902.

34. REDDY, D.V., AROCKIASAMY, M., and HALDAR, A.K., 1979. "Nonlinear Seismic Response Analysis of a Gravity Monopod using MODSAP-IV". Proc. Third Canadian Congress on Earthquake Engineering, June, Montreal, Canada, pp. 1343-1364.

35. AROCKIASAMY, M., REDDY, D.V., BOBBY, W., and HALDAR, A.K., 1979. "Comparison of Finite Element and Lumped Parameter Modelling for Seismic Response of Reactor Building-Foundation Systems". Proc. Third International Conference of Numerical Methods in Geomechanics, April, Aachen, Germany, pp. 817-829.

36. HALDAR, A.K., REDDY, D.V., and AROCKIASAMY, M., 1978. "Probabilistic Seismic Soil-Structure Interaction of a Nuclear Reactor Containment". Proc. Fifth National Meeting of the University Council for Earthquake Engineering Research, June 28-29, M.I.T., Mass., U.S.A., pp. 77-79.

37. AROCKIASAMY, M., REDDY, D.V., THANGAM BABU, P.V., and HALDAR, A.K., 1978. "Probabilistic Response of a Floating Nuclear Plant to Seismic force". Proc. Fifth National Meeting of the University Council for Earthquake Engineering Research, June, M.I.T., U.S.A., pp. 83-85.

38. REDDY, D.V., AROCKIASAMY, M., and HALDAR, A.K., 1978. "Response of an Offshore Nuclear Plant to Seismic Force". Proc. International Conference on Vibration in Nuclear Plants, May, Keswick, England, Paper No. 9.1, 10 p.

39. AROCKIASAMY, M., HALDAR, A.K., and REDDY, D.V., 1977. "Comparison of 'Equivalent Linear' and Elasto-Plastic Soil Modelling for a Gravity Monopod". Proc. Fourth International Conference on Port and Ocean Engineering Under Arctic Conditions, September, St. John's, Newfoundland, Canada, Vol. I, pp. 149-167.

40. REDDY, D.V., SODHI, D.S., AROCKIASAMY, M., and HALDAR, A.K., 1977. "Response of an Offshore Floating LPG (Liquid Petroleum Gas) Storage to Simulated Wind and Ice Forces". Proc. Fourth International Conference on Port and Ocean Engineering Under Arctic Conditions, September, St. John's, Newfoundland, Canada, Vol. 1, pp. 185-199.

41. AROCKIASAMY, M., REDDY, D.V., and HALDAR, A.K., 1977. "Dynamic Wave-Structure-Soil Interaction Studies of Offshore Structures Considering Soil Nonlinearity". Proc. Symposium on Applications of Computer Methods in Engineering, August 22-26, Los Angeles, California, U.S.A., pp. 1449-1465.

42. AROCKIASAMY, M., HALDAR, A.K., and REDDY, D.V., 1977. "Dynamic Water-Soil-Structure Interaction of a Gravity Platform Including Nonlinear Soil Behaviour". Proc. Second SAP-4 User's Conference, June 23-24, Los Angeles, California, U.S.A., 20 p.

43. HALDAR, A.K., SWAMIDAS, A.S.J., REDDY, D.V., and AROCKIASAMY, M., 1977. "Dynamic Ice-Water-Soil-Structure Interaction of Offshore Towers Including Nonlinear Soil Behaviour". Proc. Offshore Technology Conference Paper No. OTC-2907, May 2-5, Houston, Texas, pp. 225-234.

44. HALDAR, A.K., 1977. "Dynamic Ice-Water-Soil-Structure Interaction of Offshore Framed Tower Considering Nonlinear Soil Behaviour". M. Eng. Thesis, Memorial University of Newfoundland, St. John's, Newfoundland, Canada, 147 p.

45. REDDY, D.V., SWAMIDAS, A.S.J., CHEEMA, P.S., and HALDAR, A.K., 1975. "Stochastic Response of a Three Dimensional Offshore Tower To Ice Forces". Proc. Third International Symposium on Ice Problems, August, Hanover, New Hampshire, U.S.A., pp. 499-514.

46. REDDY, D.V., SWAMIDAS, A.S.J., and HALDAR, A.K., 1975. "Wind Force Response Spectrum Modal Analysis of the C.N. tower". (Unpublished), 31 p.

Q. Provide details of the rate impacts referred to in Mr. Osmond's Prefiled Testimony, page 2, lines 28 to 31 and page 3, lines 1 to 16.

A. (A) Newfoundland Power:

(1) Fuel at $28 per barrel:
Re: 16% wholesale increase to Newfoundland Power

2002 revenues at existing rates (net of HST reduction)	$200,369,992
2002 revenues if $28 per barrel were used	$233,208,780
Difference	$ 32,838,788
Percentage Increase over Existing rates	16%

(2) Fuel at $28 per barrel:
Re: 9% increase at end consumer level

Wholesale increase to Newfoundland Power	16%
Multiplied By	**X**
Percentage of purchased power, of Newfoundland Power's overall costs	57%

Percentage increase at the end
Consumer level 9%

(3) Re: 5.9% RSP projected wholesale adjustment in 2002

	Existing Rates	2002 Proposed Rates	% Increase
Base Revenues	$200,369,992	$213,830,400	6.7%
RSP	$7,884,996	$20,670,272	
Total	$208,254,988	$234,500,672	12.6%

The 5.9% increase attributable to the RSP was derived by subtracting the base rate increase of 6.7% from the total increase of 12.6%. This RSP increase is based on the July 1, 2001 RSP rate of 1.77 mills/kWh, projected to increase to 4.64 mills/kWh on July 1, 2002.

(4) Re: 3.4% RSP projected adjustment to end consumers in 2002

Wholesale RSP increase to Newfoundland
Power 5.9%
Multiplied By X
Percentage of purchased power, of

Newfoundland Power's overall costs 57%

Percentage 2002 RSP increase at the End consumer level 3.4%

(B) Industrial Customers

(1) Fuel at $28 per barrel:
Re: 23% increase to Industrial Customers

2002 revenues at existing rates $45,266,225

2002 revenues if $28 per barrel were used $55,882,521

Increase $10,616,296

Percentage increase over Existing rates 23%

(2) Re: 7.4% RSP projected increase to Industrial Customers in 2002

	Existing Rates	2002 Proposed Rates	% Increase
Base Revenues	$45,266,225	$49,965,557	10.4%
RSP	$4,101,916	$8,174,533	
Total	$49,368,141	$58,140,090	17.8%

The 7.4% increase attributable to the RSP was derived by subtracting the base rate increase of 10.4% from the total increase of 17.8%. This RSP increase is based on the January 1, 2001 RSP rate of 2.80 mills/kWh projected to increase to 5.58 mills/kWh on January 1, 2002.

(C) Using $20 per barrel, as proposed in Hydro's evidence for 2002, the following impacts would take place:

(1) Newfoundland Power:

Re: 6.7% wholesale increase to Newfoundland Power

2002 revenues at existing rates	$200,369,992
2002 revenues at proposed rates	$213,830,400
Increase	$ 13,460,408
Percentage wholesale increase	6.7%

(2) Re: 3.7% increase at end consumer level

2002 Base Revenues @ Proposed 2002 Rates	$213,830,400
Less 2002 Base Revenues @ Existing Rates	$200,369,992
Difference	$13,460,408

Divided by existing base revenues	
Plus RSP	$208,254,988
Multiplied by	**X**
Effective percentage impact on	
Newfoundland Power's overall costs	57%
Percentage increase at the end	
Consumer level	3.7%

(3) Industrial Customers:

Re: 10.4% increase to Industrial Customers

2002 Industrial revenues at	
existing rates	$45,266,225
2002 Industrial revenues at	
proposed rates	$49,965,557
Increase	$ 4,699,332
Percentage increase	10.4%

Q. Provide all reports and supporting documentation related to implementation of a demand and energy charge pricing structure for the wholesale power rate for Newfoundland Power as referenced in Mr. D.W. Osmond's Prefiled Testimony (page 9, lines 24 – 31). Explain why a demand charge is appropriate for Industrial Customers, but not Newfoundland Power.

A. Please see response to IC-205.1.

The primary difference between Newfoundland Power and Industrial customers relates to the level of control each has on the demand each places on the system. Industrial customers are indeed the final customers and can therefore control the loads they place on the system. Newfoundland Power is the distributor of electricity to ultimate consumers and cannot therefore exercise the same level of control over the load level.

Another significant difference is in the management of Newfoundland Power's generation facilities. Presently, Hydro gives direction to Newfoundland Power on operating its generating plants for system peak load purposes to optimize the generation that is on-line. Newfoundland Power normally operates its hydro plants to produce energy as efficiently as possible and does not use its thermal generation for peaking purposes unless requested by Hydro. This will result in some of Newfoundland Power's plants not being on-line at the time of its peak. Having a demand charge may result in less optimal use of the resources as Newfoundland Power may place all of its generation on at the time of their peak to reduce their demand cost. There may be several near peaks when this could occur or they could decide to keep some hydro plants off at non-peak times to ensure they had capacity available for potential peak times when they occur. In either case the operation of the system will become less efficient resulting in higher costs. Therefore, the objective of ensuring the most efficient use of hydraulic resources would be negatively impacted by the implementation of a demand charge in Newfoundland Power's rate structure.

Q. On page 5, lines 7 to 13, Mr. Osmond states that until the Energy Policy Review is completed by the Government, it is premature for Hydro to recommend or commence a process to implement long-term financial targets. Is this an appropriate strategy given that the government started the review in 1998, and three years later, it has still not been completed? Does Hydro have knowledge that completion of the review is imminent? When is the review expected to be completed? If it is premature for Hydro to implement long-term financial targets, is it also not premature to recommend a rate increase at this time?

A. Please see response to IC-207.

Hydro's long-term financial targets are not related to the rate increase in 2002. This requirement is determined by Hydro's 2002 projections of costs and revenues, including a rate of return on rate base and an appropriate return on equity (ROE). The level of ROE attained is a factor in moving towards medium and long-term financial targets. Please see IC-49 regarding comments related to Hydro's current, medium and long term financial targets.

Q. On page 5, lines 21 to 28 of his Prefiled Testimony, Mr. Osmond indicates that a temporary reduction in its financial targets would not be viewed negatively by the financial community. Would a temporary reduction in its financial targets in combination with the knowledge that it is allowing for a price of fuel oil that is substantially below forecast in its revenue requirement be viewed negatively by the financial community?

A. In recent discussions with Dominion Bond Rating Service officials, the details of the current rate application were discussed, including a communication of inherent financial targets and forecast fuel prices. The general feedback received to date is that while such targets are undesirable in the longer-term, Hydro's "phased-in" approach seems reasonable from the perspective of the impact of rate increases on consumers. Adverse reaction from the financial community is not expected unless there is a rejection by the Board of Hydro's longer-term financial targets.

Q. On numerous occasions in the Prefiled Testimony of Hydro's experts, reference is made to the next Rate Application. Mr. Osmond on page 9, lines 4 to 19 of his Prefiled Testimony states that Hydro is not proposing to commence implementation of all of the recommendations in the Board's 1996 Report starting in 2002. Provide the list of recommendations included in the 1996 Report, and indicate which of these recommendations have been implemented, or are proposed to be fully implemented in this application. List the items that Hydro has proposed to address in the next rate application.

A. See attached.

PUBLIC UTILITIES BOARD

REPORT ON RURAL ELECTRICAL SERVICE

JULY 29, 1996

RECOMMENDATIONS	HYDRO'S POSITION/IMPACT
(1) The Board is not recommending any increase in the rates charged in electrically isolated systems, for the first, second or third blocks of energy, nor is it recommending any change in the monthly domestic customer charge of $16.71.	It was Hydro's position at its last rate application in 1992 that the second block should be eliminated and rates in the end block gradually increased. Hydro will address this issue at its next rate application.
(2) The Board recommends that the first block remain unchanged at 700 kWh per month (for domestic customers)	Hydro agrees with this position.
(3) The Board recommends that Hydro prepare a detailed calculation of long run marginal costs. In the event that a detailed estimate of long run marginal cost confirms it to be significantly below the current energy rate, the Board recommends that consideration be given to reducing the energy rate to a level closer to long run marginal costs (for general service customers).	Please see response to NP-184.
(4) The Board recommends that the special general service rate for the first 700 kWh per month, which was established by Order-in-Council in 1989, be eliminated. No change is recommended for the basic customer charge.	Hydro concurs with this recommendation and will address this issue at its next rate application as part of its five year rate implementation plan.
(5) The Board recommends that Hydro be directed to provide a cost benefit analysis of a rate structure for general service customers which provides for a demand charge. The energy and demand charge in such a rate structure should recover long run marginal cost.	Please see response to NP-184

RECOMMENDATIONS	**HYDRO'S POSITION/IMPACT**
(6) The Board recommends that preferential rates be phased out. The phase out period should be five years.	Hydro concurs with this recommendation. Hydro, at its next rate application, will be addressing this issue as part of its five year rate implementation plan. See recommendation number 7.
(7) The Board recommends that a new rate be designed for federal and provincial departments and agencies and these rates, phased in over five years, should recover full costs (i.e. 100% cost recovery).	Hydro concurs with this recommendation and has in its current rate application before the Board recommended starting the phase out in 2002 and to complete the phase out over a further five year period after Hydro's next rate application.
(8) The Board recommends that both generation assets and the 138 kV transmission line on the Great Northern Peninsula be assigned, on a provisional basis, as being of common benefit to all interconnected customers and that sub-transmission costs (for lines whose voltage is below 138 kV) be specifically assigned. The Board further recommends re-examination of these costs assignment decisions, and the rules for cost assignment, at a future hearing.	Hydro concurs with this recommendation, and has implemented the recommendation in the current rate application.
(9) The Board recommends that the treatment of the Roddickton Woodchip Plant be 100% demand related, as proposed by Hydro.	The Roddickton Woodchip Plant was removed from service with PUB approval in 2000.
(10) The Board recommends that future cost of service reports be generated with six separate studies: (1) Rural Island Interconnected; (2) Newfoundland Light & Power; (3) Island Industrials; (4) Labrador Interconnected; (5) Isolated Island Systems; and (6) Isolated Labrador Systems	Hydro concurs with this recommendation and has included this information in its 2002 Cost of Service Study.

RECOMMENDATIONS	**HYDRO'S POSITION/IMPACT**
(11) The Board recommends that Hydro provide, as part of future cost of service reports, the specific policies as well as an allocation schedule related to operation and maintenance overheads.	Hydro concurs with this recommendation and has included such information in NP-132.
(12) The Board recommends elimination of interest margin on the Hydro Rural Interconnected system and that a rate of return not be allowed on rural electrical assets, as long as the rural system is operating on a deficit basis.	Hydro has excluded these items from its 2002 Cost of Service Study.
(13) The Board recommends that Hydro and Newfoundland Power establish a joint task force to identify measures whereby cost savings can be achieved, both in isolated and interconnected rural systems.	Hydro and Newfoundland Power have held discussions to explore opportunities for co-ordination in an effort to lower the overall cost of providing service to electrical customers on the Island. A Memorandum of Understanding is in place covering the sharing of services and equipment during emergencies.
(14) The Board recommends that independent consultants should be retained to study the isolated systems for the purpose of identifying all possible cost savings and efficiency improvements. The consultant should provide Hydro with targets and with a tracking system by which to measure progress toward achieving these targets.	Hydro does not concur with this recommendation and it does not plan to implement. .
(15) The Board recommends a study of system losses be conducted to improve measurement of station service and line losses.	A field investigation program was implemented to identify metering and reporting deficiencies. Plant metering equipment has been checked and re-calibrated. In addition, new electronic meters have been installed.

RECOMMENDATIONS	**HYDRO'S POSITION/IMPACT**
(16) The Board recommends an enhanced consumer education program be undertaken in isolated areas, to promote greater understanding of the costs and operations of the electrical system and the effect of consumer decisions upon electrical loads and costs. Dissemination of information describing the full cost of the electricity they consume would be a major component of such an education program.	Hydro concurs with this recommendation and has taken action to facilitate this activity by the creation of a Customer Services Department. Increasing consumer education and improving customer service has been a major activity of the Customer Services Department.
(17) The Board recommends each bill should show the full embedded cost of the energy consumed, as well as the amount charged to isolated rural customers.	Hydro has not implemented this recommendation.
(18) The Board recommends design criteria for plant and ancillary equipment should be re-examined, with a view to ensuring reliability requirements are not unduly stringent, particularly in communities operating close to capacity limits.	Please see response to NP-184(d).
(19) The Board recommends tendering practices for fuel should be reviewed, along with the possibility of larger scale purchases and regional storage facilities.	In 1996 and 1999, Hydro tendered its fuel requirements for 3 and 5-year terms, respectively. The specification was structured in an attempt to reduce fuel costs through large-scale purchases. In both cases, no competitive advantage was realized as typically each vendor dominates supply in a specific region. Hydro continues to evaluate the cost benefit of providing its own regional storage facilities versus leasing from third parties.

RECOMMENDATIONS	**HYDRO'S POSITION/IMPACT**
(20) The Board recommends an experimental project should be designed by selecting a community facility, such as a school or other public building, in close proximity to a diesel plant, whereby heat from the diesel plant can be recovered. Such a demonstration project might provide a model for research and for subsequent technology transfer.	Hydro initiated a pilot project in 1994 with a church in Mary's Harbour for the sale of waste heat from our diesel plant. The pilot project is in service and a report and recommendations are to be completed in 2001.
(21) The Board recommends alternative technologies should be examined to ensure that all opportunities for cost reduction are fully realized. New technologies for harnessing wind power should be given particular attention.	Hydro continues to monitor alternative technologies for opportunities of cost-effective applications in the isolated diesel areas. However, to date, the most cost-effective and practical supply is diesel generation. In 1997 Hydro participated in a joint study with Newfoundland Power into the potential for mini-hydro in Island Rural Isolated Systems. In 1998, Hydro worked with the Atlantic Wind Test Site (AWTS) in PEI to investigate the integration of wind energy technology at St. Brendans and is currently reviewing a proposal from the AWTS for a wind demonstration project in Ramea.
(22) The Board recommends conservation programs for isolated areas should be designed to defer expansion of capacity and to target for subsidy reduction rather than lower energy use. Demand side management should be directed toward those systems which will soon require capacity expansion.	Please see response to NP-184(e).

Q. Why is Hydro recommending that Hydro Rural Customers on the Island Interconnected System pay the same rates as Newfoundland Power customers (page 11, lines 4 to 7 of Mr. Osmond's Pre-filed Testimony)? If it is appropriate to charge customers in the same class and served from the same grid the same rates, even though Newfoundland Hydro's costs are different from Hydro's *(sic)* costs. Is it appropriate to charge the same rates to Labrador customers and Isolated Rural System customers in the same class? If not, provide an explanation.

A. Cabinet, by an Order-in-Council in 1974, directed that Island Interconnected Customers whether served by Hydro or Newfoundland Power pay the same rates as Newfoundland Power's customers. This policy was subsequently accepted by the Board.

It is not appropriate to charge the same rates to customers in the same class on the Labrador Interconnected System and on the Labrador Isolated Rural System. The Labrador Interconnected System and the Labrador Isolated Rural Systems are completely different electrical systems, as are the Island Interconnected and Island Isolated Rural systems with totally different sources of energy supply. Customers served on the Labrador Isolated Rural Systems are supplied power through expensive diesel generation.

Q. Why is Hydro continuing to provide subsidies to Government Agencies and Departments in the Isolated Rural System of $2 million (Osmond Prefiled Testimony, page 12, lines 24 to 25) when the Board's 1996 Report directed that the subsidy be phased out over five years? Provide Hydro's specific plan showing the date when this subsidy will be removed.

A. Please see response to NP-150, NP-151 and IC-205.

Q. Provide the plan referred to on page 13, line 5 of Mr. Osmond's Prefiled Testimony.

A. Please see response to PUB-61.

Q. On page 17, lines 6 to 9 of Mr. Osmond's Prefiled Testimony, it is proposed that the Wabush surplus be refunded to Wabush customers in 2002 on the basis of each customer's proportionate share of the 2001 revenues. The surplus has been accumulating since 1989. Is this refund fair to the customers who have left the system since 1989?

A. To be theoretically precise the refund should be made to all customers who have been billed on the Wabush system since 1989 however this is no longer possible. Some customers have since left the area and would not be able to be tracked as well there have been numerous customer transfers and name and address changes since this time. Further, it would be a significant administrative exercise to attempt to calculate the refund over that time frame as several years of records are not available in electronic form.

Q. On page 5, lines 26 to 28 of his Prefiled Testimony, Mr. Brickhill states that the results from the cost of service study allocate a somewhat lower proportionate classification to the customer component than generally used by Canadian utilities. Provide the supporting analysis for this statement. Is it reasonable to assume that customer-related costs on the Island Interconnected System are roughly the same as customer-related costs on the Labrador Interconnected System? If not, explain why.

A. The statement was based on a review of pages 15-17 of the December 1998 "Study of Distribution System Cost Classification" provided in response to NP-123. A summary comparison of Hydro with other Canadian utilities is set out on the attached Exhibit.

Yes the customer-related costs on the Island Interconnected System are roughly the same as on the Labrador Interconnected System as shown in Exhibit JAB-1, Schedule 1.3, column 6, page 1 of 5 for Island Interconnected and page 5 of 5 for Labrador Interconnected. The table below provides a summary of unit customer costs by rate class for each system.

	Island Interconnected	**Labrador Interconnected**
Domestic	$20.73	$19.30
General Service 2.1	23.21	21.56
General Service 2.2	38.25	35.32
General Service 2.3	38.82	36.45
General Service 2.4	35.94	36.45
Street Lighting	29.12	36.20

PERCENTAGE OF DISTRIBUTION COST CLASSIFIED AS CUSTOMER RELATED

	PRIMARY LINES				SECONDARY LINES							
UTILITY	PRIMARY COND.	POLES	TOTAL	DISTRIBUTION TRANSFORMER	SECONDARY COND.	POLES [1]	TOTAL	SERVICES	METERS	TOTAL THREE PHASE PRIMARY	URBAN SINGLE PHASE PRIMARY	RURAL SINGLE PHASE PRIMARY
NOVA SCOTIA POWER CORP.	0%	0%	0%	0%	100%	100%	100%	100%	100%			
EDMONTON POWER	0%	0%	0%		BASED ON SPECIFIC ASSIGNMENT							
NEWFOUNDLAND POWER	33%	33%	33%	25%	33%	33%	33%	100%	100%			
HYDRO QUEBEC	18.40%	89.70%	44.50%	45.50%	18.60%	88.70%	NA	100%	100%			
SASKPOWER				61%			100%	100%	100%	0%	63.50%	81.00%
NEW BRUNSWICK POWER	50%	50%	50%	25%	50%	50%	50%	50%	NA			
BC HYDRO				0%						0%	100%	100%
NEWFOUNDLAND HYDRO	**11.30%**	**19.80%**	**16.20%**	**63.90%**	**41.70%**	**12.20%**	**36.40%**	**100%**	**100%**	**0%**		

Notes: 1. 100% of poles used for secondary are considered to be customer related. 35% of total poles (used to support primary and for secondary) are considered as secondary line poles.

Q. Provide the LOLH study referred to on page 8, lines 19 to 22 in Mr. Brickhill's Prefiled Testimony.

A. Please refer to the response to NP-135.

Q. On page 11, lines 13 to 18 of Mr. Brickhill's Prefiled Testimony, he indicates that purchased power for the L'Anse au Loop (*sic*) System is classified entirely to energy as it is purchased entirely on an energy basis with no capacity charges. Is this appropriate given that the major source of power on all of Hydro's other systems are classified on the basis of system load factor? Does the contract with CF(L)Co have a capacity charge? Given that Newfoundland Power purchases energy from Hydro entirely on an energy basis with no capacity charges, is it also appropriate for Newfoundland Power to classify its purchases from Hydro in its cost of service study entirely to energy?

A. It is appropriate to allocate purchases from Hydro Quebec for the L'Anse au Loup System on an energy basis because unlike the sources of power on all of Hydro's other systems, the purchase is on a secondary energy basis and subject to interruption.

The contract with CF(L)Co. has no capacity charge, but that purchase is on a firm basis with an obligation to take on the part of Hydro.

It would not be appropriate for Newfoundland Power to classify its firm purchases from Hydro entirely to energy. There is a demand cost component for firm purchases as shown in Exhibit JAB-1, Schedule 1.3.1, page 1 of 5.

Q. Provide a written explanation of the treatment of CFB-Goose Bay Secondary in Schedule 1.2, page 1 of 6 of Mr. Brickhill's Prefiled Testimony.

A. CFB – Goose Bay net secondary revenues of $2,808,526 (line 4), are used to reduce regulated firm customers' revenue requirement, namely the revenue requirement of Rural Labrador Interconnected customers (line 5).

Q. Explain the “Firming Up Charge” and its purpose referred to on Schedule 1.4 of Mr. Brickhill’s Prefiled Testimony.

A. The firming up charge is a fee, applied to energy that is supplied by Corner Brook Pulp & Paper (Deer Lake Power) to Newfoundland Power. Corner Brook Pulp & Paper supplies secondary energy, which Hydro “firms up”, i.e. makes available as though it is firm. Newfoundland Power is then charged both the amount due to Deer Lake Power, and the firming up charge, as approved by the Board.

Q. Provide a written explanation of the revenue credits and their purpose included in Schedule 1.2, page 1 of 6 of Mr. Brickhill's Prefiled Testimony.

A. The revenue credits shown on Schedule 1.2 of the Cost of Service Study are available when regulated customers take non-firm service. Rates for non-firm service are based on costs other than the embedded costs identified in the COS Study. Non-firm service may be provided to both Island Industrial customers and the Labrador Interconnected customer, CFB-Goose Bay. Since the rates charged recover more than the allocated COS, the excess, or revenue credit, is allocated among the regulated firm customer classes in the appropriate system, to reduce the revenue requirement of those customers.

Q. Given that transmission costs are allocated on the basis of coincident peak, why is the Wheeling Charge rate calculated on the basis of energy (i.e., $/kWh)?

A. Hydro's transmission system was sized to serve peak load, which is why costs are allocated based on a demand allocator. Wheeling is incidental, rather than a component for which the system was designed. Billing wheeling on an energy basis is consistent with system usage.

The revenues from the wheeling service are credited to the transmission cost of service, thereby reducing other customers' rates.

Q. Similar to Table 1 (page 4) of Hamilton's Prefiled Testimony, provide a table in the format shown below. Show what each customer group (including those receiving preferential rates) is paying, on average, under both current rates and proposed rates, and then show the revenue/cost ratio for each customer group under both current and proposed rates using the test year cost of service study as the denominator. Show two tables, one with, and one without, the rural deficit allocation.

System/	Test Year	Average Energy Charge		Revenue/Cost Ratio	
Cust. Category	Energy	Current	Proposed	Current Rates	Proposed Rates
	(MWh)	(cents/kWh)			
Island Interconnected					
(Show each customer category)					
Labrador Interconnected					
(Show each customer category)					
Isolated Systems					
(Show each customer category)					
L'Anse au Loop					
(Show each customer category)					

A. Please see the attached tables.

Q. By Hydro's own admission, its rate structure has many subsidies and cross-subsidies; i.e., taxpayers are subsidizing electricity consumers because revenues are not allowing it to meet appropriate financial targets, because the full price of fuel oil is not being recovered, because the rate stabilization plan is in arrears, etc. Rural customers are being subsidized by other customer classes because they are paying less than the full cost of service, etc.). All of these subsidies make it difficult to tell how much the various customer classes are actually being subsidized. In this regard, provide a list of all subsidies being provided to customers. Show the revenue requirement that in Hydro's view, provides adequate revenues to meet appropriate financial covenants for the year 2002, show the appropriate cost allocation to each customer group (including customers receiving preferential rates), and compare to the revenues being collected from each customer group. Provide the results in a table in the format shown below. Basically, show the revenue/cost ratios for each customer group under current and proposed rates based on a revenue requirement without subsidies.

System/	Revenue/Cost Ratio			
Customer Category	Without Rural Deficit		With Rural Deficit	
	Current Rates	Proposed Rates	Current Rates	Proposed Rates
Island Interconnected				
(Show each customer category)				
Labrador Interconnected				
(Show each customer category)				
Isolated Systems				
(Show each customer category)				
L'Anse au Loop				
(Show each customer category)				

A. A revenue requirement without subsidies would include the following additional items:

(a) No. 6 fuel at $28/ bbl;
(b) Return on equity of 11.25%;
(c) Debt to capital ratio of 60%; and
(d) Return calculation applied to full ratebase.

The increase in the price of fuel, as well as the existing RSP balances defer costs to future years, so can be considered as subsidies among ratepayers over time. The existing rural deficit allocation, as well as variations in revenue/cost coverages among Rural Labrador Interconnected customers, are examples of cross-subsidization among today's ratepayers. The increase in return on ratebase due to items (b), (c), and (d), can be considered cross-subsidization between taxpayers and ratepayers.

Refer to page 3 for the requested table of revenue/cost coverages. The revenue requirement and cost allocations by rate class are attached as pages 4-11.

Please note that these results do not incorporate any changes to revenues, or any related cash flow impacts associated with interest and return on rate base, from those filed in Exhibit JAB-1.

Q. On page 6, lines 8 to 10 of Mr. Hamilton's Prefiled Testimony he indicates that non-firm industrial rates should recover all incremental costs of providing the service and provide a contribution towards the fixed cost of the relevant generating plant. Provide the analysis that shows that the non-firm rate is, in fact, meeting this objective.

A. The energy portion of the rate recovers the actual fuel cost incurred to provide the non-firm energy. Other indirect costs are recovered through the 10% surcharge on energy and the $1.50 /kW demand charge. Please see response to IC-44 (3) for explanation of 10% surcharge on the energy portion of the non-firm rate and the response to NP-183 for explanation of the demand charge portion.

Q. Provide the costs and benefits expected to result from 1) seasonal rates, and 2) time-of-day rates for each customer class. Show the expected incremental costs for metering, billing and settlement versus the expected reductions in demand and energy costs resulting from customer load shifting in response to the rates.

A. As outlined in response to IC-205 (2), Hydro has not conducted the studies necessary to answer this question.

Q. For Hydro's Interruptible Service, explain the following:

(a) The billing methodology for firm and interruptible power and energy
(b) The terms of interruption
(c) The analysis supporting the cost of Interruptible Service versus the value to consumers
(d) Provide a comparison of Hydro's and Newfoundland Power's interruptible rate options, explaining the philosophy behind each, and reconciling all differences.
(e) Explain why Interruptible Service is offer *(sic.)* to Industrial Customers but not Newfoundland Power.

A. (a) The "Interruptible Service" which is the non-firm Interruptible Power and Energy in the industrial contracts, is provided to all industrial customers to permit them to take power and energy above their firm load. It is billed based on a demand and an energy charge. The billing demand is the maximum demand measured in excess of the Power On Order (firm load) during the month. The Interruptible Energy is all energy taken by the customer associated with the demand in excess of the Power On Order.

These quantities are determined using metering equipment that measures and stores the energy use of the customer in fifteen minute intervals. The stored data is retrieved via modem and processed via spreadsheets to determine the separation between firm and non-firm (Interruptible) power and energy.

(b) The need for interruptions to the Interruptible portion of the customer's load is determined and notice given by Hydro's Energy Control Centre staff. Once a customer is provided notice it is expected to immediately reduce to its firm load level. There are no restrictions in duration or notice period for these interruptions.

(c) The demand charge, energy charge and administration surcharge components of the proposed Industrial - Non-Firm rate that applies to "Interruptible Service" are outlined in CA-72, NP-183 and IC-44. There is value in such sales for consumers other than the Industrial Customers in that the revenue from such sales in excess of the costs is credited to all firm service rate classes through the COS study.

(d) Hydro's "Interruptible Service" is of a different nature than Newfoundland Power's Curtailable Service Option. Hydro is selling additional energy otherwise referred to as non-firm energy whereas Newfoundland Power is purchasing capacity from customers. The difference in rate structure reflects this difference in intent.

(e) "Interruptible Service" has not been offered to Newfoundland Power as there is no method of measuring reduction in load initiated by Newfoundland Power. They have an energy only rate and there is no reference load level to indicate the difference between firm and non-firm sales.

Q. On page 6, lines 13 to 17 of Mr. Hamilton's Prefiled Testimony, he states that Island Interconnected System rates should continue to track the rates charged by NP to similar customers. Does Hydro believe that cost of supply is also a factor, and if so, how is cost of supply to be reflected in these rates?

A. It has been the policy of the Board to charge the same rates for similar customers served from the same system. This policy therefore recognizes that rates are not always related to cost recovery. However, Hydro recognizes that cost of supply is very important and therefore strives to minimize the cost of supply.