

The Technical Challenge of Developing and Managing the La Grande Rivière Hydroelectric Complex¹

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ABSTRACT

The addition of flow from the three rivers diverted into the La Grande Rivière for the three power plants of the hydroelectric complex allow for the generation of 10,200 MW and an annual output of 62 TWh. Commissioning the complex, started in 1979, was spread over five years during phased construction. Planning was affected by timing to meet environmental requirements, systems testing and remedial actions. Operation of the power plants is optimized through long-, medium- and short-term planning for water resource regulation and generator performance.

1. THE LA GRANDE RIVIÈRE HYDROELECTRIC COMPLEX

The La Grande Rivière is the core of the La Grande Rivière hydroelectric complex. Flow of the river has been increased by diverting the waters of the Eastmain and Opinaca rivers to the south, and the Caniapiscau River to the east, to supply three power plants sited along the river (Figure 1). The complex generates close to 45% of the power needs of the Hydro-Québec grid – a total of 10,282 megawatts (MW) and an annual output of 62.2 terawatt-hours (TWh).

The La Grande Rivière is 850 km long; total drop is 500 m. At its mouth, the river drains a catchment area of 98,820 km² and mean interannual flow is 1,700 m³/s. The three power plants along the river, each with a reservoir, are located at kilometres 112, 237 and 463; downstream to upstream, the plants are called La Grande-2, La Grande-3 and La Grande-4. Table 1 indicates the plants' main characteristics. La Grande-2 is by far the largest, with its 16 turbine-generator units and an installed capacity of 5,328 MW.

At its mouth, the Eastmain River drains a basin of 46,360 km², of which 87%

¹Revue de L'Energie, # 428, février-mars 1991. Updated and translated by Hydro-Québec, Montreal, Quebec, Canada, for republication.

The La Grande Riviere Hydroelectric Complex The Environmental Challenge

Yi-Tong Ma



The La Grande Riviere Hydroelectric Complex The Environmental Challenge:

The La Grande Rivière Hydroelectric Complex Société d'énergie de la Baie James (Québec),1988 A comprehensive overview of environment related activities in connection with the first phase of construction of the La Grande Riviere hydroelectric complex by the James Bay Energy Society in northern Quebec Describes what has been learned about protection of the environment through the La Grande Complex *GRANDE RIVIERE HYDROELECTRIC COMPLEX - ENVIRONMENTAL CHALLENGE*. QUEBEC. SOCIETE D'ENERGIE DE LA BAIE JAMES.,1988 The La Grande Rivière Hydroelectric Complex ,1988

Mercury in the Biogeochemical Cycle Marc Marcotte,Roger Schetagne,Normand Therien,Claude Langlois,Alain Tremblay,2012-12-06 Nowadays major environmental issues are the object of large public debates despite the fact that scientific knowledge is often insufficient to draw unequivocal conclusions Such is the case in the ongoing debate regarding the specific contributions of anthropogenic greenhouse gas emissions and of natural climate changes to global warming At least 10 to 20 years of additional observations will be required before we will be able to conclude with certainty on this subject In the mean time and as directed by their immediate interests people will continue to promote contradictory opinions The media are in part responsible for perpetuating such debates in that they convey indiscriminately the opinion of highly credible scientists as that of dogmatic researchers the latter unfortunately too often expressing working hypotheses as established facts Naturally in a similarly misinformed manner pressure groups tend to support the researcher whose opinions most closely represent either their particular ideological battles or their economic interests and hence in their own way add further to the confusion and obscurity of the debate Only a few years ago mercury Hg contamination in hydroelectric reservoirs was the object of such media and social biases At the time analytical data used to support the discourse were themselves uncertain and numerous hypotheses often times fanciful were proposed and hastily delivered to the public **Canada** ,1989

An Environmental History of Canada Laurel Sefton MacDowell,2012-07-31 Throughout history most people have associated northern North America with wilderness with abundant fish and game snow capped mountains and endless forest and prairie Canada's contemporary picture gallery however contains more disturbing images deforested mountains empty fisheries and melting ice caps Adopting both a chronological and thematic approach Laurel MacDowell examines human interactions with the land and the origins of our current environmental crisis from first peoples to the Kyoto Protocol This richly illustrated exploration of the past from an environmental perspective will change the way Canadians and others around the world think about and look at Canada

Social and Environmental Impacts of the James Bay Hydroelectric Project James F. Hornig,1999 Planning and construction of the James Bay Hydroelectric project began in the early 1970s when the effect of such projects on the physical and social environment was seldom considered As the project matured however its unique and diverse environmental impacts came under intense scrutiny on both sides of the border The first mega scale hydro project to be built in the sub

Arctic capable of generating as much electricity as fifteen nuclear power plants its impact includes disruption of vast areas in an extremely fragile ecosystem as well as displacement of native peoples and the introduction of dangerous levels of mercury into their food supply The debate over these complex environmental issues has been further complicated by political issues stemming from the importance of the project to the economic development of Quebec and the sale of at least ten percent of the electricity generated the United States The contributors examine core issues of the controversy both in relation to James Bay and to other large hydroelectric projects such as the Aswan dam in Egypt and the Three Gorges dam in China Providing insights from an unusual variety of disciplines the authors offer important considerations that must be taken into account as Quebec assesses additional phases of hydroelectric development of the watershed east of Hudson Bay Contributors include Raymond B Coppinger Hampshire College Bill Dale Roebuck Dartmouth Medical School Will Ryan Hampshire College Adrian Tanner Memorial University Stanley L Warner Hampshire College Kessler E Woodward University of Alaska and Oran R Young Dartmouth College James F Hornig is professor emeritus of chemistry and environmental studies Dartmouth College

Environmental Technology and Economics Claire Soares,1999 There is no shortage of books about ISO14000 and what it contains What is needed is a guidebook that will show practicing engineers in industry how to implement systems that will achieve manufacturing and business efficiency and environmental compliance at the same time This book will meet that goal in the most straightforward and forthright way What is provided here is a guide to the actual technology at the disposal of plant designers specifiers engineers and managers that will give them the answers to the questions that other sources simply do not address

Case Studies in Environmental Science Larry Underwood,1998 Case Studies in Environmental Science is designed to promote grassroots awareness of global environmental issues through problem solving analysis and verbal and written discussion of topics that pertain to seven regions of the United States and Canada The twelve case studies present a range of views on selected environmental issues in a non biased approach Thought provoking questions commentaries and readings have been included to stimulate students to investigate the issues in further detail beyond the presentation of each case study The accompanying website provides the students with the tools and resources to go beyond the confines of the book and their geographic region Updated monthly the site will provide up to date links to resources and articles for each case in each region Summaries of significant events in each region and for each issue will be provided with additional Critical Thinking questions designed to demonstrate the interrelationships between regions and issues

Potential Sedimentological Impacts of Hydro-electric Developments in James Bay and Hudson Bay Bruno D'Anglejan,North Wind Information Services,1994 Renewable Energy Tim Jackson,2013-09-17 Renewable Energy Prospects for Implementation contains papers that were originally commissioned by the journal Energy Policy for a series on renewable energy appearing between January 1991 to September 1992 In view of the fast changing demands on conventional energy supply to meet environmental imperatives it seemed timely to reproduce here a selection of those papers with a new

introduction and a revised concluding chapter by the Editor of the series Dr Tim Jackson a research fellow with the Stockholm Environment Institute The book is organized into four parts The papers in Part I cover the individual renewable energy technology types from a broad perspective addressing the technological aspects of improved power capture and conversion efficiency but also providing a broad overview of costs environmental aspects and institutional factors for each technology category Part II of this collection examines questions of feasibility and system integration Renewables and development is the theme of Part III of the book while Part IV is dedicated to policy aspect and the development of strategies for implementation of renewable energy technologies **Alternative Sources of Energy** ,1988 New

England/Hydro-Quebec 450kV Transmission Line Interconnection, Phase II (MA,VT,NH) ,1987 **Rivers Handbook, Volume 1** Peter P. Calow,Geoffrey E. Petts,1992-11-10 Assesses and reports on the scientific and ecological principles that are relevant for developing an integrated approach to rivers management Ecosystems properties and processes of sub temperate temperate large alluvial tropical semi arid and mountain rivers are described *Seas and Waterways of the World* John Zumerchik,Steven L. Danver,2009-11-12 This is the first comprehensive encyclopedia on the history of the vast and varied ways human beings have used the world s waterways for business protection and recreation Seas and Waterways of the World An Encyclopedia of History Uses and Issues offers a comprehensive introduction to humanity s historical reliance on the world s seas and waterways and how that reliance continues to evolve Over the course of two volumes this extraordinary resource describes the world s major nautical features the wide variety of uses for those waterways and a number of essential issues arising from water borne commerce The encyclopedia marks the emergence of the aquarium cruise energy fishing insurance mining trade transportation recreation and sport industries and includes entries on harbors ports and coastal development that play a part in the economics of commercial water use Also included is coverage of a number of significant themes such as the rise and fall of the Erie Canal as the gateway to the Midwest and the declining popularity of the Panama Canal **Reflections on the James Bay and Northern Québec Agreement** Alain Gagnon,Guy Rocher,2002 Impact Assessment and Project Appraisal ,1999 Introduction To Environmental Impact Assessment John Glasson,Riki Therivel,Andrew Chadwick,Professor of Political Science & Co-Director of the New Political Communication Unit Andrew Chadwick,2005-09-30 First Published in 1994 Routledge is an imprint of Taylor Francis an informa company Bibliographie du Québec ,1988 **Energy Policy** ,1991

Adopting the Track of Appearance: An Mental Symphony within **The La Grande Riviere Hydroelectric Complex The Environmental Challenge**

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