Keeyask Generation Project

Environmental Impact Statement

Supporting Volume

Physical Environment

KEEYASK
Hydropower Limited Partnership

June 2012

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KEEYASK GENERATION PROJECT

ENVIRONMENTAL IMPACT STATEMENT
RESPONSE TO EIS GUIDELINES

PHYSICAL ENVIRONMENT
SUPPORTING VOLUME

Prepared by

Keeyask Hydropower Limited Partnership
Winnipeg, Manitoba

June 2012

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KEEYASK
Hydropower Limited Partnership

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PREFACE

The Environmental Impact Statement (EIS) for the Keeyask Generation Project (the Project) is submitted to Canada and Manitoba by the Keeyask Hydropower Limited Partnership (the Partnership), which consists of Manitoba Hydro and four Cree Nations (referred to collectively as the Keeyask Cree Nations or KCNs): Tataskweyak Cree Nation (TCN) and War Lake First Nation (WLFN), acting collectively as the Cree Nation Partners (CNP), York Factory First Nation (YFFN), and Fox Lake Cree Nation (FLCN).

The Partners agreed early on that there would be a Keeyask Cree Nations evaluation process as well as the government regulatory environmental assessment process for the Project.

In the KCNs' process, each of the KCNs, assisted by Manitoba Hydro, evaluated the impact of the Project on their communities and Members in terms of their own worldview, values and experience with past hydroelectric development. This process supported conclusion of the Joint Keeyask Development Agreement by the Partners.

The Partnership's EIS response to the government regulatory environmental process was undertaken by Manitoba Hydro with the support of the KCNs. In summary, the EIS consists of:

- A video, *Keeyask: Our Story,* which presents the Keeyask Cree Nations' history and perspectives related to hydroelectric development. Presented through the prism of their holistic Cree worldview, it explains the journey taken by the KCNs as they evaluated their concerns about the Project, the nature of their participation as Partners, and the decisions they ultimately made to support the Project;
- An executive summary;
- A Response to EIS Guidelines issued by Canada March 30, 2012 in response to an application by the Partnership for environmental approvals under the government regulatory environmental assessment process. This response includes findings and conclusions[1], with charts, diagrams, and maps to clarify information in the text, and a concordance table to cross reference requirements of the EIS Guidelines with information in the EIS; and
- The KCNs' Evaluation Reports providing each of the KCNs' own evaluation of the effects of the Project on their community and Members and including Aboriginal traditional knowledge (ATK) relevant to the Partnership's response to the EIS Guidelines.

[1] Technical supporting volumes are also provided, as developed by the Manitoba Hydro environmental team in consultation with the KCNs and their Members, to provide details on the Project Description and on the research and analysis of the following topics: Public Involvement Program, Physical Environment, Aquatic Environment, Terrestrial Environment, Socio-economic Environment, Resource Use, and Heritage Resources.

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ACKNOWLEDGEMENTS

The assessment of the effects of the Project on the physical environment was undertaken by a wide range of technical specialists from Manitoba Hydro and a number of consulting firms. The assessment was coordinated by a Keeyask Physical Environment Coordination Team.

Keeyask Physical Environment Coordination Team:

Marc St. Laurent, M.Sc., P.Eng., Manitoba Hydro
William DeWit, M.Sc., P.Eng., Manitoba Hydro
George Rempel, M.Sc., P.Eng., Stantec
Dave Morgan, Ph.D., P.Eng., Stantec
Khizar Mahmood, M.Sc., P.Eng., Stantec

The physical environment assessment encompassed a broad spectrum of topics. Therefore, the coordination team relied upon a multidisciplinary group of specialists to assess the effects of the project on the physical environment and report on these effects. Key personnel involved in the physical environment studies and preparation of the Physical Environment Supporting Volume include:

Climate

Kristina Koenig, M.Sc., P.Eng., Manitoba Hydro
Bill Hamlin, P.Eng., Manitoba Hydro
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Air Quality and Noise / Effects of the Environment on the Project

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Debris

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William DeWit, M.Sc., P.Eng., Manitoba Hydro

The physical environment studies could not have been completed without the dedicated efforts of many other people providing specialist support in areas such as computer modeling, geographic information systems, technical analyses, data management, and field studies. Those who provided specialist support for the physical environment studies include:

Manitoba Hydro

Jennifer Lidgett, H.B.Sc.F.
Zsolt Zrinyi, Ph.D., P.Eng.
Tariq Aziz, M.Eng., P.Eng.
Greg Johnston, P.Eng.
Marc Totte, B.Sc.
Brent Bencharski, B.Sc.
Ben Schmidt, B.A.
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Paul Chanel, M.Sc., P.Eng.
Danielle Kerr, B.A.
John Crawford, B.Sc., P.Eng.
Mike Viera, B.Sc., E.I.T.
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Shaun Kenny, B.Sc., P. Eng.
Joe Groeneveld, M.Eng., P.Eng.
Ruxandra Ditica, B.Sc.
Elise Neufeld, B.Sc.

The specialists performing the physical environment assessments relied heavily upon data gathered in field studies performed in the project area over the last decade or more. Community Members from the Keeyask Cree Nations (Tataskweyak Cree Nation at Split Lake; York Factory First Nation at York Landing; War Lake First Nation (WLFN) at Ilford; and Fox Lake Cree Nation (FLCN) at Bird and Gillam) were involved in these field studies at various times for different durations over the years. The coordination team and study specialists would like to acknowledge the efforts of more than one hundred and thirty Members of the Keeyask Cree Nations who contributed significantly to the successful collection of data upon which physical environment studies are based.

In addition to the foregoing, the coordination team and study specialists also wish to acknowledge the contribution of the following people who contributed to the physical environment assessment:

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Finally, the coordination team and study specialists also acknowledges the valuable input provided by the Keeyask Cree Nations representatives, community Members, and advisors throughout the process of preparing the physical environment assessment. Your probing questions, insightful criticism, and gracious compliments have helped shape the assessment of the effects of the Keeyask Project on the physical environment reported in this supporting volume.

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	
AE SV	Aquatic Environment Supporting Volume
asl	Above sea level
ATK	Aboriginal traditional knowledge
ATV	All terrain vehicles
BC	British Columbia
BOD	Biochemical oxygen demand
CCME	Canadian Council of Ministers of the Environment
CEAA	Canadian Environmental Assessment Agency
CNP	Cree Nation Partners (Tataskweyak Cree Nation (TCN), War Lake First Nation (WLFN))
CO	Carbon monoxide
CO_2	Carbon dioxide
CRCM	Canadian Regional Climate Model
CRD	Churchill River Diversion
dB	Decibel (noise power)
dBa	Decibel- a weighted
DO	Dissolved oxygen
e.g.	Example
EA	Environmental assessment
EC	Environment Canada
EIA	Environmental impact assessment
EIS	Environmental impact statement
EMPA	Excavated Material Placement Area
EnvPP	Environmental protection plan
EPA	Environmental Protection Agency
et al.	and others
FLCN	Fox Lake Cree Nation
FSL	Full Supply Level
GHG	Greenhouse gas
GIS	Geographic Information System
GPS	Global positioning system
GS	Generating Station
HVDC	High Voltage Direct Current
HZI	Hydraulic Zone of Influence
i.e.	in other words
IEZ	Intermittently exposed zone
IPCC	Intergovernmental Panel on Climate Change
JKDA	Joint Keeyask Development Agreement
KCN	Keeyask Cree Nations communities including Tataskweyak Cree Nation (TCN), War Lake First Nation (WLFN), York Factory First Nation (YFFN), and Fox Lake Cree Nation (FLCN).
KIP	Keeyask Infrastructure Project
LCA	Life Cycle Assessment
LWR	Lake Winnipeg Regulation

Acronym / Abbreviation	
MB	Manitoba
MH	Manitoba Hydro
MIT	Manitoba Infrastructure and Transportation
MOL	Minimum operating level
MWQSOG	Manitoba Water Quality Standards, Objectives, and Guidelines
NO_X	Nitrogen oxides (*e.g.*, NO_2, NO_3)
NPRI	National Pollutant Release Inventory
PD SV	Project Description Supporting Volume
PE SV	Physical Environment Supporting Volume
PEMP	Physical Environment Monitoring Program
PI SV	Public Involvement Supporting Volume
PM	Particulate Matter
PR	Provincial Road
PTH	Provincial Trunk Highway
QA/QC	Quality assurance/quality control
RCM	Regional Climate Model
SE SV	Socio-Economic Environment, Resource Use and Heritage Resources Supporting Volume
SO_2	Sulphur dioxide
SOD	Sediment Oxygen Demand
SV	Supporting Volume
TCN	Tataskweyak Cree Nation
TDS	Total Dissolved Solids
TE SV	Terrestrial Environment Supporting Volume
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
VEC	Valued Environmental Component
VOC	Volatile organic compounds

LIST OF UNITS

List of Units	
Unit	**Abbreviation**
centimetre	cm
cubic centimetre	cm^3
cubic metre	m3
cubic metre per second	m^3/s
day	d
days per week	d/wk
days per year	d/y
degrees Celsius	°C
gigajoule	GJ
gigawatt	GW
gigawatt-hours	GWh
gram	g
grams per litre	g/L
grams per square metre	g/m^2
grams per tonne	g/t
greater than	>
greater than or equal to	≥
hectare (10,000 m2)	ha
hertz	Hz
hour	h
hours per day	h/d
hours per week	h/wk
hours per year	h/y
inch	"
joule	J
kilogram	kg
kilograms per cubic metre	kg/m^3
kilograms per hour	kg/h
kilograms per square metre	kg/m^2
kilojoule	kJ
kilometre	km
kilometres per hour	km/h
kilopascal	kPa
kilovolt	kV
kilowatt	kW
Kilowatt-hour	kWh
less than	<
less than or equal to	≤
litre	L
megawatt	MW
megawatt-hour	MWh
metre	m
metres per second	m/s

List of Units	
Unit	**Abbreviation**
metric ton (tonne)	t
milligram	mg
milligrams per litre	mg/L
millimetre	mm
million	M
percent	%
second (time)	s
square centimetre	cm^2
square kilometre	km^2
square metre	m^2
tonne (metric ton)	t
week	wk
year	y