Keeyask Project Overview

- Lorne Midford P. Eng, MSc – Vice President, Generation & Wholesale
- Jeff Strongman P. Eng, MBA – Keeyask Business Manager
- Dave Bowen P. Eng, MSc – Keeyask Project Director
Manitoba Hydro System

**Generation:**
- 15 Hydro Generating Stations

**Transmission:**
- 3 HVDC converter stations
- 18,500 km of transmission lines
- Bipole I & Bipole II
  - 1,800 km HVDC
Keeyask Overview

• Collaborative effort between Manitoba Hydro and 4 Manitoba First Nations working together as the Keeyask Hydropower Limited Partnership (KHLP).
  – Tataskweyak Cree Nation and War Lake First Nation (acting as the Cree Nation Partners);
  – York Factory First Nation; and
  – Fox Lake Cree Nation.

• The Partnership is governed by the Joint Keeyask Development Agreement (JKDA).
  – Long-term revenue opportunity for KCN communities
  – Training, employment and business opportunities during construction.
Respecting the Communities

- Incorporating the Cree world view into the project activities
- Face in the rock
- Community Liaison staff
- Involvement from partner communities
Project Governance Structure

Keeyask Hydropower Limited Partnership

- Keeyask Hydropower Limited Partnership
  - General Partner Board
    - Issues Coordination Committee (ICC)
      - Monitoring Advisory Committee (MAC)
      - Construction Advisory Committee (CAC)
      - Advisory Group on Employment (AGE)
      - Project Implementation Offices

President and CEO

Vice President, Generation & Wholesale

Major Projects Executive Committee

Keeyask Project Director

- Construction Manager
- Commercial Contracts Manager
- Engineering Manager
- Business Manager
Major Projects Executive Committee

- Established in early 2016.
- Oversees, directs, and make strategic decisions on Manitoba Hydro’s major capital projects.
- Membership includes:
  - The President & CEO
  - VP Transmission
  - VP Generation & Wholesale
  - VP HR & Corporate Services
  - VP Indigenous Relations
  - VP Finance & Strategy
- Meeting every 2 weeks (or as required)
Project Execution Team
What are we Building?

A 695-megawatt hydroelectric generating station

Keeyask Project includes:
- Powerhouse
- Spillway
- Dams & Dykes
- All supporting infrastructure (camp, roads, cofferdams)
- All required transmission facilities
Powerhouse Rendering
Powerhouse Size Comparison

Powerhouse is as tall as the 18th floor of Manitoba Hydro Place
Spillway Rendering
Spillway Size Comparison

Spillway is as tall as the 17th floor of Manitoba Hydro Place
River Management Structures
Typical Cross Section of a Dam
Dam and Dyke Construction
“Getting off the rock”
Keeyask Transmission

The Keeyask Transmission Project fulfills two purposes:

1) Provide power to the Keeyask site during construction of the GS;

2) Facilities required to integrate power generated by Keeyask (when online) into the Manitoba Hydro system.
Lessons learned

• Experience gained from past projects:
  – Early contractor involvement;
  – Contracting model;
  – Third-party reviews;
  – Continuous improvement and rigorous oversight;
  – Project integration;
  – Contract interfaces;
Complex Project Environment
Employment

• Employment milestone reached this summer on Keeyask.
  – 2 million person hours worked by KCN members
  – 4 million person hours worked by Indigenous employees

• 73% of total hires are Manitobans.
WHERE in the WORLD do KEEYASK Workers Come From?
Global Supply Chain

From Manitoba suppliers:
- Generator step-up transformers
- Trashracks

From the United States:
- Isolated phase bus
- Exciter

From across Canada:
- Intake gates and hoists
- Spillway gates, hoists, structural steel
- Maintenance gates/stoplogs
- Powerhouse cranes
- Intake and draft tube cranes
- Turbine components
- Governor

From Europe:
- Turbine and generator
- Generator circuit breakers

From Brazil:
- Turbine and generator
Keeyask Project Safety

- Strong safety culture
- Over 15 million person hours worked
- Better than industry standards
- GCC has gone over a year without a lost time incident
- MH and all our contractors will continue to focus on our goal of zero injuries
Delivery Strategy

- Contracting model for each scope of work.
- Considers market capacity
- Risk allocation
Types of Contracts

• Cost-reimbursable
• Target price
• Fixed price
• Unit price
**Major Contract Types**

<table>
<thead>
<tr>
<th>Contract</th>
<th>Contractor</th>
<th>Contract Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Civil Works</td>
<td>BBE Hydro Constructors</td>
<td>Target Price</td>
</tr>
<tr>
<td>Camp Operation Services*</td>
<td>Fox, York &amp; Sodexo JV</td>
<td>Cost Reimbursable</td>
</tr>
<tr>
<td>Main Camp</td>
<td>Britco</td>
<td>Fixed Price</td>
</tr>
<tr>
<td>Turbines &amp; Generators</td>
<td>Voith Hydro</td>
<td>Fixed Price</td>
</tr>
<tr>
<td>Engineering – Final Design</td>
<td>Hatch</td>
<td>Cost Reimbursable with Cap</td>
</tr>
<tr>
<td>Maintenance Services*</td>
<td>Maintenance Services JV</td>
<td>Cost Reimbursable</td>
</tr>
<tr>
<td>South Access Road*</td>
<td>Amisk Construction</td>
<td>Unit Price</td>
</tr>
<tr>
<td>Reservoir Clearing*</td>
<td>Amisk Construction</td>
<td>Unit Price</td>
</tr>
<tr>
<td>Spillway GGH</td>
<td>Canmec Industriel</td>
<td>Fixed Price</td>
</tr>
<tr>
<td>Intake GGH</td>
<td>Canmec Industriel</td>
<td>Fixed Price</td>
</tr>
<tr>
<td>Security Services*</td>
<td>Fox, York and Sodexo JV</td>
<td>Cost-reimbursable</td>
</tr>
</tbody>
</table>

* Directly Negotiated Contract (DNC) with KCN businesses
General Civil Contract

• General Civil Contract awarded to BBE in 2014.
• Largest contract on the project and includes:
  • Cofferdams,
  • Rock excavation,
  • Concrete structures,
  • Earthworks structures,
  • Electrical and mechanical work.
Keeyask GCC Tendered in ‘Hot’ Market

Keeyask GCC awarded

Cost per barrel of oil

Dollars per barrel

Dec-12 Dec-13 Dec-14 Dec-15 Dec-16 Dec-17
GCC Procurement

2000’s - 2014
Stage IV Design Engineering

2012
Market Sounding

2012
7 Respondents to RFPQ

2013
Issue RFPQ

2013
4 Proponents Pre-Qualified

2013
Proposals received, evaluate & negotiate

March 2014
Award of GCC to BBE

2011

2012

2013

2014

= Milestone
General Civil Contract

- Target price contract where the contractor is reimbursed for actual costs.
- Contractor has profit at risk.
- If the project cost is over the target the contractor loses a proportional amount of his profit margin and overhead.
- If the cost is under the target, the contractor shares a portion of the savings and gets his predetermined profit and overhead set out in the contract.
Construction Milestones Achieved

March 2014
Award of GCC to BBE

2012 – 2014
Infrastructure construction

2014 - 2015
Cofferdam construction

2016 - 2017
Permanent Earthworks and Concrete

2012 - 2014

July 12, 2014
Approval to Proceed (including NFAT recommendation)

2014

July 16, 2014
First rocks in the river

2015

First Permanent Earthworks

2016

May 2016
First Powerhouse Concrete

2017

= Milestone
Future Construction Milestones

**January 2018**
Start of T&G Installation

**July/August 2018**
Divert river through spillway

**December 2019**
Full Powerhouse Enclosure

**July 2020**
Impoundment

**Aug. 2021 - Aug. 2022**
Unit ISD’s (~2 months/unit)

**February 2017**
Control Budget = $8.7B
Unit 1 ISD = Aug. 2021

**2022 - 2023**
Infrastructure decommissioning & environmental rehabilitation.

= Milestone
General Arrangement

- Spillway
- Central Dam
- South Dam
- South Dyke
- North Dam and Dyke
- Powerhouse
- Outlet
  Transmission Line
  and Switching Station
Powerhouse Rendering
2016 Powerhouse Construction
2016 Powerhouse Construction
Powerhouse Complex
2017 Powerhouse Complex

July 2017
2017 Powerhouse Complex
Powerhouse – Current Status

December 15, 2017
Spillway Rendering
2016 Spillway Construction

July 2016
End of 2016 Spillway
2017 Spillway

August 2017
Spillway - Current Status

January 11, 2018
Construction Update Video

2 minutes, 30 seconds
Timeline of 2016 Challenges

- **March 2014**: Award of GCC to BBE
- **2014 - 2015**: Cofferdam construction and rock excavation
- **January 2016**: First Permanent Earthworks (North Dyke)
- **May 2016**: First Concrete
- **June 2016**: Concrete not meeting plan. Letter issued to BBE requiring immediate recovery strategy
- **July & August 2016**: Concrete still not meeting plan
- **Sept. 2016**: Formal Recovery Plan Initiated

= Milestone
2016 Recovery Plan

- A call to action for BBE’s project team, Executive Sponsors and CEOs.
- The development of a plan for the continuation of concrete through severe winter months.
- Identifying root causes of performance issues
- Initiating activities to reforecast the cost and schedule for the project.
- Undertaking analysis around Contractor’s claims.
- Supplementing the commercial expertise of the Manitoba Hydro team.
2016 Challenges

• In 2016 the GCC only achieved 41% of the concrete plan and 65% of the earthworks plan.

• Main contributing factors were:
  – Aggressive concrete production assumptions by Contractor
  – Slower than planned progress in ramp-up on site, and
  – Actual experience with geotechnical and geological conditions.

• Schedule rapidly changed from having a 6 month advancement opportunity to a potential 2+ year delay.
Recovery Plan Implementation
Commercial Options

• Manitoba Hydro undertook a thorough process to evaluate alternatives for and impacts to the General Civil Contract.

• The process included input from industry experts including:
  – KPMG – Recovery Plan support.
  – Revay – Claims valuation and management.
  – Borden Ladner Gervais LLP (BLG) – Legal support.
  – Validation Estimating – Contingency development.
Evaluation Outcome

• The review demonstrated that the best course of action was to amend the existing contract with BBE.
• All other alternatives introduced significant additional risks as well as guaranteed impacts to cost and schedule that were greater than the selected option of amending the contract with BBE.
Timeline of Recovery Plan

- Sept. 2016: Formal Recovery Plan Initiated
- Fall/Winter 2016:
  a) Improved Production
  b) Immediate Plan
  c) Long Term Plan
- Winter/Spring 2017: Recovery plan implementation

February 2017: Revised Control Budget and Schedule Approved

= Milestone
Column Extenders

Previous Design – No Column Extenders

New Design – With Column Extenders
Contract Amendment Achieved

- Manitoba Hydro and BBE were able to achieve mutual agreement that was required to amend the contract.
  - The negotiation required ‘gives and takes’ from both parties.
- Lowered the overall cost and schedule risk for Manitoba Hydro and allowed BBE an opportunity to re-establish a reasonable profit level.
- The terms of the agreement aligned the interests of both parties to deliver a “Best for Project” approach.
Features of the Amendment

• The details of the amendment to the contract are formalized in Amending Agreement #7 between Manitoba Hydro and BBE.

• Key features of the amendment include:
  – Contractor claims “wiped clean”;
  – Schedule and cost incentive pool provides incentive for BBE to earn profit and MH to minimize Project cost and schedule;
  – General Administration & Overhead (GA&O) capped at target price;
  – Narrowed ability for future claims;
  – Liquidated damages.
Establishing a New Control Budget

<table>
<thead>
<tr>
<th>Project in Service Cost (Billions $)</th>
<th>Original Control Budget</th>
<th>Third Party Recommended Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Estimate Including Spent, Costs to Go, Interest and Escalation</td>
<td>-</td>
<td>11</td>
</tr>
<tr>
<td>Delay (months)</td>
<td>-</td>
<td>11</td>
</tr>
<tr>
<td>First Unit In-Service</td>
<td>Nov-19</td>
<td>Oct-20</td>
</tr>
<tr>
<td>Total Base Estimate</td>
<td>6.2</td>
<td>7.8</td>
</tr>
<tr>
<td>Contingency</td>
<td></td>
<td>P50  P75  P90</td>
</tr>
<tr>
<td>Additional Delay (months)</td>
<td>-</td>
<td>10  14  18</td>
</tr>
<tr>
<td>First Unit In-Service</td>
<td>Nov-19</td>
<td>Aug-21  Dec-21  Apr-22</td>
</tr>
<tr>
<td>Estimated Contingency</td>
<td>0.307</td>
<td>0.578  0.914  1.246</td>
</tr>
<tr>
<td>Additional Interest &amp; Escalation on Contingency</td>
<td>-</td>
<td>0.339  0.464  0.588</td>
</tr>
<tr>
<td>Project Estimate (with Contingency)</td>
<td>6.5</td>
<td>8.7  9.1  9.6</td>
</tr>
</tbody>
</table>

Note: Interest and escalation are reasonable approximations; full financial-model calculations will be incorporated into control budget.
# Keeyask Budget Summary

(From PUB MFR 122)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Item</th>
<th>NFAT Approved Budget (2014$) CPJA #4</th>
<th>Current Approved Budget (2016$) CPJA #4</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Generating Station</td>
<td>4.046</td>
<td>5.948</td>
<td>1.902</td>
</tr>
<tr>
<td>1.2</td>
<td>Generation Outlet Transmission (GOT)</td>
<td>0.164</td>
<td>0.202</td>
<td>0.038</td>
</tr>
<tr>
<td>1.3</td>
<td>Escalation @ CPI</td>
<td>0.244</td>
<td>0.249</td>
<td>0.005</td>
</tr>
<tr>
<td>1.4</td>
<td>Interest (including Interest on Equity)</td>
<td>1.343</td>
<td>1.749</td>
<td>0.406</td>
</tr>
<tr>
<td>1.5</td>
<td>Contingency</td>
<td>0.307</td>
<td>0.578</td>
<td>0.271</td>
</tr>
<tr>
<td>1.6</td>
<td>Labour Management Reserve</td>
<td>0.304</td>
<td>0.000</td>
<td>-0.304</td>
</tr>
<tr>
<td>1.7</td>
<td>Escalation Management Reserve</td>
<td>0.088</td>
<td>0.000</td>
<td>-0.088</td>
</tr>
<tr>
<td>1.8</td>
<td>Total</td>
<td>6.496 B</td>
<td>8.726</td>
<td>2.230</td>
</tr>
<tr>
<td>1.9</td>
<td>First in-service Date</td>
<td>Nov-2019</td>
<td>Aug-2021</td>
<td>21 months.</td>
</tr>
</tbody>
</table>
2017 Performance

<table>
<thead>
<tr>
<th></th>
<th>2017 Actual Quantities (m³ rounded)</th>
<th>% Improvement over 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>86,000</td>
<td>~12%</td>
</tr>
<tr>
<td>Earthworks</td>
<td>1,030,000</td>
<td>~90%</td>
</tr>
</tbody>
</table>

- There was a significant improvement in performance over 2016 which occurred in both concrete and earthworks.
- Actual quantities were less than planned.
- However, key milestones were achieved in 2017 which maintain the schedule for the shortest duration.
## 2017 Key Milestones

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Date</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion of the Spillway concrete and handoff of the Spillway to the</td>
<td>November 2017</td>
<td>Completed on schedule</td>
</tr>
<tr>
<td>Gates, Guides and Hoists Contractor (Canmec).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation of the Powerhouse Cranes in the Service Bay.</td>
<td>November 2017</td>
<td>Completed on Schedule</td>
</tr>
<tr>
<td>Enclosure of Powerhouse Units 1 and Service Bay</td>
<td>December 2017</td>
<td>Completed on Schedule</td>
</tr>
<tr>
<td>Enclosure of Powerhouse Units to allow for the start of turbine and</td>
<td>February 2018</td>
<td>On track</td>
</tr>
<tr>
<td>generator work.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significant progress on dams and dykes required to divert the river through</td>
<td>July/August 2018</td>
<td>On track for river diversion</td>
</tr>
<tr>
<td>the Spillway in July/August 2018.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Milestone - Spillway Concrete Complete

October 2017
Milestone - Powerhouse Crane Installation Complete

November 2017
Milestone - Enclosure of Service Bay and Unit 1

December 15, 2017
Milestone - Earthworks on Track for River Diversion in Summer 2018
2018 Plan

Improved performance by the GCC is required to meet control budget ($8.7B) and a first unit ISD 10 months in advance of control schedule.

Main contributing factors will include:

• 2018 winter concrete and south dyke work;
• Continuing to learn from past experiences;
• Earthwork foundation preparation is now complete for 2018 work;
• Cold eyes review; and
• MH and BBE leads continuing to drive improvement;
2018 Key Risks

• With 4+ years of construction ahead there are still significant risks that have the potential to jeopardize meeting the control budget and schedule.
  – This risk is typical for projects of this scale and complexity.

• The top risks include:
  – Execution/productivity rates of the GCC;
  – Loss of site access/work stoppages;
  – Unexpected geotechnical/geological conditions at the South Dam/Dyke;
  – Unseasonable weather
Current Forecast at Completion

• Manitoba Hydro is currently forecasting the following cost and schedule outcomes for the Keeyask Project:
  – Cost - A final project cost on or below the control budget of $8.7 B.
  – Schedule – A first unit in-service date in advance of the control schedule of August 2021.
    • All seven units are forecasted to be within control schedule dates.
Key Messages

• Manitoba Hydro is capable of successfully delivering the Keeyask Project and has effective governance.
  – Manitoba Hydro will continue to leverage third party expertise as required.
• Amending the contract with BBE was the best path forward with least impact to cost and schedule.
• The necessary milestones were achieved in 2017 to maintain the shortest duration schedule.
• Plans continue to be developed to cause a 10% improvement going forward to achieve our control budget.
Summary

• Hydro has a number of capital projects underway at varying levels of completion
• We are managing the risks
• We are incorporating lessons learned across the projects as we move forward
• There is a strong team in place supported by external expertise
• MH is open and transparent, gave MGF access and answered any question they had
• We want the Panel, intervenors and public to know where we are, what challenges we face, and how we address them
Bipole III Transmission Reliability Project

Overview

Manitoba Hydro
Presentation Outline

- What is HVDC
- Existing HVDC system
- Bipole III overview
- Bipole III status update
- Remaining risks
- Video
Why HVDC?

“Bulk” transmission

AC

DC
Why HVDC?
The Existing Bipole I and II System

- Link to 70% of the Province’s generating capacity
- Bipole I and II HVDC lines constructed on the **same Right-of-way (same corridor)**
- 900km overhead lines, difficult terrain and access in the north
- Terminated at **a common station** – Dorsey (inverter)
Reliability Risk – Dorsey Converter Station

- Dorsey is currently single terminus point for HVDC system
- Significant weather events (tornados, etc.) in the vicinity of Dorsey in the past
- A loss at Dorsey could mean loss of connection to northern generation for up to 3 years.

Elie F5 tornado
Approximately 40 km from Dorsey
Supply Deficit

- Supply deficit of approx. 700MW for Bipole I/II line loss in winter of 2020 vs. 1,300MW surplus with Bipole III.

- Rotating blackouts for about 140,000 homes (5kW per household), even with new 500kV import line
Maximum Percentage Power through a Single Facility

- Manitoba has highest percentage of power concentrated in a single facility for a major network in the world.
- “Too many eggs in one basket”

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**Bar Chart**

- **Manitoba Hydro**
- **China**
- **Brazil**
- **Hydro Quebec**

- **Y-axis:** Facility
- **X-axis:** Percentage of Power
- **Legend:**
  - With Bipole III
  - Current HVDC System
Bipole III Overview

- **Increase reliability**
  - Second corridor for northern generation
  - Supply deficit of 700MW with loss of Bipole 1 & 2 (~140,000 homes)
  - Additional conversion facility

- **Increased capacity**
  - Increase of 2,000MW
  - Keeyask or associated power sale requires the transmission capacity of Bipole III

1997 wind events near Dorsey
Bipole III Overview

- 230kV Collector Lines (5) to connect existing system to new Keewatinohk Converter station
- 2 HVDC Converter Stations
  - Keewatinohk Converter Station - 80 Km North East of Gillam Manitoba
  - Riel Converter Station – just East of Winnipeg
- 500kV HVDC Transmission Line (1384 km)
- Keewatinohk 600 person Construction Camp
- Tie into the southern transmission system
Converter Station
Transmission Line

Bipole III-500kV HVDC
• 500kV HVDC Transmission line
• 3,076 towers starting from Keewatinohk to Riel
• 1,388km length (actual constructed length)

Collector Lines-230kV AC
• Five AC collector lines to transfer all AC power from the Henday and Long Spruce stations to Keewatinohk
• Total length of 165km and 384 towers.
Riel Converter Station
Bipole III Transmission Line
SCOPE HISTORY OF BIPOLLE III

Post Licence Control Budget

*In Service Date July 2018

2014
$4,652*

- Complete project re-estimate
- Based on updated line routing and environmental act Licence requirements
- Updated land acquisition costs

- LCC HVDC technology based on vendor pricing
- Includes Synchronous Condensers
- Includes costs for the Community Development Initiative (CDI)
SCOPE HISTORY OF BIPOLE III

Control Budget

*In Service Date July 2018

$5,042

2016

2014  2015  2016  2017  2018

• Actual transmission line construction unit rates (market rates)
• Updated transmission line material costs
• Southern route change

• Actual land acquisition
• Increase contingency
Bipole III Status

• Converter station construction is 91% complete
• Transmission line construction is 84% complete
• Budget is 79% spent and is on target

In Service Date July 2018

• 6 months of work left to test and energize thousands of components
  • The remaining risks are more an impact to schedule, not budget
Keewatinohk CS Current Status

• HVDC equipment has been installed at site
• AC Switchyard construction is complete and energization is well underway
• Construction on Auxiliary Buildings is complete
Riel CS Current Status

- HVDC equipment has been installed at site
- AC Switchyard expansion is complete and has been commissioned
- Three Synchronous Condenser units are onsite and under installation. One Synchronous Condenser unit remains to arrive at Riel
Transmission Line Current Status

- Tower anchor and foundation installation is at 99%
- Tower erection is at 84%
- Stringing is at 45%
- Transmission line construction will be complete March 2018

As of January 1, 2018
Commissioning Sequence

January 2018

February/March 2018

March 2018
Bipole III Commissioning

• Quality assurance to ensure manufacturing of equipment meets technical specifications prior to being placed in-service

• Equipment is tested in the factory to ensure technical compliance prior to being shipped to site

• Subsystems are verified on-site prior to being connected to the Manitoba Hydro network

• Energized system testing is conducted to integrate the Bipole III HVDC system to the existing network
Integrating Bipole III into the Existing System

- Integrating a state of the art digitally controlled Bipole into a system that was designed in the 60s and 70s

- Simulated the operation of Bipole III at the factory level with over 2000 tests

- Equipment and sub systems tests - over 500 equipment tests and 450 subsystem tests

- System testing – approximately 250 tests

- Trial operation – 30 days
Remaining Schedule Risks

• Transmission Line
  – Contractor performance
  – Weather
• Converter Stations
  – Synchronous condenser transformer delay
• Commissioning
  – 6 months of work remain to test and energize thousands of components
Bipole III Video – 3 minutes
Conclusion

• Construction is on schedule to be in service July 2018
• Budget is tracking to the control budget of $5.04 Billion
• Will be an asset in operation for the upcoming fiscal year
• Capital costs will begin depreciation this year
Great Northern Transmission Line Project

David Cormie, Director
Wholesale Power and Operations
500 kV Manitoba – U.S. Interconnection

• MH Development Plan
  – Keeyask
  – New major interconnection
  – Export sales
    • Minnesota Power
    • Wisconsin Public Service
    • Northern States Power
    • SaskPower (subsequent)

• In Manitoba
  – Minnesota Transmission Project (MMTP)

• In Minnesota
  – Great Northern Transmission Line (GNTL)

• Capital cost is approximately $1 billion
U.S. Interconnection Objectives

- **Import**
  - Increase import capability by 100% or 700 MW
  - Improve energy security, emergency response and system reliability
  - Reduce import costs
  - Improve market prices

- **Export**
  - Increase export capability by 50% or 900 MW
  - Increase export market prices
  - Improve bi-lateral market access with Wisconsin utilities by 600%
MH pays 72% of the construction costs

<table>
<thead>
<tr>
<th>Construction Costs</th>
<th>MH Responsible</th>
<th>MP Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMTP</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>GNTL (54% upfront + 17.7% MTF)</td>
<td>71.7%</td>
<td>28.3%</td>
</tr>
<tr>
<td>Property Taxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMTP</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>GNTL (49% ownership + 17.7% MTF)</td>
<td>66.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Capital Taxes to MB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMTP</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>GNTL</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Operating Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMTP</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>GNTL (49% ownership + 17.7% MTF)</td>
<td>66.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Sustaining Capital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMTP</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>GNTL</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note 1. MTF is the Monthly Must Take Fee established in Section 2.6 133 MW Energy Sale Agreement for MH use of 133 MW of MP capacity. Ownership costs on 500 MW of capacity are established through a Service Fee defined in Article 6 of the Operation and Maintenance Agreement.
6690271’s Role is to Protect Manitoba Hydro

• Responsible for MH’s interests in the Great Northern Transmission Line

• GNRL Facilities Construction Agreement (FCA)
  • Between 6690271, Minnesota Power and MISO

• GNRL Construction Management Agreement (CMA)
  • Between 6690271 and Minnesota Power
  • Appoints Minnesota Power as Construction Manager
  • Establishes governance structure for the construction project
  • 669 has consultation and veto rights
  • Provides for an independent oversight engineer
GNTL Schedule and Budget

- GNTL is on schedule for June 1, 2020
- GNTL is on budget
  - 10% spent to December 1, 2017
- MH expects GNTL to be under budget
Manitoba – Saskatchewan

230 kV Transmission Project

David Cormie, Director
Wholesale Power and Operations
Saskatchewan System Power Sale Agreement

• 100 MW of capacity and firm energy
• Term is June 1, 2020 to May 31, 2040

• Existing firm export transfer capability is insufficient
• Studies indicate the need for another line
  – If project is delayed use of interim firm service, to the extent it is available, will be used
• “Both power contract and transmission line project remain economic¹”

Note 1. Daymark Energy Advisors Independent Expert Consultant Report
Birtle Transmission Project

- 230kV AC transmission line
  - Length 46 km
  - Birtle Station to Saskatchewan Border
  - ISD June 2021
  - Class 2 Regulatory Approval

- 2015 Approved Budget $57M
Major Capital Projects Summary

• Keeyask G.S.
  – On budget and schedule for ISD of August 2021
  – Several opportunities to reset for rate setting purposes if necessary

• BiPole III
  – On schedule and budget for ISD July 2018
  – Will impact 2018/19 financial results

• MMTP
  – On budget
  – Projected ISD June 2020

• GNTL
  – Budget is likely high but it is early
  – On schedule for ISD June 2020

• Birtle Transmission
  – Budget is under review
  – On schedule for ISD June 2021
Manitoba Minnesota Transmission Project (MMTP)
Project Overview

• MMTP Control Budget: $453 M
• Projected In Service Date of June 2020
Project Overview

- MMTP Components
MMTP – Transmission Line Overview

Proposed New Right of Way – 121km

Existing Corridor – 92km

Self Supporting Tower

Self Supporting Tower

Guyed Tower

50% Self Supporting Tower

100% Self Supporting Tower

50% Guyed Tower
Project Execution Plan

• Internal Resources:
  ✓ Project Management
  ✓ Design
  ✓ Construction Management

• External Contracts:
  ✓ Material Supply
  ✓ Transmission line Construction
  ✓ Majority of station construction
Budget Changes

2013
$350 M

2016
$453 M

Scope Finalization Items
- Increase in self supporting towers due to route selection
- Adding a 2nd Phase Shifting Transformer at Glenboro
- Biosecurity and Environmental Monitoring

Market Conditions Pricing
- Transmission Line Construction

Contingency
Lessons Learned

- Routing Methodologies
- Indigenous Engagement
- Biosecurity
- Contracting Models
- Construction Methods
Project Progress

2012-2015: Environmental Assessment and Public Engagement
2013: Order In Council issued by the Province
2014: NFAT Recommendation to Proceed
2015: Environmental Impact Statement Filed
2016: Application filed with National Energy Board
2017: Clean Environment Commission Hearing & Review
Project Progress

2016/2017
Detailed Design/Material Procurement Underway * 10% of Budget Spent

2017
Property Acquisition Underway

2018
National Energy Board Hearing & Review

Spring 2018
Anticipated Provincial License Decision

2018/2019
Estimated Construction Start Pending Regulatory Decisions

2020
Projected In Service Date
Thank You