Bipole III
A Major Reliability Improvement Project

Preferred Ground Electrode Site
Purpose

- To provide an opportunity for stakeholders to review and comment on the Preferred Southern Ground Electrode Site.
- To discuss mitigation measures to minimize or avoid potential project effects on people and the environment.

Public Participation Goals

- To obtain public feedback on the Preferred Ground Electrode Site and the overall project.
- To work directly with the public throughout the process to ensure that concerns are understood and considered.

Manitoba Hydro Commitment

- We will keep the public informed, listen to and acknowledge concerns raised.
- We will provide feedback on how public input has been considered in the planning and decision-making process.
Why is Bipole III Needed?

- Currently 75% of Manitoba’s power is transmitted from northern generating stations to southern Manitoba via two lines, called Bipole I and Bipole II, terminating at Dorsey Converter Station just northwest of Winnipeg.

- Bipoles I and II share the same corridor and together with Dorsey Converter Station are at risk of being damaged by a single event, such as a forest fire, wind events, ice storms or sabotage. These events present a major threat to the reliability of Manitoba Hydro’s power supply system.

- Bipole III will reduce the risk of major outages, improve reliability, and provide additional transmission capacity.
Bipole III will be routed through western Manitoba, separated from the existing Bipoles I and II to reduce the risk of simultaneous power outages.

The length of the Preliminary Preferred Route is approximately 1364 km.

Project components include:

- A 500 kV DC transmission line
- Keewatinoo Converter Station
- Southern converter station at Riel site
- Ground electrode facility and associated electrode lines for each converter station
- 230 kV AC collector transmission lines
- 138 kV AC construction transmission line
Southern Project Components

Bipole III - A Major Reliability Improvement Project

KEY PLAN

Bipoles I & II HVdc Lines

Dorsey Converter Station

Rosser Station

Ridgeway Station

La Verendrye Station

D602F

North Corridor Existing Developed Right-of-Way

South Corridor Existing Developed Right-of-Way

City of Winnipeg

St. Vital Station

Riel Site

La Verendrye Station

Existing AC

Existing DC

Proposed

Ground Electrode (Conceptual)

Vivian Corridor Existing Developed Right-of-Way

Bipole III Preliminary Preferred Route

Manitoba Hydro
• The Bipole III project will require a Class 3 Licence under *The Environment Act* (Manitoba).

• An Environmental Impact Statement (EIS) will be submitted in June 2011 to Manitoba Conservation.

• Manitoba Conservation will lead a coordinated Provincial/Federal Environmental Assessment (EA).

• Approvals are required by mid 2012 for a project in-service date of 2017.

**Bipole III Project Timeline**

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Ground Electrode

- Required for both northern and southern converter stations
- The ground electrode will provide grounding for the Bipole III HVdc System
- Preferred site for northern and southern electrodes selected

Aerial photo of ground electrode at Dorsey Converter Station


Conceptual Diagram of the Ground Electrode

Bipole III - A Major Reliability Improvement Project
**Ground Electrode Construction**

- Metal rod or pipe shallow-buried below the frost line
- Surrounded by highly conductive coke material
- Used for system balancing and infrequent mono-polar operation
- Connected to converter stations by low voltage line
- Must be located away from the converter station
- Site Area - approximately one section (1 square mile)
- The overall size of the conceptual electrode is approximately 300-800 m in diameter
A portion of the Bipole III study area, east of the City of Winnipeg, was assessed for a suitable location for the southern ground electrode.

The following site investigations (testing) are required for the ground electrode site:

- Drill tests and collecting soil samples;
- Installation of monitoring wells; and
- Ground resistivity measurements.
**Phase 1**
Candidate Site Search and Selection
- 11 candidate sites selected

**Phase 2**
Measurement Program
- 7 sites did not meet feasibility criteria
- 4 sites remained for further evaluation

**Phase 3**
Studies and Evaluation of Electrode Candidate Sites
- 4 sites studied and evaluated

**Phase 4**
Detailed Design and Public Consultation
- Preferred site selected
- Further studies initiated

We Are Here
Criteria for Selection

- Topography
- Ground resistivity
- Water supply
- Ground potential rise
- Soil moisture
- Thermal conductivity of the soil
- Heat capacity of the soil
- Land use
- Step potential (safety)
- Proximity to existing infrastructure (pipelines, rail lines, transformers, transmission lines, etc.)
- Proximity to the Riel Converter Station
- Construction costs
Ground Electrode Site Characteristics

- Site 21-11-06 E1 preferred ground electrode location
- Relatively flat site
- Lowest ground resistivity of all sites evaluated
- Wet ground condition
- Groundwater availability
- Promising thermal conductivity and heat capacity of soils
- Low step potential, safe for humans and animals
- Farmland with limited development
- Shortest electrode line of all site evaluated
- Lowest anticipated construction costs
- Located in rural area with separation from pipelines, transformers, transmissions lines, rail lines, etc.
An electrode line will connect the Riel Converter Station with the ground electrode.

The line is required to compensate for small differences in the current flow on Bipole III.

The line will carry current ranging from approximately 110 amperes during normal operation to a maximum of 2,200 amperes during emergency operation.

Electric and magnetic field levels from the line will be far below recommended thresholds to protect human health and safety.

Routing considerations will include use of existing rights-of-way (transmission lines, drainage ditches or roads), avoiding residences and farm structures, and avoiding existing infrastructure.
• Normal Operation, referred to as bipolar operation (approx. 92% of the time) - Used for grounding unbalanced current between the two Bipole lines

• Maintenance and Emergency Operation, referred to as monopolar operation (approx. 8% of the time) - The electrode also acts as a ground return system that can be used during system outages for a continuous 60 day interval

• Ground temperature can rise during monopolar operations

• Irrigation may be required to maintain soil moisture

• Access to site required for ground electrode maintenance
DC current from the ground electrode may cause electrical potential shift along certain infrastructure or exceed allowable current flow. To mitigate these effects, upgrades may be required on some infrastructure:

- **Pipelines**: Increased cathodic protection may be necessary on pipelines.

- **Railway Signals**: Upgrades may be required on older railway signaling relays.

- **Transmission Lines**: Installation of additional insulators may be required on transmission lines.

- **Distribution Transformers**: Upgrades may be required on transformer grounding systems.
Health and Safety

- DC electric and magnetic fields far below recommended standards.
- No safety risk to people, pets and livestock.
- All safety guidelines will be met.
- No fencing is required for the site.
- Dorsey Station’s ground electrode near Argyle has been in service for nearly 40 years.
Ground Electrode Next Steps

- Present the ground electrode preferred site to the public and other stakeholders and record and consider their input

- Conduct additional site studies and tests to confirm preliminary results, including detailed surface resistivity, subsurface geology and well water production rates

- Determine precise ground electrode design and footprint
Bipole III Project
Next Steps

- Complete Environmental Impact Statement and submit to Regulators (June 2011)
- Regulatory Review and Public Hearings (2011-2012)
- Environmental Approvals (June 2012)
- Construction begins (Fall 2012)
- In-Service date scheduled for 2017
Thank You

To help us record your comments and concerns please fill out a comment sheet before you leave.

Thank you for your interest and participation in this project.

For more information please contact us toll-free at the Bipole III Project Information Line 1-877-343-1631 or in Winnipeg at 360-7888.

For project information and to view the Preliminary Preferred Route please visit the project website: www.hydro.mb.ca/bipole3