2.0 Project Licensing, Facilities, and Operations: How It All Works

LWR is an extensive engineered system of channels and structures that allows about 50% more water to flow out of the lake than would otherwise flow out naturally. This increased outflow capacity helps reduce flooding around Lake Winnipeg and helps optimize power generation along the Nelson River.

This section of the report presents a description of the licensing process and a discussion of terms of the Interim Licence. The section then describes the roles of all major physical elements of the LWR system, and how the system operates over the course of a year. The section concludes with a review of Manitoba Hydro’s record of compliance with licence conditions.

2.1 Water Power Act Licence

In Manitoba, all projects that use water to produce power are subject to the Manitoba Water Power Act and its Regulations.

The Water Power Regulations entitle the licensee to a Final Licence upon implementation and compliance with the Interim Licence. Manitoba Hydro continues to operate LWR under an Interim Water Power Act Licence (as shown in Appendix 1) while the Province reviews the request for a Final Licence.

2.1.1 Types of Licences

A new development is initially authorized under an Interim Licence which allows a proponent to build the project and, after a period of operation, confirm that the existing licence terms are suitable. If the Minister of Conservation and Water Stewardship is satisfied that the licensee has met the terms and conditions of the Interim Licence, a Final Licence is issued. This is not a permanent licence, nor is it automatically renewed. The maximum length of term that can be granted is 50 years. When that term comes to an end, the licensee requests a Renewal Licence. If granted, this licence will also have a fixed term. The Water Power Act licensing process is shown in Figure 4.

Interim Licence (authorization to build, test, and fulfill obligations)

Final Licence (authorization to operate for a maximum of 50 years)

Renewal Licence (authorization to operate for a maximum of 50 years)

Figure 4. Water Power Act licensing process.
The LWR Water Power Act timeline, as shown in Figure 5, provides a summary of the key dates in the Water Power Act licence process.

**Figure 5: LWR Water Power Act timeline.**

### 2.1.2 Terms

The LWR Interim Water Power Act Licence provides the following operating conditions, shown in summary form.

- **Operating Ranges**: Manitoba Hydro may regulate water levels to and between the following elevations in feet above sea level (with wind effect eliminated):
  - Lake Winnipeg – maximum 715.0 and minimum 711.0 (this is the range in which Manitoba Hydro regulates outflows in a manner that meets the utility’s power generation needs)
  - Playgreen Lake – maximum 714.9 and minimum 707.0
  - Kiskittogisu Lake – maximum 714.8 and minimum 706.0
  - Kiskitto Lake – natural range
  - The licensee is to maximize the use of water for power production.

- **Maximum Discharge**: When the level of Lake Winnipeg exceeds 715.0 feet above sea level, maximum flow must be discharged at Jenpeg until the level is restored to 715.0 feet.

- **Minimum Outflow**: The combined flow from all the natural and artificial channels from Lake Winnipeg must be not less than 25,000 cfs (cubic feet per second, a measurement of water flow).

- **Low Level Support**: When the level of Lake Winnipeg falls below 711.0 feet above sea level, the Minister of Conservation and Water Stewardship determines how outflows should be managed.

- **Outflow Rate of Change**: The maximum rate of flow change at Jenpeg in a 24-hour period is 15,000 cfs.
2.1.3 Why A Regulation Range of 711–715 Feet?

Initially, Manitoba studied and considered a variety of Lake Winnipeg water level regulation ranges. The studies considered the interests of agriculture, recreation, power, navigation, wildlife, and the fishery. In the end, the Interim Water Power Act Licence issued by the Manitoba government set the range as 711–715 feet. This is within Lake Winnipeg’s natural historical range of 709.3–718.2 feet, reduces flooding around Lake Winnipeg, and is adequate for Manitoba’s power generation needs.

A 1972 provincial report, Program for Regulation of Lake Winnipeg, reaffirmed the 711–715 foot range of the LWR Interim Licence after citing the Crippen Report (1970), and the Manitoba Hydro Task Force Report (1970). The 711–715 foot range was adequate for Manitoba Hydro’s needs, would reduce Lake Winnipeg water levels in high inflow years by about two feet, and would reduce the risk of shoreline flooding. The report anticipated that because of LWR, the annual median level of the lake would increase by a few inches, while the minimum levels would be a foot higher than they would be without LWR.

One of the key considerations in choosing a water range was the varying Lake Winnipeg outflow capability as the water level changes. The higher the water level, the more water can pass downstream, while the lower the water level, the less water can pass downstream. A range that is too low will restrict the flow capacity and compromise power generation. This is an important factor to consider in deciding whether the project is economically viable and provides the required level of reliability.

The continued full authority of Manitoba Hydro to regulate outflows in the Lake Winnipeg water level range established by the licence is essential for the reliable and economic operation of Manitoba’s power system.

2.2 Scope

2.2.1 Regions of Interest

In determining the regions of interest for this report Manitoba Hydro considered several factors:
- The physical structures that comprise the LWR project are located between the outlet of Lake Winnipeg and Jenpeg.
- LWR influences the Nelson River water regime from Lake Winnipeg to Hudson Bay.
- Downstream of Gull Rapids, the operation of Kettle Generating Station is the primary influence on the water regime.
- Lake Winnipeg stakeholders continue to have a variety of concerns about LWR.

As a result, Section 3 of this report describes the effects between the outlet of Lake Winnipeg and Gull Rapids which in this document is referred to as the Downstream Area. Section 4 discusses public concerns specifically related to Lake Winnipeg. These areas are shown on Map 3.

Separate from this document, Manitoba Hydro is working with the Province of Manitoba to develop a Regional Cumulative Effects Assessment (RCEA) that describes the impacts of previous hydropower developments including LWR, CRD, and other projects.
Map 3: Regions of interest.
2.2.2 Physical Structures

The key structures associated with LWR are located between Lake Winnipeg and Jenpeg. Certain components are required for the proper and efficient operation of LWR, and other components are required to limit the forebay flooding. These structures are listed as follows with descriptions further below:

Operational components:

- Two-Mile Channel
- Eight-Mile Channel
- Ominawin Bypass Channel
- Kisipachewuk Channel Improvement
- Jenpeg

Other important components:

- Kiskitto Lake Inlet Control Structure, Main Dam, and Dykes
- Black Duck Control Structure and Diversion Channel
- Stan Creek Diversion (not shown)

The location of each of the major operational components is shown on Map 4.
A summary of some of the key features of channels constructed to improve the flow out of Lake Winnipeg are presented in Table 3.

<table>
<thead>
<tr>
<th>Component</th>
<th>Construction Period</th>
<th>Approximate Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Length</td>
</tr>
<tr>
<td>Two-Mile Channel</td>
<td>1973–1976</td>
<td>2 miles (3.1 km)</td>
</tr>
<tr>
<td>Eight-Mile Channel</td>
<td>1971–1976</td>
<td>8 miles (12.9 km)</td>
</tr>
<tr>
<td>Ominawin Bypass Channel</td>
<td>1972–1975</td>
<td>2.1 miles (3.4 km)</td>
</tr>
</tbody>
</table>

Table 3: Lake Winnipeg Regulation channel summary information.

The operational components of the LWR project are the Two-Mile Channel, Eight-Mile Channel, Ominawin Bypass Channel, Kisipachewuk Channel Improvement, and Jenpeg.

**Two-Mile Channel**

Two-Mile Channel connects Lake Winnipeg and Playgreen Lake as a second outlet for Lake Winnipeg. The channel is about two miles (3.2 km) long, 600–700 feet (183–213 m) wide, and about 30 feet (9 m) deep. The natural outlet is located east at Warren Landing. This outlet has a few major islands with one wider channel, and then transitions to one channel with numerous vegetated shallows, rock outcrops, and smaller islands. These features impede the flow of water during the open water season with even more significant flow constrictions in winter as ice grows.

**Eight-Mile Channel**

Eight-Mile Channel provides a direct flow of water from Playgreen Lake to Kiskittogisu Lake, which allows water to flow more directly to the Nelson River. It ranges in width from about 700 to 1,200 feet (213–366 m) and is about 20 feet (6 m) deep. Without this channel, water could only flow downstream through a relatively narrow part of Playgreen Lake and then through an even narrower portion at the north end of the lake called Whiskey Jack Narrows.
Ominawin Bypass Channel
The Ominawin Bypass Channel is located at the north end of the Kiskittogisu Lake and allows water flow to bypass the natural restrictions of the Ominawin Channel. The channel has a centre division (a rockfill groin) designed to reduce ice thickness. The Ominawin Bypass Channel is about 1,400 feet (427 m) wide, about 20 feet (6 m) deep, and about 2.1 miles (3.4 km) long.

Figure 8: Ominawin Bypass Channel.

Kisipachewuk Channel Improvement
The Kisipachewuk Channel Improvement was constructed to increase water flows through this outlet channel from Kiskittogisu Lake into the Nelson River. The channel improvement is an excavation of the river bed over a length of about 260 feet (80 m) and width of 200 feet (60 m).

Figure 9: Kisipachewuk Channel Improvement.

Jenpeg
Jenpeg is located about 62 miles (100 km) north of Lake Winnipeg, on the upper portion of the Nelson River. Jenpeg controls most of the flow of water out of Lake Winnipeg for flood protection on Lake Winnipeg and power generation along the Nelson River. Although originally envisioned to be a control structure only, a decision was made to add a generating station at Jenpeg. A separate Water Power Act licence was issued for the generating station. Manitoba Hydro has also requested a Final Licence for the Jenpeg Generating Station.

Figure 10: Jenpeg generates electricity and has a capacity of around 125 MW.
Jenpeg was the first generating station in North America to use bulb-type turbine generators, as shown in Figure 11. This design reduces the depth of excavation required into the underlying bedrock.

The main dam extends across the west channel of the Nelson River, diverting water to Jenpeg’s 125 MW powerhouse, and a spillway where surplus water can flow. The main dam is approximately 1,075 feet (289 m) long with a maximum height of 84 feet (24 m) above the river’s bottom.

Figure 11: Jenpeg Generating Station and Control Structure.

Other Important Components
Other important components of LWR are the Kiskitto Lake Inlet Control Structure, main dam, and dykes, the Black Duck Control Structure and Diversion Channel, and the Stan Creek Diversion Channel. A description of these is provided below.

Kiskitto Lake Inlet Control Structure, Main Dam, and Dykes.
The Kiskitto Inlet Control Structure regulates inflow to Kiskitto Lake so that Kiskitto Lake water levels can be maintained within their natural range. The impoundment of water from the construction of Jenpeg required prevention of the free flow of water from entering and flooding Kiskitto Lake. While a dam and dyke prevent this, some inflow is required to control the water level. The flows through the culvert are regulated using a vertical lift gate. The original gated steel culvert was replaced in 2003/04 with a concrete box culvert.

Figure 12: Kiskitto Lake Inlet Control Structure.

The Kiskitto Main Dam is about 2,000 feet (600 m) in length, with a maximum height of 49 feet (15 m) from its base. There are also 16 separate dykes with a total length of 8.75 miles (14 km). These dykes protect Kiskitto Lake and the surrounding area from the higher water levels of the Nelson River’s west channel.
The Black Duck Control Structure and Diversion Channel
The Black Duck Control Structure, as shown in Figure 13, regulates the amount of water diverted from Kiskitto Lake into the Minago River via Black Duck Creek. The control structure is made of concrete with wooden stoplogs used to regulate flow. The purpose of the structure along with the Kiskitto Lake Inlet Control Structure is to regulate the water level of Kiskitto Lake within its natural range.

Figure 13: Black Duck Control Structure.

The Kiskitto-Minago Drainage Channel, sometimes called the Black Duck Diversion channel, diverts water from Kiskitto Lake to the Black Duck Control Structure. The channel is about 10 feet (3 m) wide at its base. Its length is about 2 miles (3.3 km) between Kiskitto Lake and the control structure, and about 0.9 miles (1.5 km) from there to Black Duck Creek.

The Stan Creek Diversion Channel
The Stan Creek Diversion routes local natural drainage into Kiskitto Lake that was blocked from flowing into the Nelson River by the construction of dykes. The channel is approximately 10 feet (3 m) wide at its base, is on average 9 feet (2.7 m) deep, and is about 5,000 feet (1,500 m) in length.

2.3 Project Operation

2.3.1 System Operations
Operating a power system involves developing a plan, or series of planned operating decisions, to ensure that supply (electrical generation) and demand (electrical load) will be in balance over the entire operating horizon – whether that’s the next hour or many months into the future. If economics were the only priority, then an optimal plan would simply achieve this supply and demand balance while maximizing net revenues. However, the actual challenge is more complex because additional priorities must be considered, and these priorities often compete with each other.

Figure 14 illustrates the balance concept in power system operations planning.
Figure 15 illustrates the basic elements of the Manitoba Hydro system and helps explain the parameters of operations planning and the processes and complexities faced by operations planners.

1. Precipitation  
2. Runoff and regulated inflows  
3. Upstream stakeholders and environment  
4. Reservoir operating limits  
5. Reservoir level  
6. Hydroelectric generation and powerhouse flow  
7. Spill flow  
8. Station outflow (combined powerhouse and spill flow)  
9. Downstream stakeholders and environment  
10. Hydroelectricity provided to grid (one direction)  
11. Electricity delivered to load (one direction)  
12. Domestic load obligation  
13. Export or import over interconnecting transmission  
14. Wholesale electricity market (generation and load)

Figure 15: Basic elements of a simplified integrated hydroelectric system.

With the vast amount of information that needs to be considered in operations planning, manual calculations are insufficient to capture all of the possible trade-offs. To assist decision-making, Manitoba Hydro uses a suite of computer models referred to as a Decision Support System. This system has models for forecasting important information including inflows, ice conditions, market prices, and load. Other forecasts, including plant maintenance schedules, are also provided as inputs. A flow simulator is used to examine in detail the response of the lakes and rivers to planned operating changes, possible inflows, and ice conditions. Figure 16 illustrates the planning cycle. The operations planning process is continually updated and generally repeated weekly.
Figure 16: Energy operations planning cycle.

While day-to-day decisions are generally economic in nature, they are made within the framework of the LWR Interim Licence and with consideration of stakeholders and the environment. As shown in Figure 16, external input and feedback are part of the energy operations planning process. Community concerns and stakeholder interests are relayed to Manitoba Hydro staff. Discussions consider trapping, hunting, fishing, travel activities, cultural pursuits, and other matters in areas affected by the operating plan. Through this communication, Manitoba Hydro works to reduce the impacts of its operations.

Examples of how Manitoba Hydro has modified LWR operations to address community and stakeholder concerns include:

- changing the flow at Jenpeg during the freeze-up period at a slower rate than allowed by the LWR Interim Licence and limiting the peak outflow from Jenpeg after the lakes downstream are frozen; this limits the potential to cause slush ice which can impede travel;
- changing the flow at Jenpeg during the open water season at a slower rate than allowed to limit the change in water levels on downstream lakes and river reaches, thereby reduces the impact on waterway users; and
- increasing LWR outflow, even to the point of causing spill, earlier than required by licence to reduce the likelihood and duration of exceeding 715 feet on Lake Winnipeg.

Reservoir storage is one of the most important components of hydroelectricity production, and serves a number of roles over a range of time horizons. The two key roles are:

- managing variability of inflow over the full spectrum of conditions, from drought to floods; and
- timing flow releases so electricity generation matches electricity demand.

Not surprisingly, the usefulness of a reservoir for hydroelectric operations depends on its storage capability between its upper and lower operating limits. Commonly referred to as the reservoir’s “active storage,” this is usually defined by physical or regulatory restrictions. However, to understand the usefulness of a reservoir for hydroelectric operations, the active storage must be looked at in relation to:

- the average inflow to the reservoir;
- the generation capability downstream of the reservoir; and
- the flexibility and certainty of controlling outflow from the reservoir.
2.3.2 LWR Operations

Manitoba Hydro’s system has a number of waterbodies that serve as reservoirs. On an annual average, Lake Winnipeg contributes about 40% of the storage across the Manitoba Hydro system, as shown in Figure 17. Despite the large geographic diversity of the Churchill-Nelson River drainage basin, inflows into Lake Winnipeg vary tremendously from year to year. With the narrow storage range defined by the licence, Manitoba Hydro has only a limited ability to manage these large variations in inflows. Except for periods of very low inflows, outflows must match inflows within a one year or shorter time frame. Compared to other major hydro utilities in Canada, Manitoba Hydro has relatively limited reservoir storage capability. For example, BC Hydro and Hydro Quebec have multi-year storage reservoirs.

Lake Winnipeg is not useful for short-term operations because it takes several weeks for water released from the lake to reach Manitoba Hydro’s major generating stations on the lower Nelson River. For example, if Manitoba Hydro were to experience a sudden period of exceptionally high electrical demand, such as a heat wave in summer, changes to Lake Winnipeg outflows wouldn’t help because it would take too long for the water to reach Manitoba Hydro’s major generation stations on the lower Nelson River. Instead, Lake Winnipeg releases are planned based on current storage levels, near term water supply trends, and seasonal load patterns.

Figure 17: Total average annual energy in reservoir contribution from 1977 to 2014.

Maximum Discharge

The operation of LWR maximizes discharge when Lake Winnipeg water levels are above 715 feet (217.93 m). In general, maximum discharge is accomplished by lowering the Jenpeg forebay to a minimum water level. To avoid physical damage at Jenpeg, the lowest water level to which the forebay can be drawn down is 702 feet (213.97 m) in summer. Even during periods of maximum discharge, forebay variations occur due to local and upstream conditions. Wind set-up at the north end of Lake Winnipeg increases lake outflow and can cause the forebay level to increase temporarily. This can wrongly give the appearance that maximum discharge is not occurring.

Lake Winnipeg discharge is also maximized during most winters when ice in the outlet of Lake Winnipeg reduces outflow capacity. The thickening of ice upstream of Jenpeg as winter progresses gradually reduces outflow. The degree of the reductions differs from year to year depending on the duration and severity of the winter. To achieve maximum outflow under ice conditions the forebay is drawn to 703 feet (214.27 m).

At some point after the Nelson River freeze-up, Lake Winnipeg outflow will be limited by the ice constrictions, rather than by the Jenpeg forebay elevation. When this occurs, maximum discharge can be achieved with forebay levels greater than the minimum. The Water Power Act licence recognizes that maximum discharge varies according to the circumstances prevailing at the time.
Freeze-up Program
During freeze-up, flow is temporarily reduced – typically for a week or two – to permit the formation of a smooth ice cover that improves the Nelson River West Channel flow capacity. This ultimately increases the total Lake Winnipeg outflow capability over the winter. After this ice cover is formed, maximum discharge operations can be resumed if required. Operations during the freeze-up period attempt to reduce the impact on local resource users. Monitoring of ice conditions upstream and downstream occurs on a daily basis during the program.

Typical LWR Operations
LWR operating decisions are made considering water supply conditions and other factors at the time. The following is a broad description of typical LWR operations over the course of a year. It is not meant to be a comprehensive guideline applicable to all possible conditions.

Winter
Following the freeze-up program, flows are usually increased to supply Nelson River generation during the winter when Manitoba load is highest. Flows are typically increased to the maximum possible – which is mainly dependent on the level of Lake Winnipeg and the ice constrictions upstream of Jenpeg. In all but one of the years since 1977, flows have been maximized during winter. Winter differences in outflow are the result of varying Lake Winnipeg water levels and differences in ice constrictions.

Spring
As spring approaches, LWR operations are planned based on current Lake Winnipeg levels, storage levels elsewhere in the system, snowpack, and inflow forecasts. Generally, the objective for spring operation of LWR is to allow some refill of the lake with spring runoff while avoiding overloading the lower Nelson River with Lake Winnipeg outflows at a time when demand is lower. However, under above average or higher water supply conditions (e.g., above average Lake Winnipeg levels and high expected snowmelt runoff), maximum discharge operations may continue through the spring into the summer to avoid Lake Winnipeg levels rising close to or above 715 feet. In low water supply years, lake outflows will be reduced to conserve spring runoff to supply lower Nelson River generation at a later time.

Summer
LWR outflows during the summer are largely dependent on inflows at the time which can vary greatly from year to year and can change relatively quickly. Inflows can transition from normal to flood inflows after only a few widespread, major rain events. LWR provides increased discharge capability to manage floods and this capacity can be used in response to an increase in inflows. There is a much wider range of outflows in summer, from the minimum outflow required by licence up to maximum discharge to manage flood inflows. In comparison, the range of outflows during the winter months is smaller since outflows are almost always maximized.

Fall
Inflows to Lake Winnipeg typically decline through August and into the fall. Evaporative losses from Lake Winnipeg are highest in late summer and early fall which decreases the net inflow to the lake. Fall floods are not as common as spring and summer floods but they do occur. LWR outflows are generally less in the early fall than the summer because inflows are lower on average and because electrical demand is less in the early fall versus summer. Lake Winnipeg levels typically decline through the fall, however when water supply conditions are low (i.e., system storage and inflows are low), outflows will be reduced to conserve water for use in supplying winter demand and to protect against the possibility of drought. In late fall, between mid-November and early December, LWR outflow is usually reduced for the freeze-up program described above.
Best Management Practices
Manitoba Hydro’s objective is to plan for the secure and economic operation of Manitoba Hydro’s system of reservoirs and generating stations while considering the effects on stakeholders and the environment. To meet this objective, Manitoba Hydro’s operations are planned based on numerous operations planning activities or processes. These activities are referred to as Best Management Practices (BMPs) because they have proven to give consistent and reliable results, given the unique characteristics of Manitoba Hydro’s system, frequently surpassing legislative requirements. Manitoba Hydro’s BMPs have continued to evolve over the years, adapting to new technologies and to an increased awareness and understanding of social, environmental, and economic concerns of stakeholders affected by hydroelectric operations. Each BMP helps Manitoba Hydro achieve its annual operation planning objective. The BMPs are:

- Ongoing dialogue with downstream communities informs operating decisions.
- Manitoba Hydro accommodates flow reduction requests to ensure the safety of participants during search and rescue efforts and other emergencies.
- Forecasts are updated each week using the most current information as it becomes available.
- Operational forecasts are compared to actual inflows, market, and load each week and over the course of the year to assess forecast accuracy.
- Manitoba Hydro aims to maintain minimum energy reserves for use during extreme drought. On an emergency basis, energy reserves can be used to avoid possible load interruptions to the power supply when no alternative resources are available.
- In all its operations planning decisions, Manitoba Hydro complies with its Water Power Act Licences. Manitoba Hydro has a formal reporting program, providing flow and level data to the provincial regulator on a regular basis and self-reporting any deviations from licence conditions.
- Manitoba Hydro uses a computer-based Decision Support System to help identify economic and strategic opportunities, ensuring water resources are used as efficiently as possible, while still considering other priorities.

2.3.3 Licence Compliance
Manitoba Hydro complies with water level and flow conditions based on the LWR Interim and Supplementary Interim Water Power Act Licences issued November 18, 1970, and August 8, 1972, respectively. For charts showing Manitoba Hydro’s record of compliance with the licence terms see Appendix 2.

Playgreen Lake and Kiskittogisu Lake
Licence Term 6 dictates that Manitoba Hydro may regulate the water levels on Playgreen Lake between 707.0 and 714.9 feet, and on Kiskittogisu Lake between 706.0 and 714.8 feet. Water levels on Playgreen and Kiskittogisu Lakes have been within the mandated ranges 99.9 % of the time. Most instances when water levels have been outside the range were the result of wind set-up on Lake Winnipeg. Wind set-up is a condition where wind depresses water on one side of a lake, and elevates it on the other. The water surface is tilted, with one side being higher than the other, but the average elevation is unchanged. Water levels on Playgreen Lake are directly influenced by water levels on Lake Winnipeg.

Maximum Discharge
Licence Term 7 dictates that Manitoba Hydro must operate the control structure at Jenpeg to maximize discharge when the water level on Lake Winnipeg exceeds 715 feet. Manitoba Hydro has operated to maximum discharge 100 % of the time when Lake Winnipeg has exceeded 715 feet.
Minimum Outflow
Licence Term 8 dictates that Manitoba Hydro must operate the control structure at Jenpeg so that the combined outflow of water from Lake Winnipeg through Jenpeg and the Nelson River East Channel is not less than 25,000 cubic feet per second (cfs). Manitoba Hydro has operated so that the combined outflow has not been less than 25,000 cfs 99.9% of the time. All instances where Lake Winnipeg total outflow has not been in compliance with this licence term were the result of wind effects reducing flow out of Lake Winnipeg through the East Channel of the Nelson River.

Outflow Rate of Change
Licence Term 12 dictates that Manitoba Hydro must operate the control structure at Jenpeg to keep the rate of change in discharge below 15,000 cfs per day. The rate of change discharge has been below the licence condition 94.8% of the time. The primary reasons for exceeding this licence condition include unexpected powerhouse unit or transmission line outages, operator error during flow or generation adjustments, wind effects, ice jamming issues, and emergency situations.

Although there will likely continue to be some instances when discharge rate of change will exceed 15,000 cfs per day, Manitoba Hydro has made efforts to reduce the frequency. The percentage of time this licence condition is exceeded has been reduced over the years. From 1976 to 1999, this licence condition was exceeded about 7 to 8% of the time, and from 2000 to 2012, this has been reduced to less than 2% of the time. Included in this is an authorized deviation that occurred in 2010 to install an ice boom. The improvement in performance related to this condition is partly attributable to a compliance monitoring program that was implemented in 2005 and to increased operator experience.

Kiskitto Lake
Licence Term 12A dictates that Manitoba Hydro must regulate water levels on Kiskitto Lake within the natural range. Water levels on Kiskitto Lake have been within the natural range 100% of the time.

Reporting
Manitoba Hydro implemented a reporting program in 2005 that monitors near real time compliance with all of Manitoba Hydro Water Power Act licences on a weekly basis. The program is intended to demonstrate that Manitoba Hydro is following its licences. Any deviation from a licence condition is reported to Manitoba Conservation and Water Stewardship, typically within one week of the event. Manitoba Hydro also provides Manitoba Conservation and Water Stewardship with an Annual Water Levels and Flows Report that is made available to internal and external stakeholders. The report contains information on data collection, verification, and reporting related to Water Power Act licences, as well as a summary of deviations from licence compliance during the calendar year. Annual Water Level and Flows Reports from 2008 to 2013 are posted on the Manitoba government website http://www.gov.mb.ca/waterstewardship/licensing/water_power_licensing.html.

Licence Term 11 of the Interim Licence requires Manitoba Hydro to provide a 90-day forecast of water levels and flows for the LWR project each month to the Minister of Conservation and Water Stewardship. These forecasts include daily inflows to Lake Winnipeg, flows for the Nelson River (East and West Channel), and levels for Lake Winnipeg, Playgreen and Kiskitogisu Lakes. In addition to providing this to the minister, Manitoba Hydro reports the forecast on its website.