

Voltage Schedule issued to Generator Operators within the Québec Interconnection IQ-N-001

**Direction principale - Contrôle des mouvements
d'énergie et exploitation du réseau**

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VERSION HISTORY

Revision number	Date	Modifications
1	August 15, 2022	Initial release.
2	September 28, 2022	Revised effective date of January 1, 2023.
3	December 12, 2022	Modification to section 7.2 (connection points)
4	September 18, 2024	Hyperlinks update Minors adjustments accordingly to language in Reliability Standards Minor modifications for precision

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1. PURPOSE

This operating plan defines the methodology and the application of voltage schedule (providing either a range or a target value with an associated tolerance band) on the System by Generator Operators (GOP).

This schedule is used in the operation of the Main Transmission System (RTP) and to ensure voltages are monitored, controlled and maintained in Real-time within the limits set to preserve equipment integrity and Reliable Operation of the Québec Interconnection.

In short, this plan provides guidance on the requirements set out in Reliability Standard [VAR-002-4.1](#) — *Generator Operation for Maintaining Network Voltage Schedules* (“VAR-002”). It also ensures Hydro-Québec’s Direction Principale – Contrôle des mouvements d’énergie et exploitation du réseau unit has access to the data it needs to perform its function as Transmission Operator (TOP) under Reliability Standard [VAR-001-4.2](#) — *Voltage and Reactive Control* (“VAR-001”).

2. DEFINITION

All capitalized terms in this document are defined in the [Glossary of Terms and Acronyms used in Reliability Standards](#).

3. SCOPE OF APPLICABILITY

This guideline applies to RTP generation facilities, which are listed in the [Register of Entities Subject to Reliability Standards](#) (the “Register”) filed with the Régie de l’énergie.

4. REGISTERED ENTITIES

This operating plan is intended for Registered Entities exercising the GOP function. The list of Registered Entities is found in the [Register](#) filed with the Régie de l’énergie.

5. DATA CONFIDENTIALITY

Under this operating plan, Hydro-Québec will keep the data submitted by Registered Entities confidential in accordance with the [Transmission Standards of Conduct](#) that came into force January 1, 2024, replacing the [Transmission Provider Code of Conduct](#) and the [Reliability Coordinator Code of Conduct](#).¹

6. RTP VOLTAGE SCHEDULE

6.1. VOLTAGE SCHEDULE CRITERIA

System voltages vary with the time of day and season. They are strongly influenced by the Load profile, System state and power flows over the System.

The TOP is responsible for operating the System in accordance with the following criteria:

- System Operating Limit (SOL) and Interconnection Reliability Operating Limits (IROL)
- Equipment voltage Facility Ratings and

¹ Decision [D-2023-036](#).

- Regulator ranges (VAR-001-R5.3)

6.2. VOLTAGE SCHEDULE IMPLEMENTATION

The TOP has various means at its disposal to control voltages (VAR-001-R2), including:

- Switching reactors and capacitors on the RTP
- Adjusting the set point of static and synchronous compensators
- Adjusting the voltage set point of tap-changing transformers
- Switching Transmission Lines
- Adjusting the Real or Reactive Power output of generating stations
- Adjusting the Interconnection Interchanges for the Transmission Operator Area
- Adjusting the Reactive Power control set point of converter units

7. VOLTAGE SCHEDULE APPLICABLE TO GOPS

7.1. VOLTAGE SCHEDULE INSTRUCTIONS

In accordance with GOP voltage control strategies, the TOP is responsible for providing GOPs with the voltage schedule, which defines by one of the following instructions (VAR-001-R1):

- Voltage set point
- Voltage range
- Reactive Power set point
- Real Power set point for loading lines and modifying voltage
- Power factor set point

When the TOP instruction is a set point, it shall be accompanied by a tolerance range. By default, the TOP instruction is a set point at nominal voltage of connection point on the high-voltage side with a tolerance range of $\pm 5\%$. In the event of a discrepancy between the voltage schedule and the common operating instructions on the default set point or on the default tolerance range, the common operating instructions take precedence.

The GOP shall not change the instruction on its own initiative. The instruction remains in effect until the TOP issues a new one to the GOP.

7.2. CONNECTION POINTS

The TOP specifies the GOP voltage schedule at the following connection points:

- i. If the GOP is also a Transmission Owner (TO), generally at the points of connection of its System to the RTP (VAR-002, Quebec Appendix, R2)
- ii. If the GOP is not a TO, generally on the high-voltage side of the step-up transformers (VAR-001-R5)

7.3. MAINTENANCE AND MONITORING OF VOLTAGE SCHEDULE

Each GOP shall maintain the generator voltage schedule within each generating facility's capabilities). (VAR-001-R5.1 and VAR-002-R2)

The GOP shall monitor the voltage and Reactive Power at the connection points to maintain the instruction provided by the TOP. Should a GOP not monitor the voltage and Reactive Power at the point specified by the TOP, it shall have an appropriate methodology to convert that instruction into an equivalent value for the point where that is actually monitored by the GOP. (VAR-002-R2.3)

A GOP that fails to maintain the voltage range or tolerance range set by the voltage schedule shall inform the TOP within **60 minutes** of range exceeding unless it is restored within that period. If the exceeding is due to the GOP's inability to comply with the schedule, the GOP shall provide an explanation. (VAR-001-R5.2; VAR-002-R2 and R2.2; TOP-001-R4)

7.4. EXEMPTION CRITERIA FOR VOLTAGE SCHEDULE IMPLEMENTATION

The GOP is exempted from following a voltage schedule when the required actions (VAR-001-R4 and TOP-001-R3):

- Are physically impossible
- Breach regulatory or statutory requirements
- Compromise safety
- Contravene material/equipment-related requirements (such as the facility rating)

If the GOP fulfills an exemption criterion, it shall notify the TOP within **60 minutes** of becoming aware of the criterion, unless the exemption criterion is restored within that time, and it shall subsequently follow the TOP's instructions.

8. OPERATION IN VOLTAGE CONTROL MODE

8.1. AUTOMATIC OR “SGP² ON” MODE

The GOP shall operate each generator with the automatic voltage regulator or, for wind farms, with “SGP On” mode (VAR-001-R5.1 and VAR-002-R1).

If the regulator is operating in a normal mode that is not the automatic or “SGP On” voltage control setting, the GOP shall follow the TOP's instructions. (VAR-002-R1)

8.2. MANUAL OR “SGP OFF” MODE

If a generator does not have an automatic voltage regulator or if its automatic voltage regulator is out of service, the GOP shall operate each generator in Manual or “SGP Off” mode, taking the following actions (VAR-002-R2.1):

- Notify the TOP within **30 minutes** of an automatic voltage regulator loss, unless control is restored within that period (VAR-002-E3).
- Follow the TOP's instructions. (VAR-001-R5 and VAR-002-R2.1)

8.3. AUTOMATIC VOLTAGE REGULATOR STATUS AND POWER SYSTEM STABILIZER STATUS

The GOP shall notify the TOP of any status change on automatic voltage regulator or power system stabilizer within **30 minutes** of the change unless its initial status is restored within that period. (VAR-002-R3)

² Automated generating fleet management system

9. REACTIVE POWER CAPACITY

The GOP shall notify the TOP within **30 minutes** of becoming aware of a change in Reactive Power capacity, due to factors other than a status change on automatic voltage regulator or power stabilizer, unless the initial capacity is restored within that time. (VAR-002-R4)

This Reactive Power capacity may depend on various generating equipment associated or not with a generating unit and on various Transmission equipment. The GOPs do not need to notify changes in Reactive Power capacity based on each generating unit individually but must notify the TOP on overall changes in Reactive Power capacity by its System.

10. EXEMPTION FOR TESTING, START-UP AND SHUTDOWN STATUS OF GENERATORS

The GOP is temporarily exempted from following the voltage schedule (**Section 6.3**) and automatic voltage regulator (**Section 7.1**) during testing, start-up and shutdown of a generating unit. This exemption may apply to a generating unit which is not being operated in automatic voltage control mode or in the control mode that was instructed by the TOP for a reason other than start-up, shutdown or testing. (VAR-001-R4, VAR-002-R1 and VAR-002-R2)

This type of exemption only applies to GOPs that shall request authorization by TOP or notify it in the following situations:

- a) Generator testing:
Notification by GOP shall be done via prior transmission of the test procedure.
- b) Generator start-up:
Start-up is authorized in advance by the TOP. Start-up is deemed to have ended when the generating unit is ramped up to its minimum continuously sustainable Load and it is prepared for continuous operation.
- c) Generator shutdown:
Shutdown is authorized in advance by the TOP. In the event of an emergency shutdown, the GOP shall notify the TOP within **60 minutes** of shutdown unless it is restored within that period. Shutdown is deemed to begin when the generating unit is ramped down to its minimum continuously sustainable Load and it is prepared to go offline.
- d) Operating mode other than the one demanded by the applicable standards for a reason other than start-up, shutdown or testing:
The GOP shall notify the TOP within **60 minutes** following the mode if it has not already been informed of the mode in use.

11. METHOD OF COMMUNICATION

The GOP shall notify the TOP through the Control Center specified in the common operating instructions.

12. SUMMARY TABLE OF TOP NOTIFICATIONS

The following summary table lists the notifications from the GOP to the TOP presented in this operating plan. This table specifies the time limit of each notification and the exemptions authorized by these notifications if applicable.

TOP notification object	Time limit for notifying TOP	Exemption from following voltage schedule	Exemption for operating automatic voltage regulator
Exceeding of range from voltage schedule	Within 60 mins		
Physical impossibility (e.g., low-power wind turbine facility)	Within 60 mins	✓	
Breach of regulatory or statutory requirements	Within 60 mins	✓	
Compromise to safety	Within 60 mins	✓	
Violation of material/equipment-related requirements	Within 60 mins	✓	
Generating unit not equipped with an automatic voltage regulator ³	Prior		✓
Out of service automatic voltage regulator	Within 30 mins		✓
Status change on automatic voltage regulator	Within 30 mins		
Status change on power system stabilizer	Within 30 mins		
Change in reactive power capability	Within 30 mins		
Generating unit testing (via transmission of the test procedure ⁴)	Prior	✓	✓
Generating unit start-up (authorized by TOP)	Prior	✓	✓
Generating unit shutdown in normal operating mode (authorized by TOP)	Prior	✓	✓
Generating unit emergency shutdown	Within 60 mins	✓	✓
Other mode, for a reason other than start-up, shutdown or testing	Within 60 mins if TOP has not been informed	✓	✓

³ Each generating unit shall be equipped with an automatic voltage regulator under the connection requirements. However, if there is a case where this criterion exists, the TOP shall authorize it.

⁴ Does not exclude the need to get authorization again by TOP in Real Time before starting testing.