

Québec Interconnection Approach to BES

NPCC Governmental/Regulatory Affairs Advisory Group

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Introduction: HQT

- **Our mission**

HQT operates its transmission system, markets system capacity and manages power flows across Québec. Our *Direction Contrôle des mouvements d'énergie* (System Control) acts as the Reliability Coordinator (RC) for transmission systems in Québec

- **Our facilities**

Our system, the most extensive transmission system in North America, comprises 33,630 km (20,897 miles) of line and 514 substations as well as interconnections allowing power interchanges with grids in the Maritime provinces, Ontario and the U.S. northeast

- **Our activities**

HQT owns and operates more than 95% of the transmission capacity in Québec. HQT is registered at NERC as TO, PA, TP, TSP, RC, BA, TOP and IA

**One entity with direct control and full awareness
of the whole Québec Interconnection**

System characteristics: reliability of the Québec Interconnection

- HQT is firmly committed to system reliability, has invested in major reliability initiatives and has learned from past blackouts
- **The characteristics** of the HQT system must be considered in system design and operation to ensure a high level of reliability
 - Remote hydroelectric generation -> Criteria met without congestion
 - Strongly winter peaking -> Worst case scenario for planning
 - Strong transmission backbone -> Clear "bright line" demarcation
 - Local transmission subsystems -> Criteria to ensure reliability
 - Asynchronous with the Eastern Interconnection -> Control of the whole Interconnection

HQT faces a combination of unique characteristics that motivates an approach to reliability different from other Interconnections

Québec system design and operation

- Because of its characteristics, HQT's BULK power system must *exceed* NPCC and NERC criteria and standards (for certain aspects) to ensure transmission backbone reliability:
 - Robustness to withstand design contingencies without use of Special Protection Systems (SPS) or loss of load
 - Performance requirements for certain extreme contingencies

Impacts of the new BES definition on the Québec Interconnection

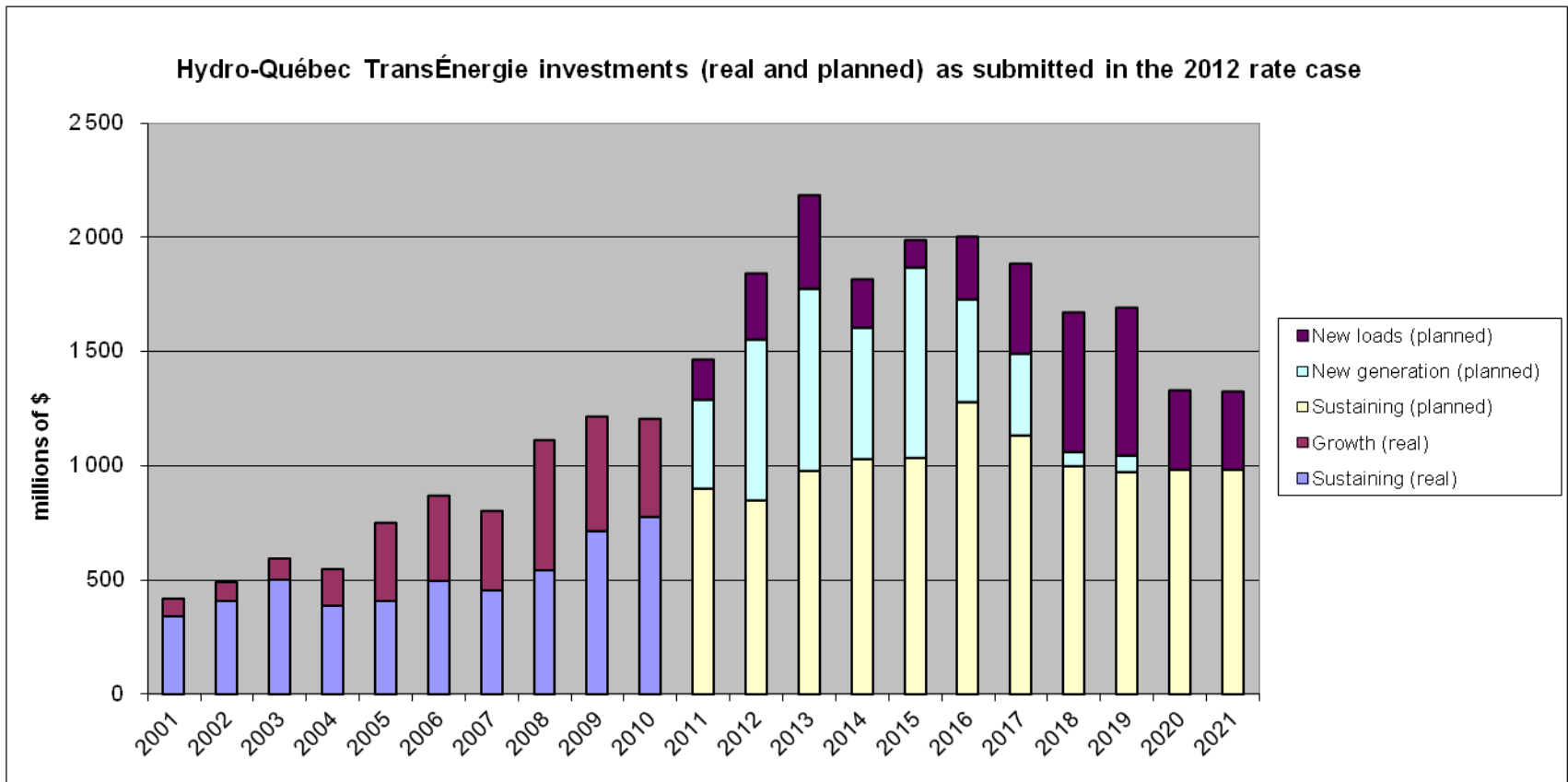
- The new BES definition filed with FERC includes transmission elements operated at 100 kV or higher
- Of the 474 substations that are part of our local transmission subsystems, a majority would be included in the BES
- **No measurable impact on bulk power system reliability;** however, increased burden for the RC and TOP
- Subsystem transmission projects would be required to comply with TPL-003-1a:
 - SPS additions
 - New lines, breaker additions to existing substations, etc.
- Many of the subsystem SPS additions would have no impact on service continuity

Quick cost estimate for these projects: > \$850 million

Investments in reliability

- Demanding reliability objectives combined with the system's unique technical characteristics meant major investments over the years. For example:
 - Adoption of criteria in the late 80's triggered a \$1.3-billion reinforcement project (\$2-billion current)
 - Addition of series compensation on the 735-kV grid
 - Commissioning of key SPSs
 - Adoption of a new voltage sensitivity criterion and the need for increased transfer capability triggered a \$250-million project in 2008
 - Addition of series compensation and SVC's at two 735-kV substations

Investments on HQT's network (in millions of \$)



8 000	19 000
27 000	

Reliability framework in Québec

- The *Régie de l'énergie du Québec* (Québec Energy Board) has exclusive jurisdiction over the entities and the framework of the Québec Interconnection and:
 - Has designated HQT's *Direction Contrôle des mouvements d'énergie* as the Reliability Coordinator (RC) for the Québec control area
 - Adopts reliability standards filed by the RC
 - Approves the Register identifying entities subject to reliability standards
 - Monitors and enforces compliance
 - Has the power to levy important fines
 - Has put in place consultation mechanisms in which NERC and NPCC can participate
- The *Régie de l'énergie* signed MOUs with NERC and NPCC to assist in these functions

Reliability framework in Québec: tiered approach to application of standards - definitions

- Bulk power system (BPS)
 - Mainly 735-kV and 450-kV DC substations with their connecting lines and transformers
 - All interties with the US included in BPS
- Main transmission system (RTP)
 - BPS facilities and some LTS (including generation assets above 50 MVA)
 - Facilities required for generation/load balancing, frequency reserve, voltage control, interchange transactions, etc.
 - The RC has full control and visualization over RTP
- Local transmission subsystems (LTS)
 - Operate at lower voltage levels and are connected to 735-kV substations
 - Feed industrial clients and load substations and connect local generation and some interconnections

Reliability framework in Québec: a tiered approach to application of standards

- BPS
 - All standards adopted by the *Régie de l'énergie* applied
- RTP (BPS and some LTS)
 - Most standards applied, excluding TPL and some PRC standards
- LTS
 - Standards such as TPL-001 and TPL-002 applied
 - Generator (50 MVA and more) requirements applied

Reliability framework in Québec: Québec's approach

- An approach customized for global reliability of the HQT system considering its special characteristics
- Tiered approach to application of standards
- Monitoring of compliance based on that approach
- Approach filed by the RC and acknowledged, but not yet approved, by the *Régie de l'énergie*



Questions? Comments?

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