Hydro-Quebec in numbers

• Total number of employees: 19,477
• Total number of customers: 4,357,000

Generation capacity
• 62 Hydroelectric power plants; >350 Hydroelectric generators
• 37,243 MW installed generation power

Transmission grid
• Over 34,802 km transmission lines 49 kV to 765 kV (almost 12,000 km 735 kV transmission lines)
• 534 Transmission substations
• 15 Strategic inter-connexions with neighbor grids for exports (Canada, NE USA)

Distribution grid
• 118,500+ km MV < 25 kV & 120,000+ km LT distribution grid
• ≈ 3,000+ Distribution substations
• ≈ 680,000+ Arial transformers

Main generation units are in North and main consumption centers are in the Southern part of Quebec, Ontario, NE USA (1,000+ km) – huge technological and scientific challenges to reliably operate the whole system
Hydro-Quebec as a part of critical national infrastructures possesses the significant asset portfolio. Its assets are aging or become obsolete (e.g. IT, communication assets) requiring large scale replacements or refurbishment.

HQ also faces an increasingly complex operating and business environment (market evolution, performance requirements, changing regulatory framework, new technologies, pandemic, climate change & extreme weather events, etc.). This complexity and uncertainties have to be managed.

Asset management is considered an efficient approach able to provide a strong scientific and technical basis for a rigorous decision-making (combined with risk and resilience management).

HQ is not certified ISO 55k, but follows its prescriptions/concept as far as possible.

HQ and NSERC also co-finance an university research chair in AM (UQTR) – R&D and innovation are considered quite important part of the overall AM undertaking.

The strength of HQ’s AM (basically managed at the level of its main divisions) is in a multidisciplinary and holistic approach, collaboration and a long-term vision of the organization (HQ’s divisions at all levels of organization, IREQ, universities, industry peers, participation at various conferences, regulatory and standardization bodies, ISEAM, IAM, CIGRE, IEEE, IEC, etc.).

HQ’s experience and approach might be of interest for other organizations.
Some future challenges in AM (list non exhaustive)

Based on HQ’s experience, there some challenges in efficiently apply AM

- Integrate new technologies, materials, scientific knowledge, AI, “smart things” with existing ones
- Align all the functions of an organization (engineering and non-engineering)
- Enhance methods and tools for:
  - Life Cycle Cost modeling and decision making support
  - Diagnostic and prognostic
  - Data acquisition and treatment
- Develop new modeling and optimization methods capable to grasp the complex operational and business environment, deep uncertainties as well as emergent and systemic risks associated with it
- Understand, model and characterize:
  - Impact of climate change on assets and AM
  - Cyber security issue and its impact on AM (particularly relevant with the introduction of edge technologies)
  - Impact of human and organizational performance on the AM efficiency
Some our publications related to AM

  DOI: 10.1504/IJSEAM.2019.10030326

  https://www.researchgate.net/publication/335966870_TUTORIAL_Asset_Management_and_its_importance_for_electrical_power_utilities


  DOI: 10.1016/j.ress.2018.07.006

  DOI: 10.1016/j.ssci.2016.05.004
  https://www.researchgate.net/publication/303316134_Risks_of_Extreme_and_Rare_Events_in_Asset_Management

  DOI: 10.1504/IJMME.2015.073047