



USE CASE

Grid Optimisation

SECTOR

Energy

By 2040, global energy demand will increase by 27%.



Opportunity The generation, consumption and distribution of electricity is done in real time, and quantum technologies will help optimize this process compared to conventional technologies.



Threat A network optimized with quantum technologies will offer better performance, less downtime and outages, and less costly management than a conventional network.



Applicable quantum technologies

- Quantum computer
- Optimized quantum networks
- Hybrid quantum algorithms

Commercial applications

- Optimisation of the electrical network on a provincial and national scale
- Real-time optimisation of the production and distribution of energy generated from several sources (hydroelectric, nuclear, solar, wind, etc.)

Examples of actors in the innovation chain

IQBit
BOLTZ.AI
agnostiq
ZAPATA

DEVELOPPERS

XANADU
rigetti
D:wave
The Quantum Computing Company™
IBM

ECOSYSTEM

Hydro Québec
énérgir
BORALEX
Brookfield
BChydro

USERS



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Factors preventing adoption

The electrical grid is often considered the biggest machine in the world¹, making it very difficult to make changes. In addition, there are often geographic, technological, and political barriers to implementing the required changes.

Despite this, the benefits of these changes are significant and will better support the ever-increasing demand. To date, efforts are already underway to move towards a so-called "smart grid".

Risks of the status quo

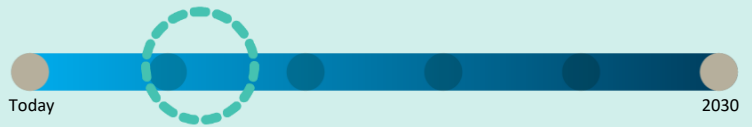
By 2040, global energy demand will increase by 27%². Moreover, this value would have been 4 times greater if not for improvements in energy efficiency³.

To manage the grid of tomorrow, various sensors and control devices are being added to the grids. These allow for a more connected network, which is able to provide more data points, and communicate between different facilities. All of this leads to an intelligent network.

In order to manage and optimize such a large and complex network, it will eventually require a computing capacity that exceeds that of conventional computers. The best solution is through quantum computing and technologies^{4,5}.

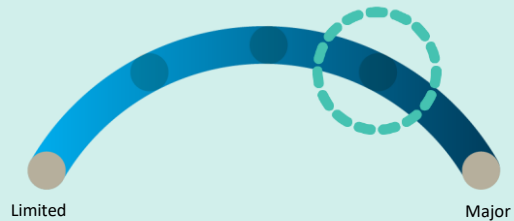
A network that does not use these technologies will be at a disadvantage and may face more problems down the road, leading to an overused and unoptimized network.

OPPORTUNITY window



Considering that the quantum computer capable of performing these calculations is not yet ready, the window of opportunity is more in the medium term. However, since changes are needed at the hardware and software levels, and since there are significant policy and regulatory barriers to overcome, it is critical to explore this opportunity now, in order to be ready once the quantum computer is available on the market.

POTENTIAL impact for businesses



The impact will be major for the companies that control the electrical networks and for the consumers. The generation and consumption of energy will be facilitated and will be done with less clashes. All this will allow a better management of energy, in order to better meet tomorrow's growing demand.

1. livescience.com/48893-improving-efficiency-on-the-electric-grid.html
2. capp.ca/energy/world-energy-needs/-/:.text=Energy Consumption by the Numbers&text=5 billion%3B from 8 billion,is forecast to increase 27%25
3. capp.ca/energy/world-energy-needs/-/:.text=Energy Consumption by the Numbers&text=5 billion%3B from 8 billion,is forecast to increase 27%25
4. energycapitalmedia.com/2021/05/25/quantum-technology-key-for-grid-optimization-and-national-security-doe/
5. sciencedirect.com/science/article/abs/pii/S0360544219308254



Québec Quantique aims to promote the adoption of quantum technologies by Québec businesses and organizations.

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