The Energy Transition:
Lac-Megantic Mobilizes

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Hydro Québec

Lac-Mégantic

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Canada

Presentation overview

- Project background
- Project overview
- Microgrid operation data
- Q&A session

Hydro-Québec

MORE THAN

99%

OF OUR ELECTRICITY IS GENERATED FROM WATER

CLEAN, RENEWABLE AND RELIABLE

HYDROPOWER:

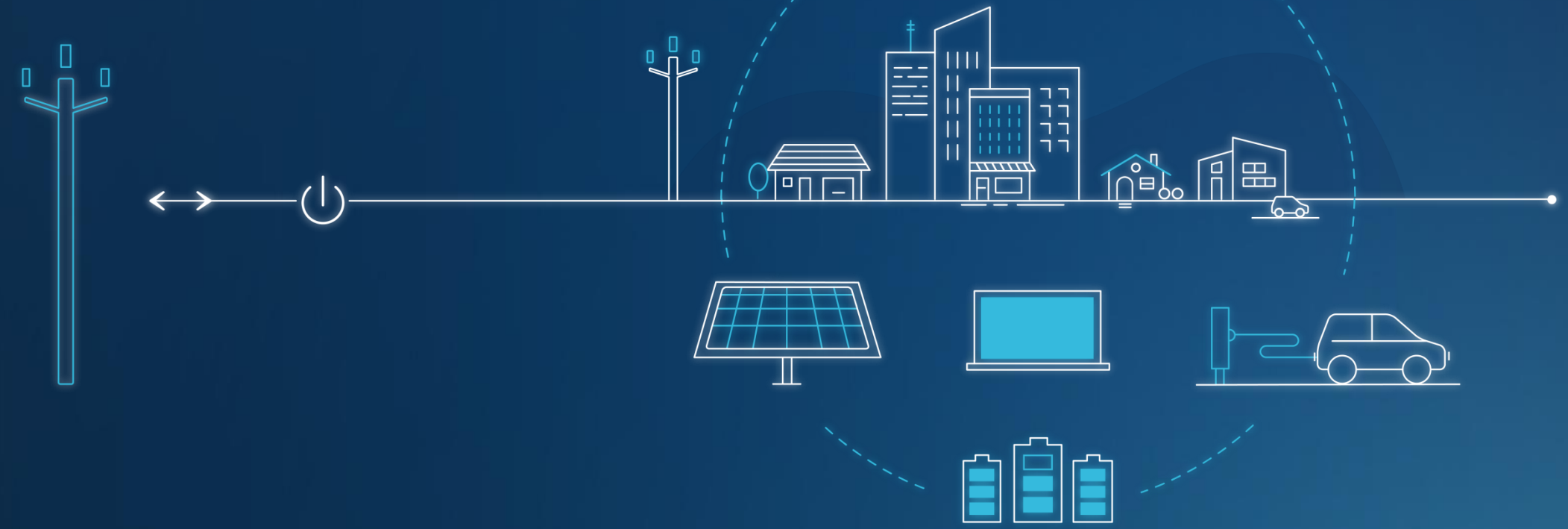
LOW GHG EMISSIONS

Photovoltaic	Natural gas	Coal
5X	50X	70X

LOWEST RESIDENTIAL RATES IN NORTH AMERICA

Québec’s first microgrid

in Lac-Mégantic's new downtown



Project background

- **Reconstruction** of Lac-Mégantic's downtown area after the 2013 tragedy
- **Partnership** between the town of Lac-Mégantic and Hydro-Québec
- **Groundbreaking project** benefiting an engaged community that is focused on the future, innovation and sustainability

Éric Filion, President of Hydro-Québec Distribution, and Julie Morin, Mayor of Lac-Mégantic, at the inauguration of the microgrid center on July 6, 2018.

Objectives of the town of Lac-Mégantic

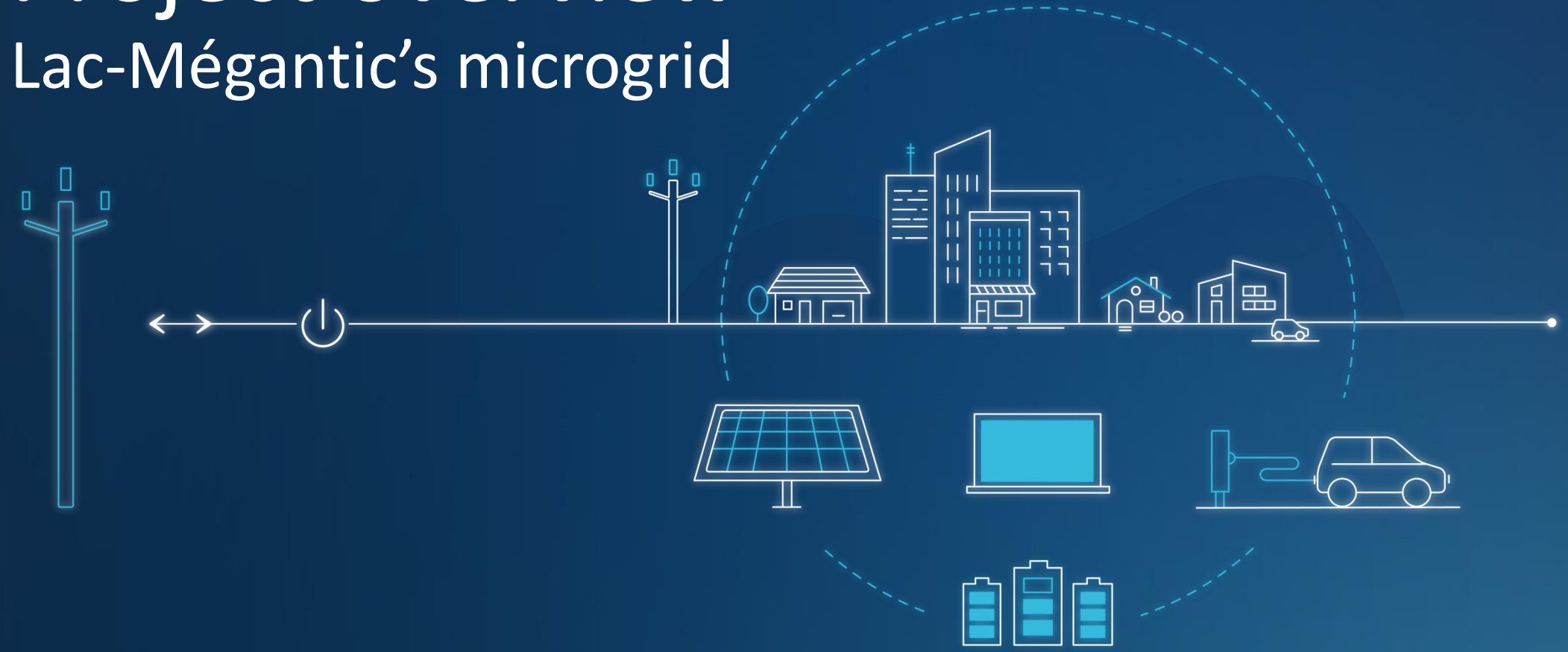
- Position Lac-Mégantic as an **energy transition leader** for rural Canada
- Make Lac-Mégantic's **vision** of a smart city a reality
- Help increase the **town's appeal** as a hub of economic and technological innovation

Objectives of Hydro-Québec

- Master and **integrate** Distributed Energy Resources (DER)
- Master **two-way exchanges** and the concept of **islanding**
- Manage **demand** during winter **peak periods**
- Understand **user adoption** factors
- **Apply the model to off-grid systems** to reduce fossil-fuel use and GHG emissions

Project overview

Lac-Mégantic’s microgrid



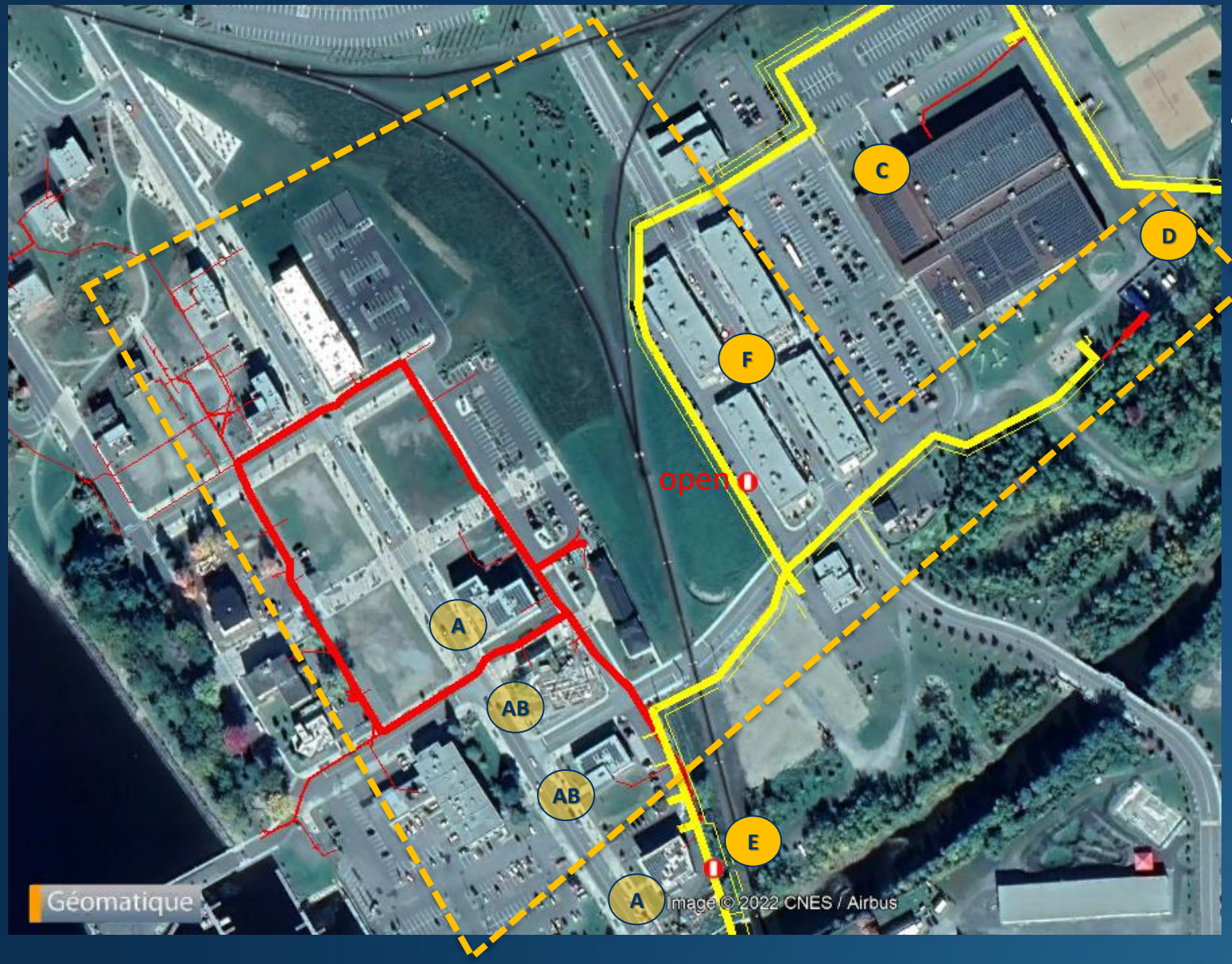
Technologies and microgrid coverage area

Microgrid perimeter
30 buildings

Behind the meter interventions
+/- 500 solar panels distributed on 4 customer buildings
A

54kWh of energy storage inside 2 customer's buildings
B

Energy efficiency
Measures deployed in small commercial buildings
F



Centralized PV plant
C
1687 panels / 600kWp

600V Microgrid substation
600kW/600kWh
D

Microgrid control system and command building

Microgrid POC
E
Circuit line breaker to disconnect from the main grid during islanding events

Lac-Megantic microgrid transitions

At Lac-Megantic, there are mainly **4 transitions** to master when **operating the microgrid** to switch between the connected and islanded state.

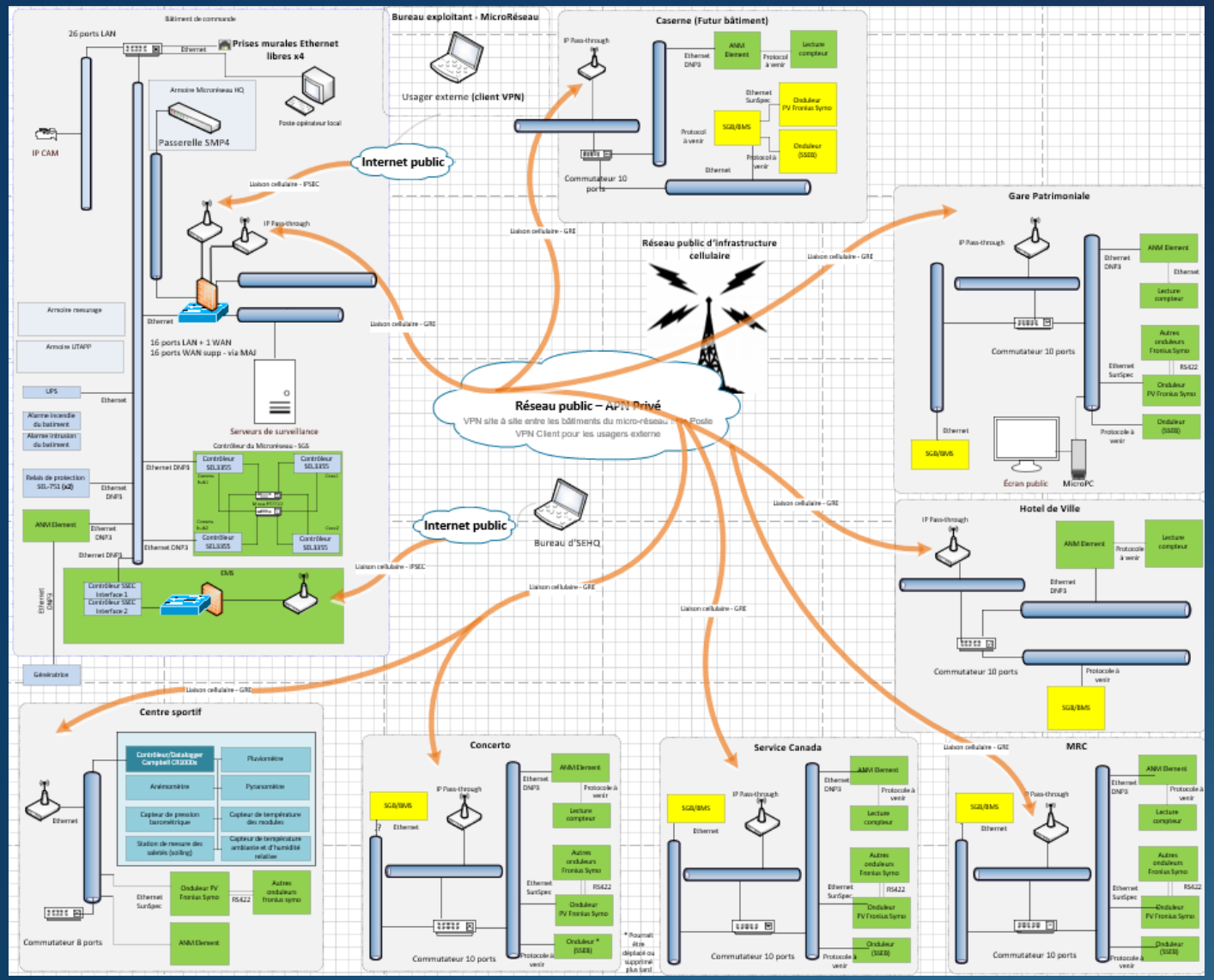
- Planned islanding (seamless)
- Resynchronization to the main grid (seamless)
- Black start
- Unplanned islanding (through blackstart)

The challenge is to perform these transitions in a closed way, similar to a transfer switch, but at the scale of a microgrid, involving several sources and several customers and at medium voltage.

Microgrid telecom architecture

Inside the microgrid :

- Direct or cellular links between building controls (local PV and ESS) and gen sources (centralized PV, ESS and Dgen) using private APN network
- Firewall and gateway between microgrid network and Hydro-Québec network
- Fiber optic link between microgrid control and synchro. relay



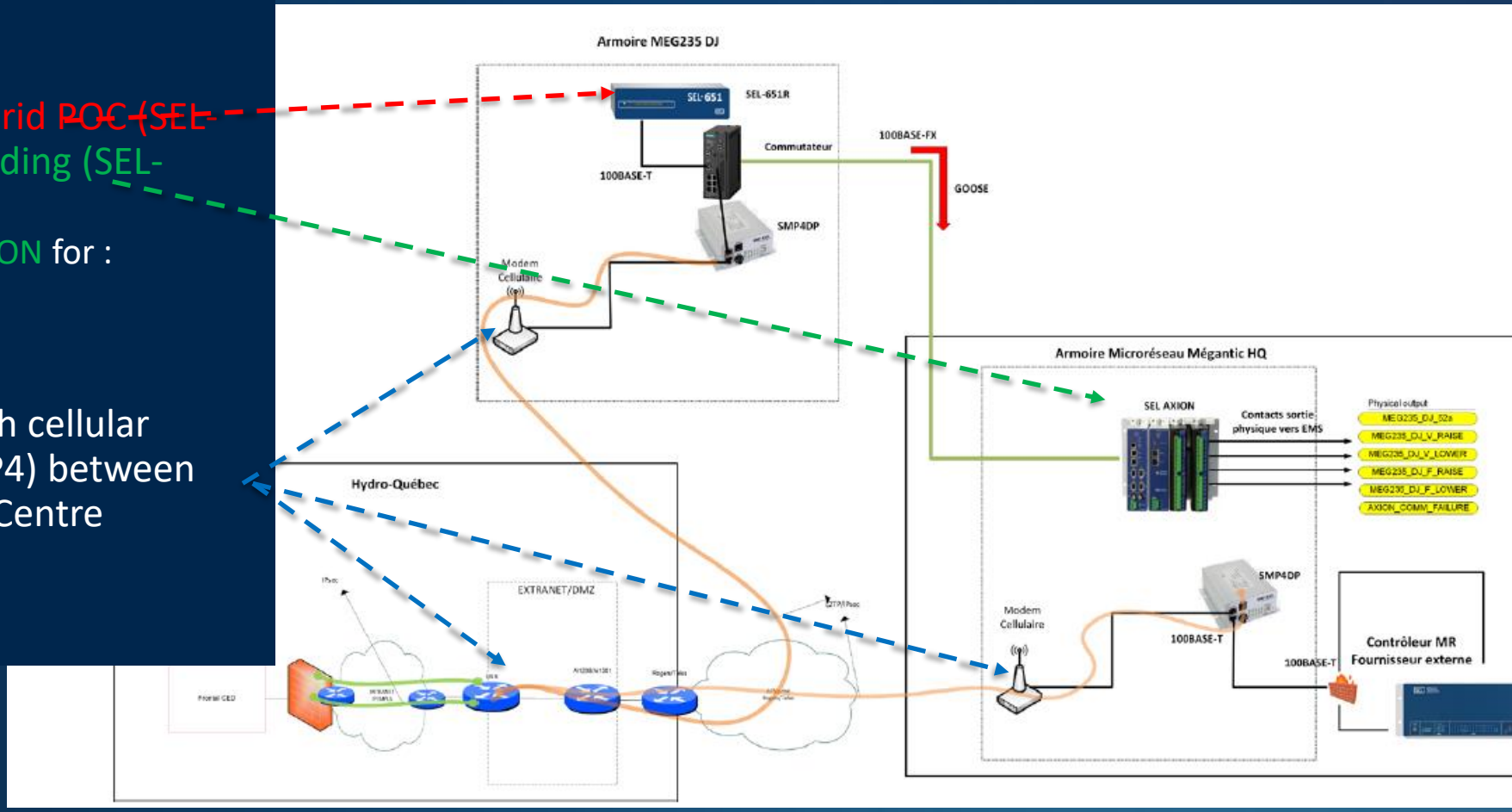
Microgrid telecom architecture

Communication between the POC and the microgrid :

- Specific fiber optic between microgrid ~~POC (SEL-~~ 651R) and microgrid command building (SEL-AXION)

  Comms between SEL-651R and SEL-AXION for :
  - V and F low/raise
  - Open/close status of the breaker

- General Hydro-Québec network with cellular communication using gateway (SMP4) between various grid devices up to the CED (Centre d'Exploitation du Distributeur)



Islanding at Lac-Megantic microgrid

⇒ Microgrid controler is using centralized battery in grid forming mode, PV generation and demand response to optimize islanding duration.

Technical challenges

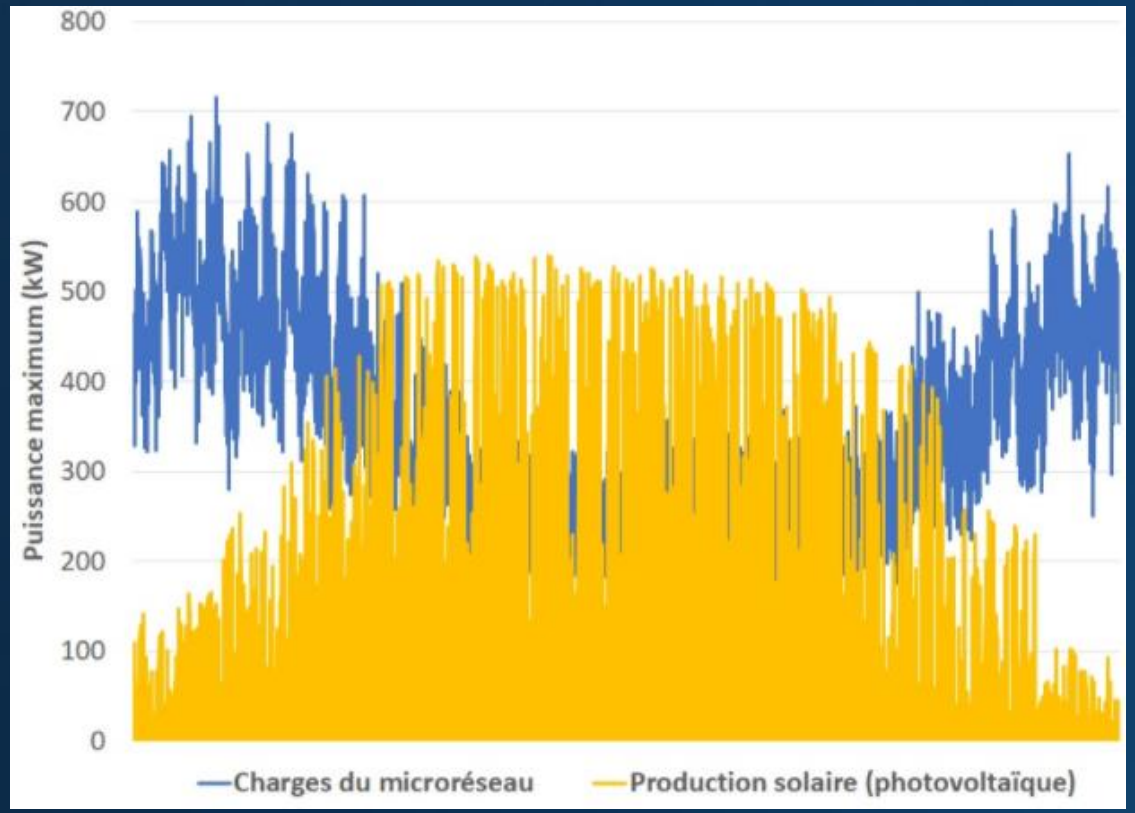
- Maintain **good power quality** in the islanded grid (medium to low voltage)
- Coverage of **short circuits** up to the customer's electrical panels
- **Distribution of microgrid intelligence** across multiple systems and equipment

Health and safety challenges

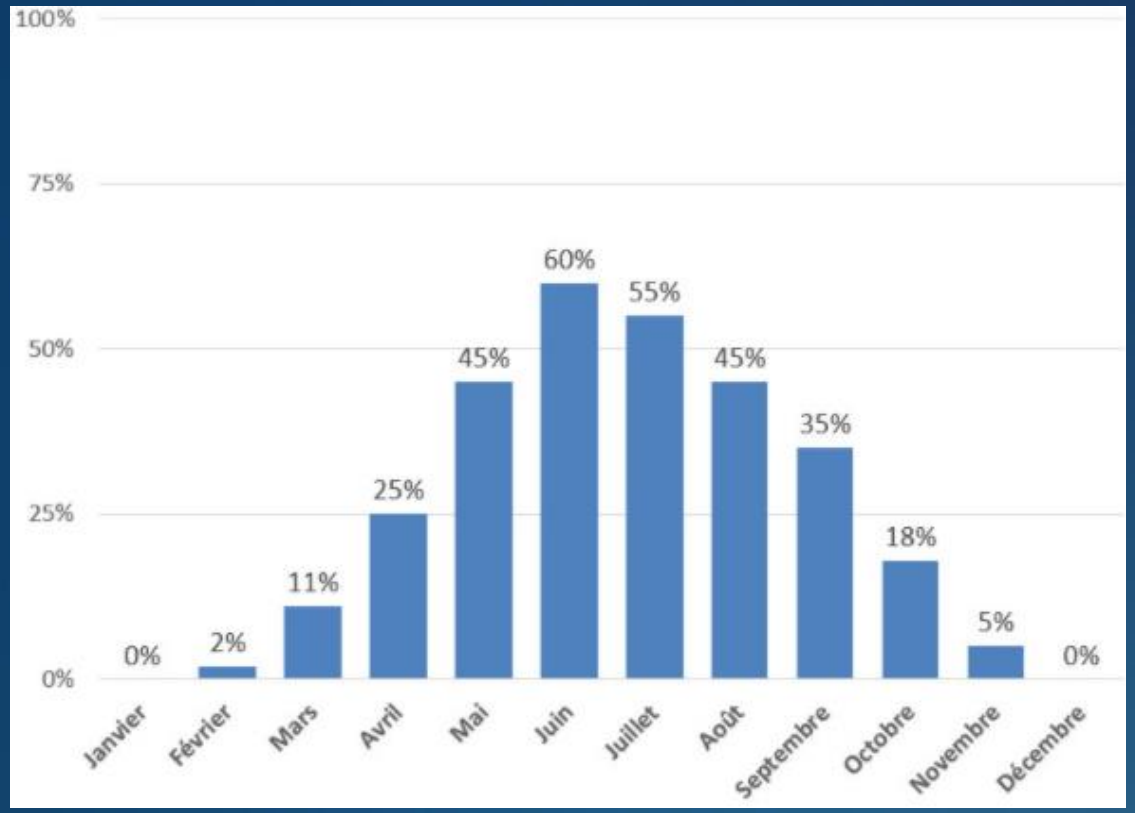
- Do not interfere with HQ work patterns

Islanding capacity

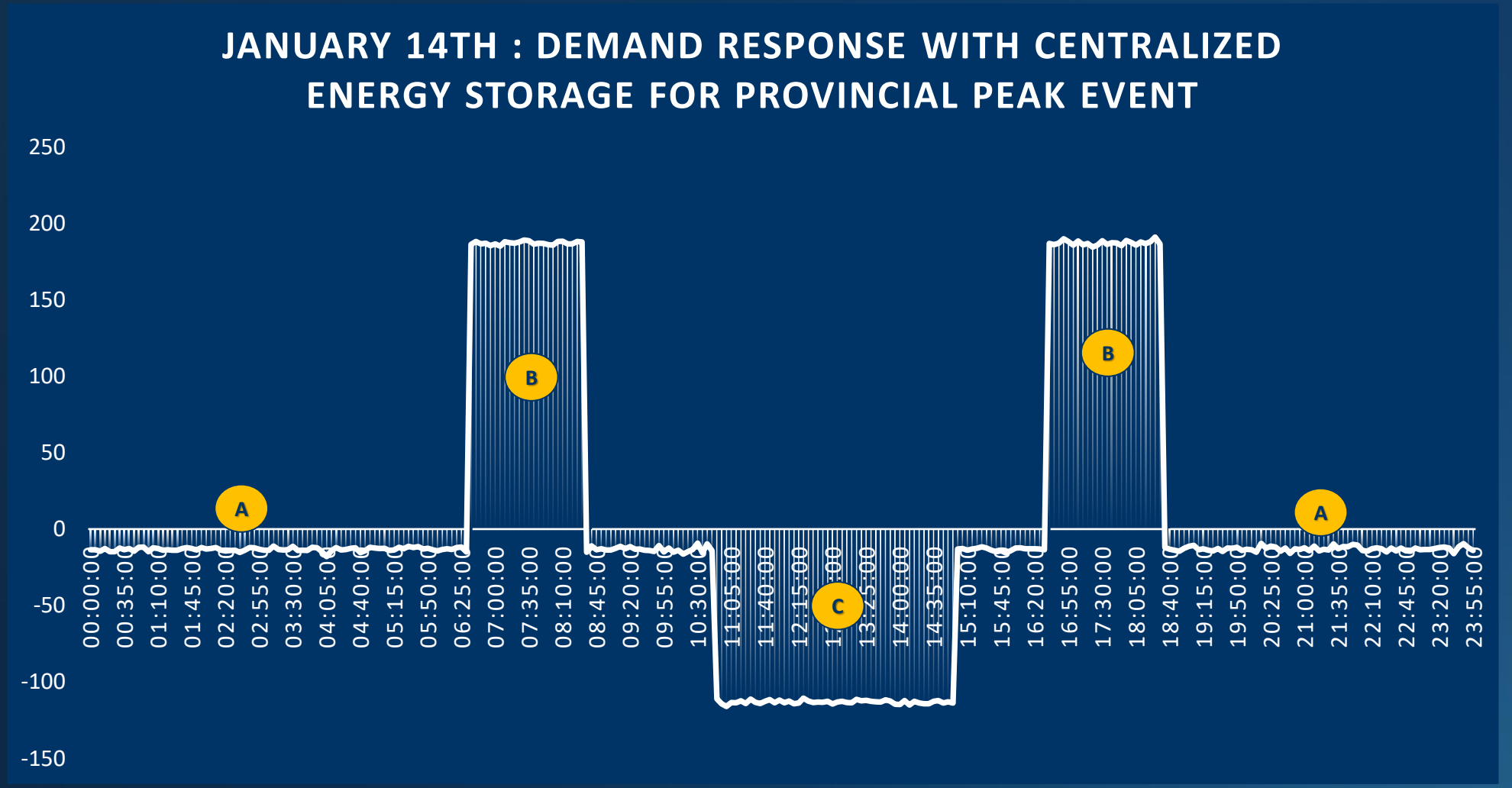
Load and PV generation



Islanding capacity (> 6 hours)

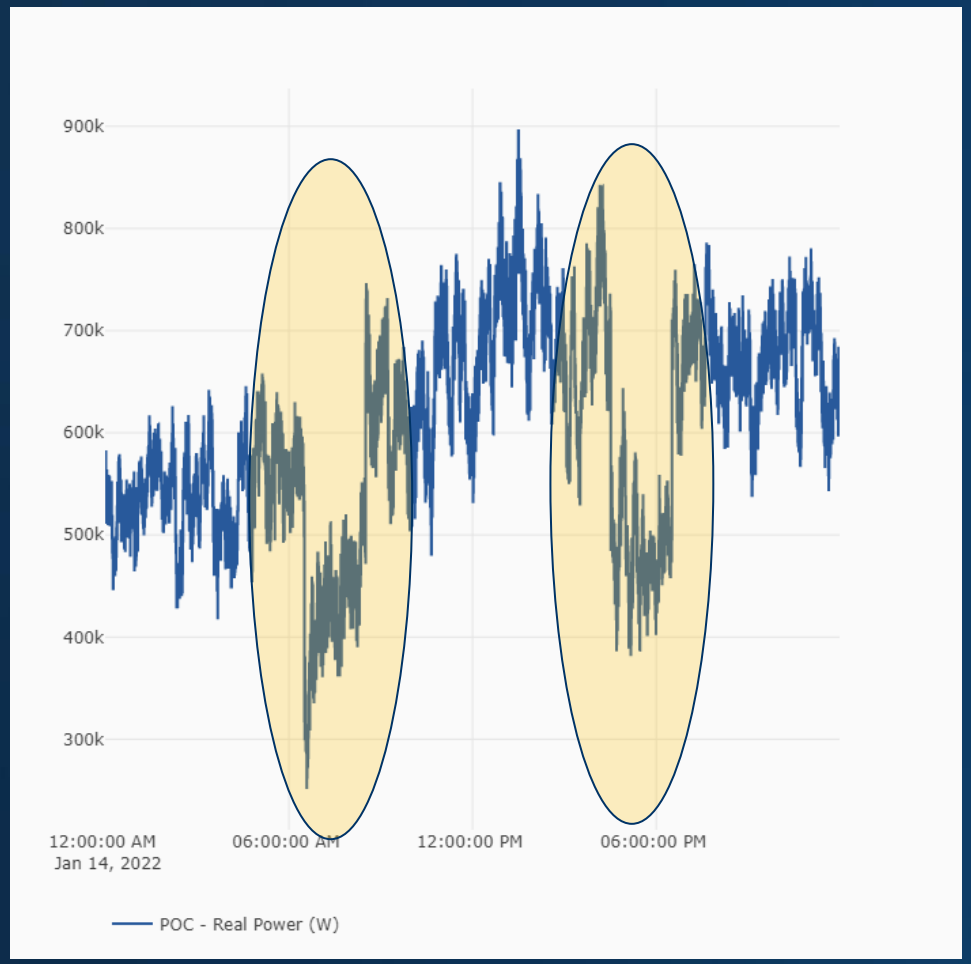


Winter use case: Demand Response

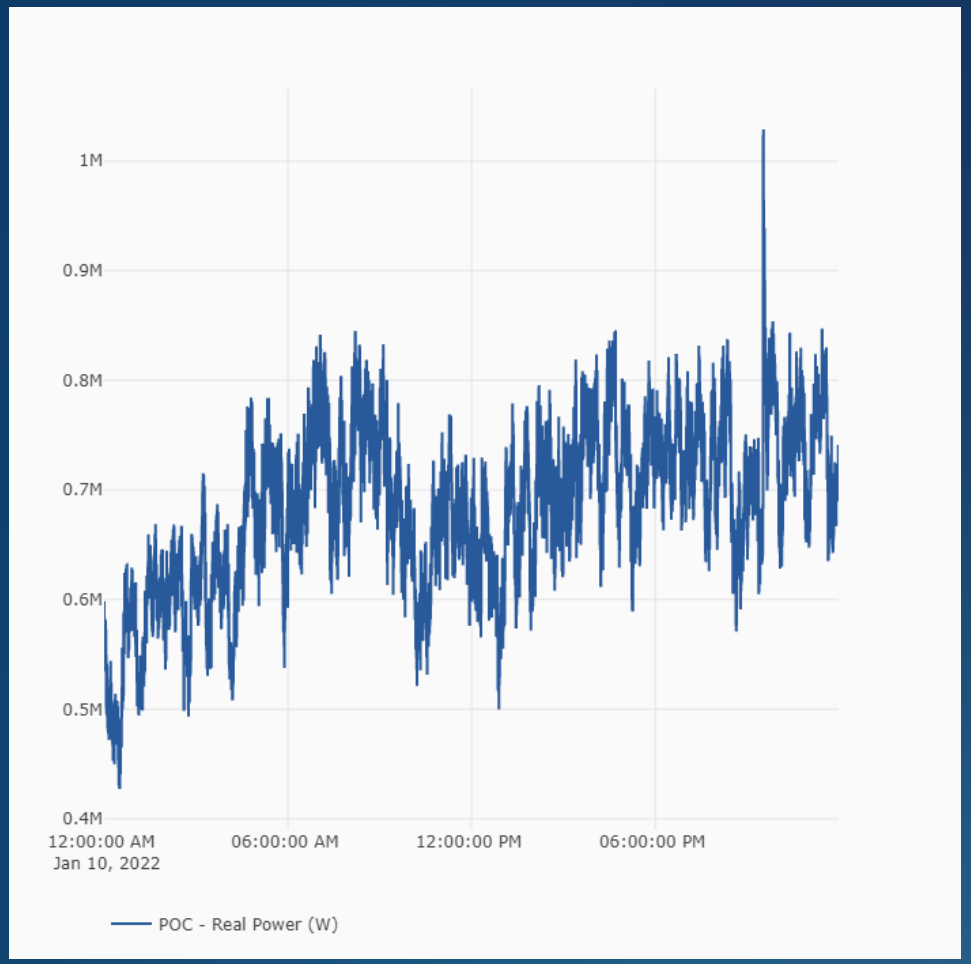


- **A** Auxiliary services consumption
- **B** 200kW of battery discharge
- **C** Battery charging for upcoming demand response event

Winter use case: Demand Response



A Day with demand response event



B Day without demand response event

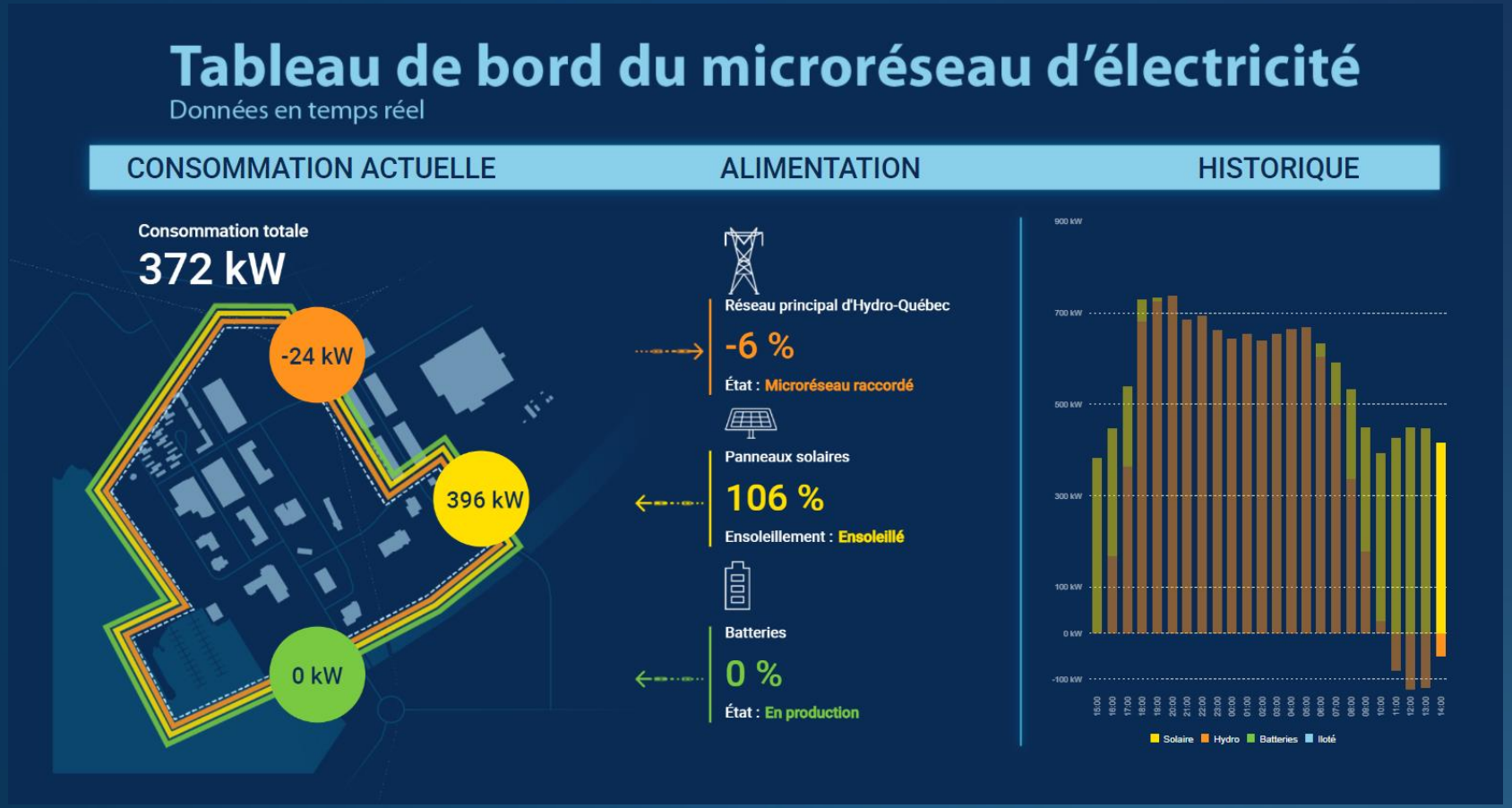
Microgrid dashboard

Dashboard - Real time data

High microgrid PV generation => flow back to the main grid

Battery used mainly for :

- peak shaving
- islanding



Thank you!

Questions?

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