NEW ELECTRIC THERMAL STORAGE FURNACE FOR SPACE HEATING - CASE STUDIES FOR THE CI MARKET

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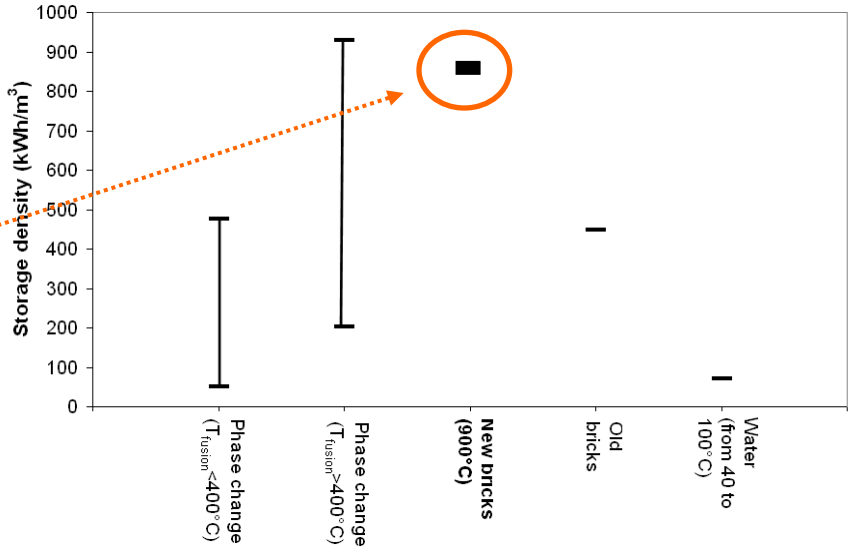
Hydro Québec

Hydro-Québec

- **winter-peaking utility**
  - installed capacity: 36 810 MW
  - 2009 peak demand: 37 230 MW
- **3.96 M customers**
  - 3.65 M residential
  - 300 000 CI

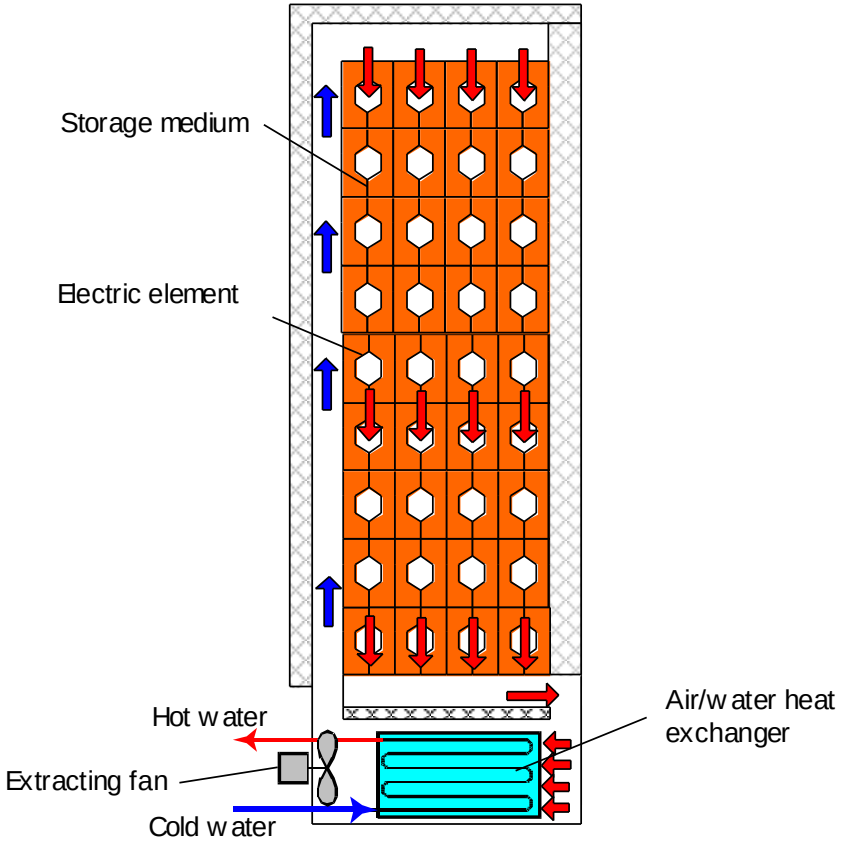
electric thermal storage (ETS) – new furnace

- **old idea ...**
- **new product !**
  - new bricks
    - 859 kWh/m^3
    - made from waste material
  - new electric element
    - higher storage temperature
      900 °C instead of 600 °C
  - new furnaces
    - smaller than previous ones
    - hydronic or forced air



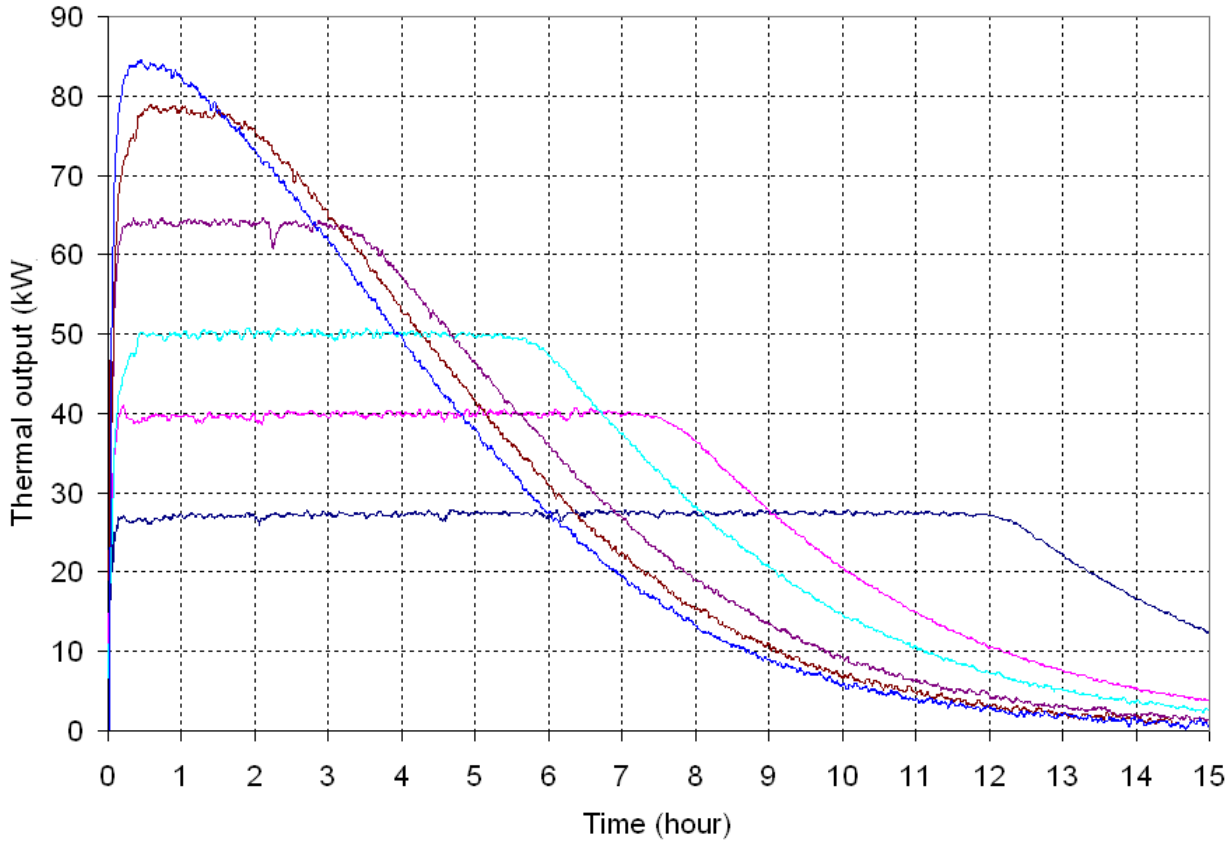
electric thermal storage (ETS) – new furnace

- **hydronic version**

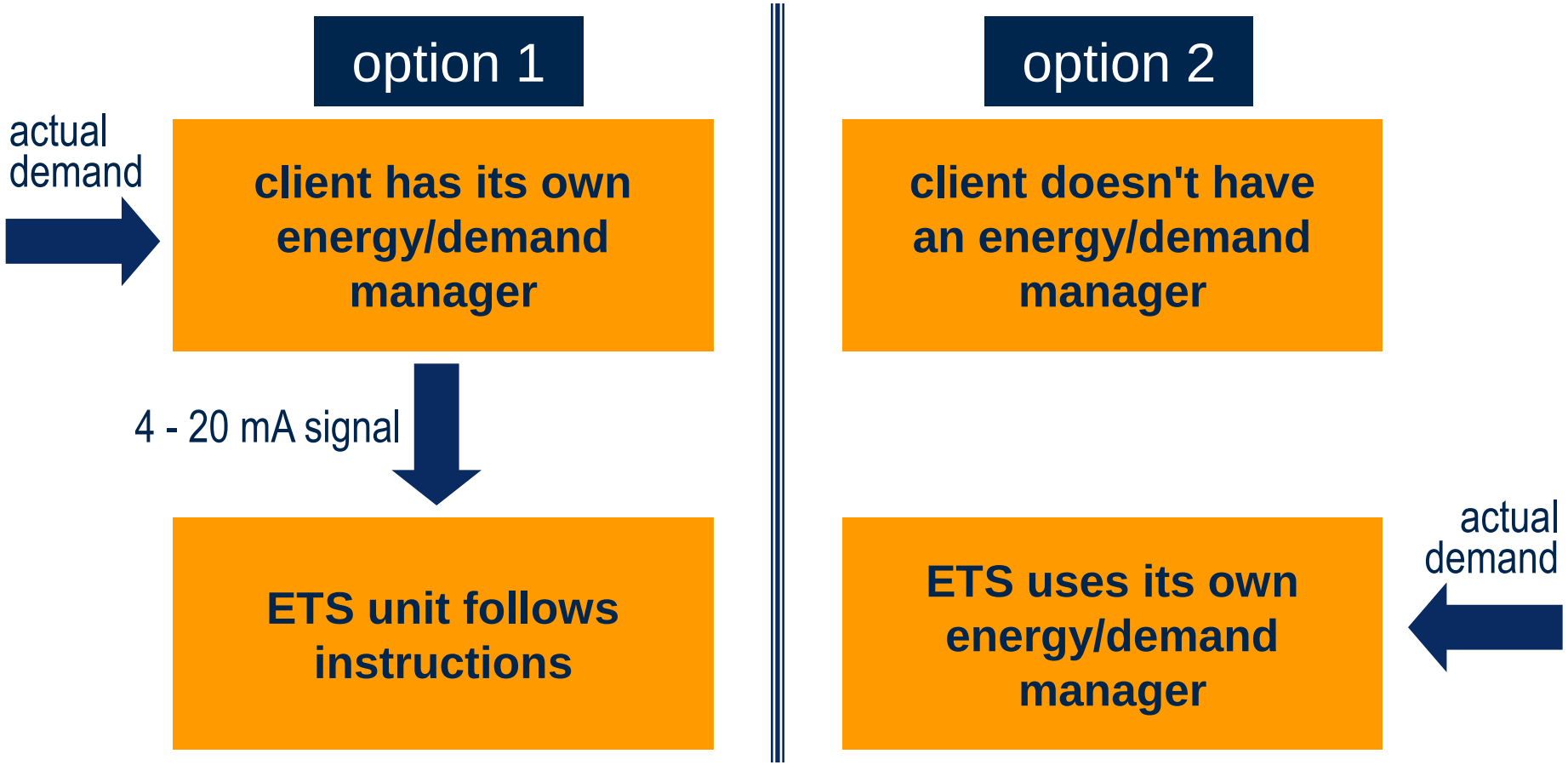


electric thermal storage (ETS) – thermal output

- **thermal output; 80 kW_{elec} hydronic**



electric thermal storage (ETS) - control



electric thermal storage (ETS) - control

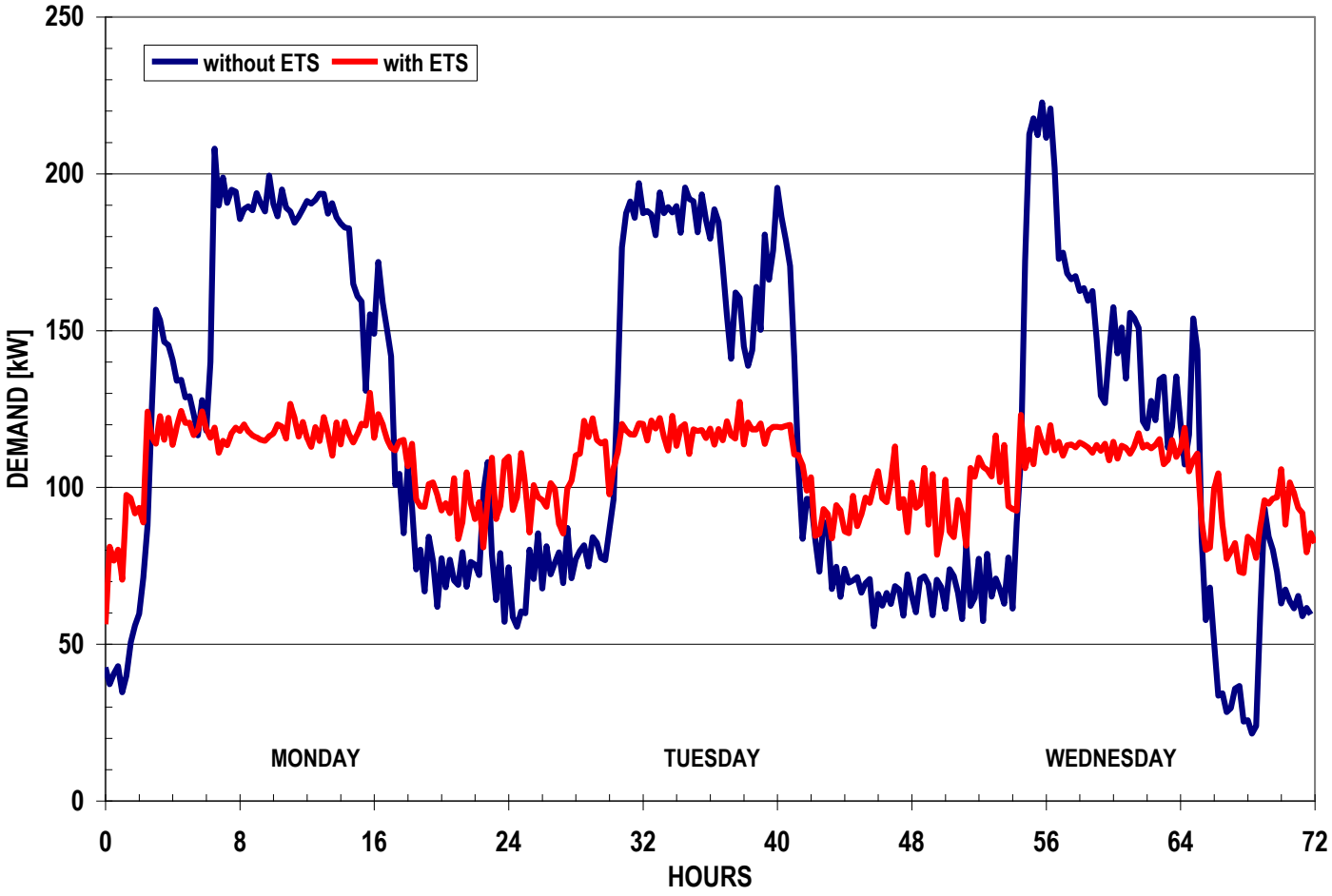
- **ETS' controller**
  - equipped with additional relays for external loads
  - electric elements controlled by SCR
  - BacNet compatible

forced air case study

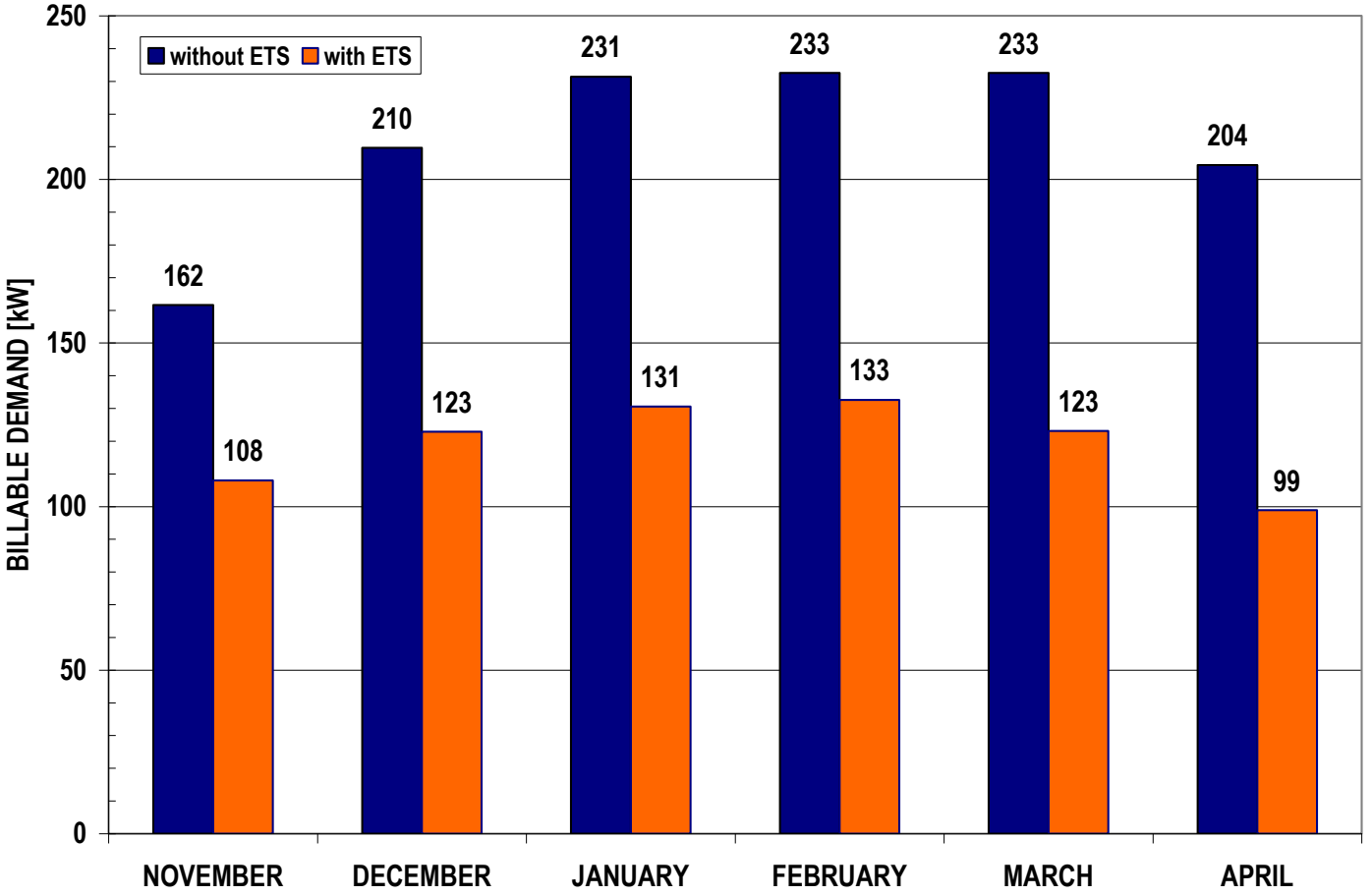
- **elementary school (Quebec City)**
  - all-electric building; resistive elements in air ducts
  - goal: to decrease its peak demand & electricity bill
  - night & weekend setbacks (pickup at 6h30 on weekdays)

- **ETS: model 8150**
  - 53 kW_{elec}
  - 320 kWh

forced air case study –demand profiles



forced air case study – monthly demand



forced air case study – ETS impact

- **ETS impact**
  - demand:
    - maximum monthly demand decreased, on average, by 93 kW
    - allowed client to switch rate category
  - financial:
    - before ETS: electricity = $42 236 / year
    - after ETS: electricity = $32 795 / year
    - savings = $9 441 per year
    - payback = 1.9 years

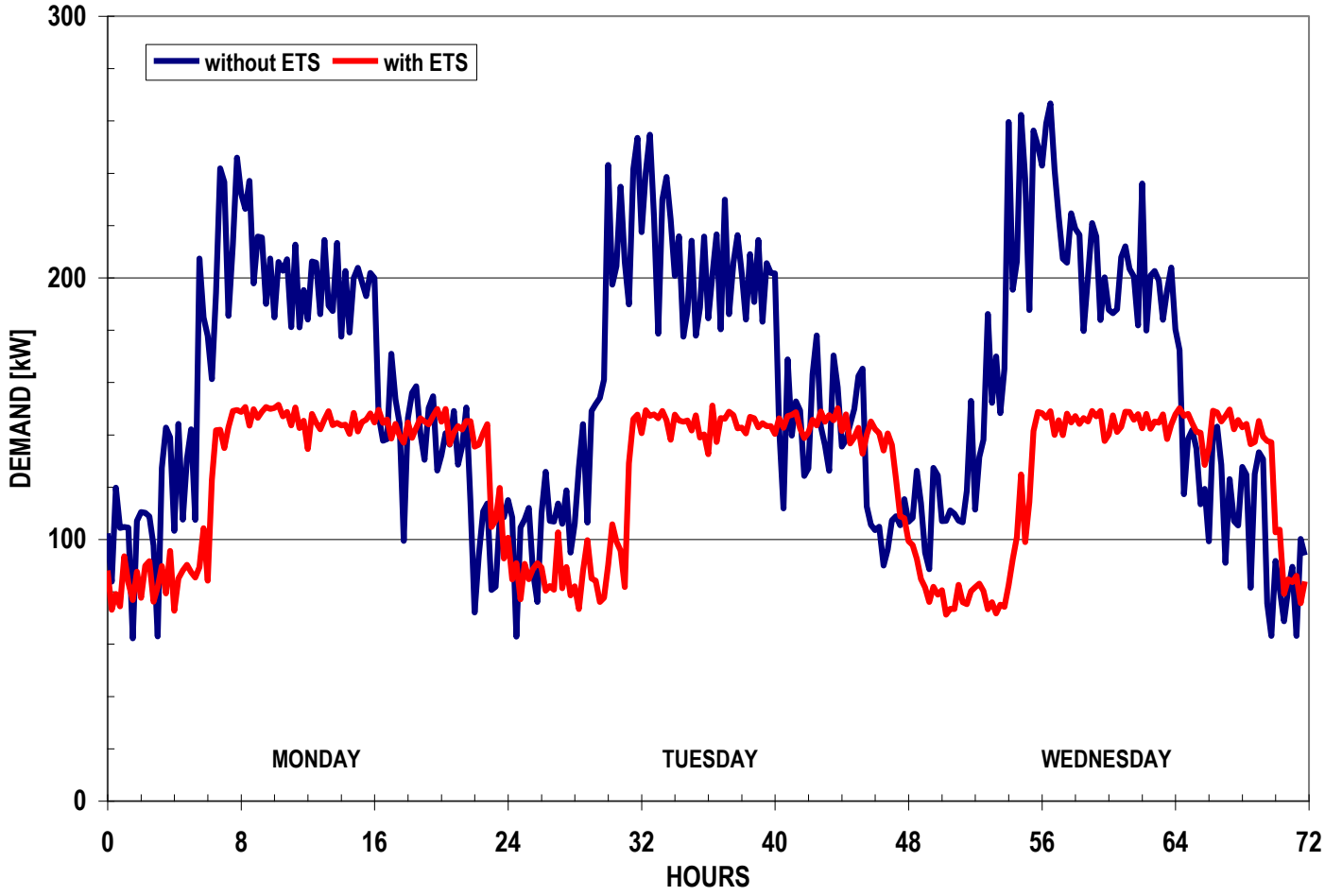
hydronic case study

- **elementary school (Quebec City)**
  - goal: to decrease its peak demand & utility bill
  - electric boiler
    240 kW

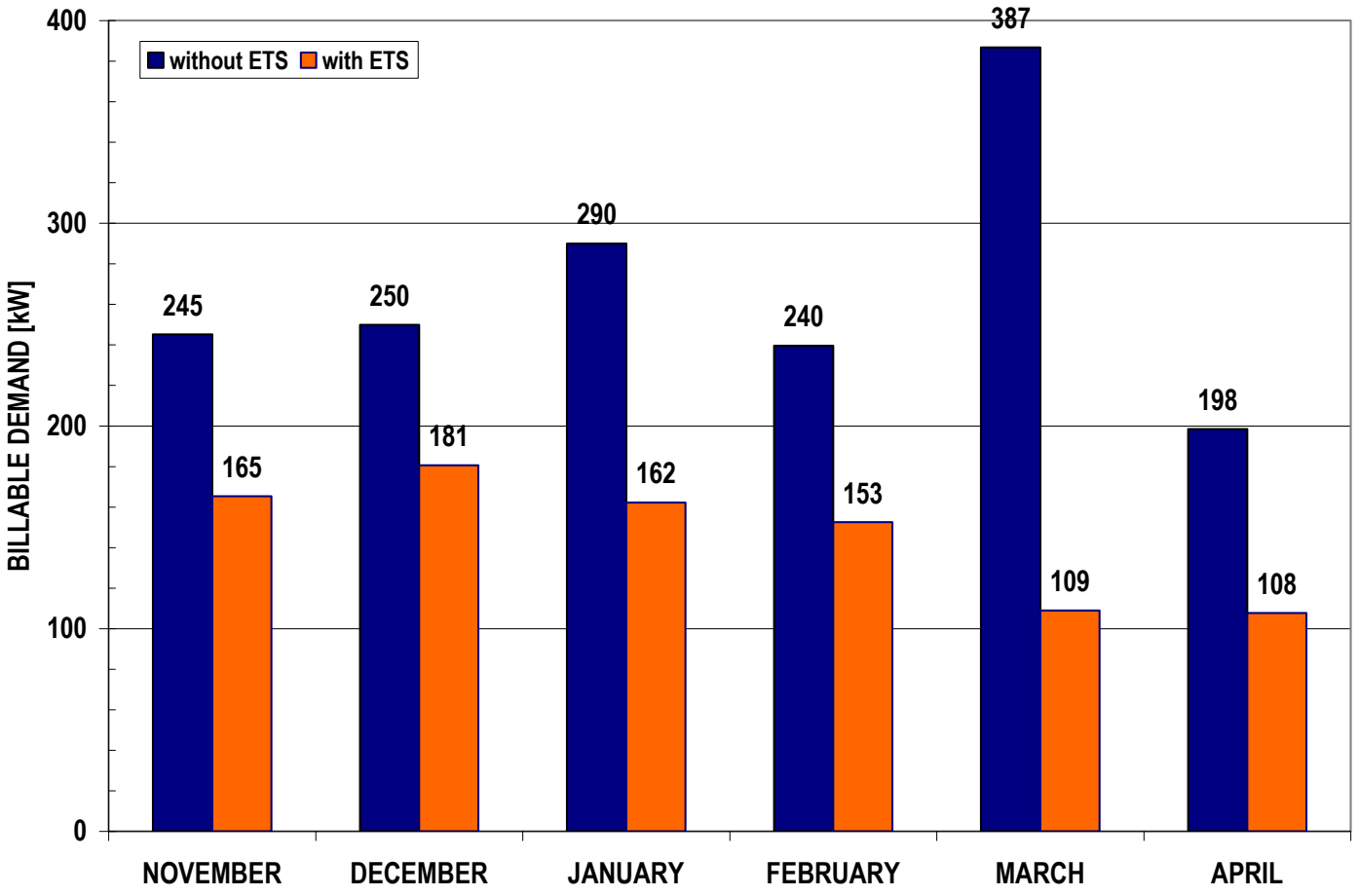
hydronic case study

- **ETS: model 9180**
  - 80 kW_{elec}
  - 480 kWh

hydronic case study –demand profiles



hydronic case study – monthly demand



hydronic case study – ETS impact

- **ETS impact**
  - demand:
    - maximum monthly demand decreased, on average, by 91 kW
    - allowed client to switch rate category
  - financial:
    - before ETS: electricity = $65 195 / year
    - after ETS: electricity = $41 496 / year
    - savings = $23 700 per year
    - payback = 1.4 years

conclusion

CLIENT	APPLICATION	VERSION	CAPACITY	GOAL	PAYBACK PERIOD
Indoor Ice Rink	central heating	forced air	80 kW	switching from gas	4.7 years
Hospital	fresh air preheating	forced air	106 kW + 80 kW	additional capacity + switching from gas	4.5 years
Zoo (2 buildings)	fresh air preheating	forced air	53 kW + 53 kW	new buildings	3.3 years
Residential and Commercial Building	fresh air preheating	forced air	106 kW	new installation	2.6 years
Elementary School	central heating	forced air	53 kW	decrease peak load	1.9 years
Elementary School	gymnasium heating	forced air	53 kW	decrease peak load	6.0 years
High School	fresh air preheating	forced air	80 kW	decrease peak load	3.9 years
Elementary School	central heating	hydronic	80 kW	decrease peak load	1.4 years
Community Center	central heating	hydronic	2 x 80 kW	decrease peak load avoid adding gas boiler	3.5 years
High School	central heating	hydronic	3 x 80 kW	decrease peak load	2.7 years
Office Building	central heating	hydronic	4 x 80 kW	decrease peak load	3.4 years

applications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