ICEBAT
ICE THERMAL STORAGE

TECHNOLOGY OVERVIEW

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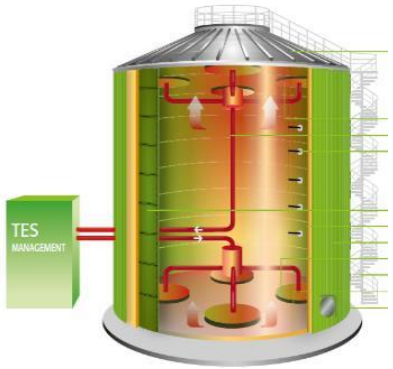
LATENT STORAGE PRINCIPLE

Sensible Storage

Water
(liquid)

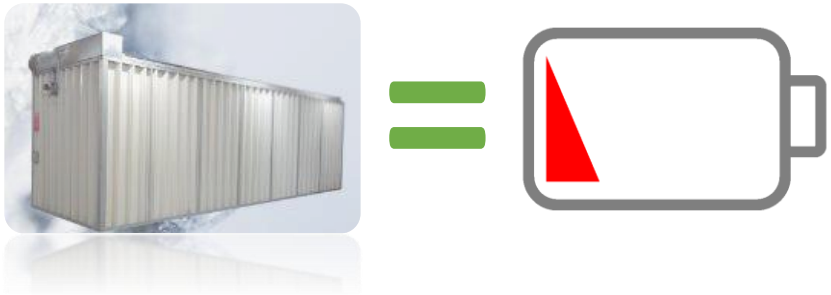


Latent Storage
By phase change in water

Water-Ice
(solid)

8 times more energy with latent heat Vs sensible heat storage

ICEBAT Latent Storage : transforming liquids into solids



- To store cold water is transformed into ice around the heat exchangers in either Fast or Modulating Charge Mode
- To release the stored energy ice is melted in either Fast Discharge or Modulating Discharge Mode

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ICEBAT Operational Benefits

Reducing energy costs via Low-Cost Tariffs

Reduce Mechanical Plant Capacity

Increase Resilience & Contingency levels

Enable Carbon Reduction from Cooling

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APPLICATIONS

Air conditionning

Commercial
- Shopping centers
- Hotels
- Hospitals
- Offices
- Workshops, cleanrooms
- Manufacturing areas
- Data Center

Public
- Cinemas, theaters,
- Museum, worship places
- Swimming pools, Stadiums
- Airports
- Universities
- Exhibition centers
- Subway/Train stations

Refrigeration

Agro-Industry
- Logistic, storage
- Cleaning,
- Sterilization, pasteurization

Supermarkets
- Refrigeration plant subcooling
- Sales area Dehumidification
- Shopping mall Air conditioning

Pharma, chemicals, biotechnologies
- Manufacturing process
- Safe storage
- Emergency needs
- temperature stabilization

Cooling networks
- District cooling

IceBat Capacities from 150 kWh to +60 MWh

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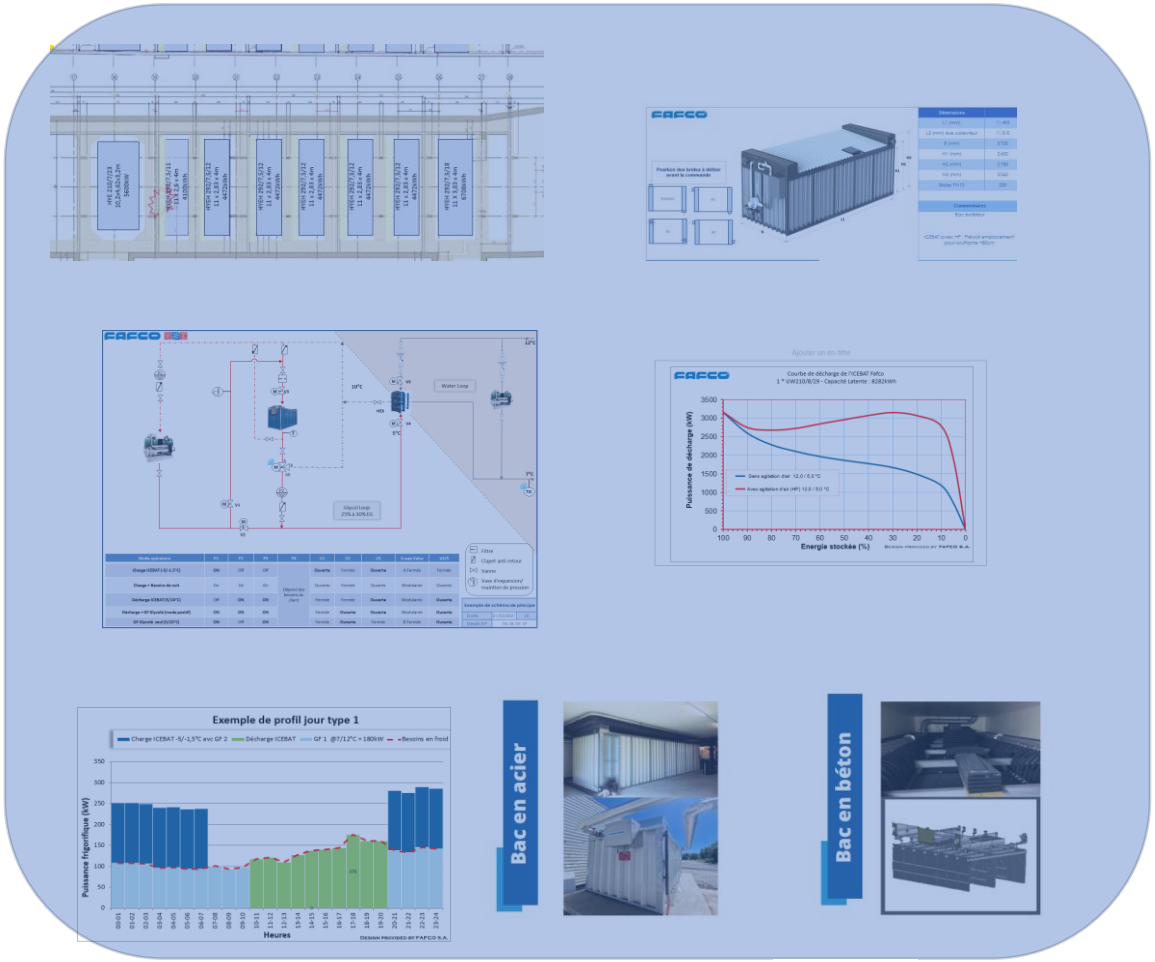
ENGINEERING & SUPPORT

- ✓ *Design and innovation engineering support*
- ✓ *Pre-sales studies and engineering*
  - *Tailor-made design of ICEBATs with layout assistance*
  - *Thermal and hydraulic calculations*
  - *Definition of dedicated architectures (steel or concrete) adapted to environmental condition*
  - *Economic and Payback calculations**
- ✓ *After-sales service and maintenance*



*** Depending on the information received by the client/end user/designer**

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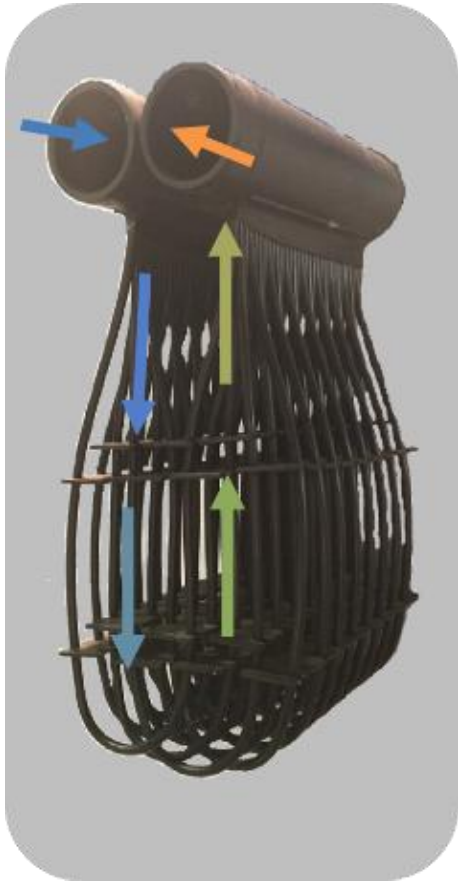
ICEBAT : EXCLUSIVE TECHNOLOGY

- ✓ *Patented Polypropylene heat exchangers*
  - *Large exchange surface and small spacing*
  - *High mechanical and chemical resistance*
  - *Low pressure drop*
  - *Vertical construction for optimum reinforced natural convection*
  - *Modular construction*
  - *Low glycol volume required*
- ✓ *Controlled charges and discharges*
  - *Full charge from -5°C*
  - *Charge in a very short time (Fast or Modulating Mode)*
  - *Flexible discharge time from +0.5°C (Fast or Modulating Mode)*
- ✓ *Minimum heat loss < 1% per day*
- ✓ *0 to 100% charge level monitoring*
- ✓ *Proven quality*
  - *40 years' experience*
  - *100% of heat exchangers are tested and approved*



Layer of ice forming around the heat exchanger tubes.

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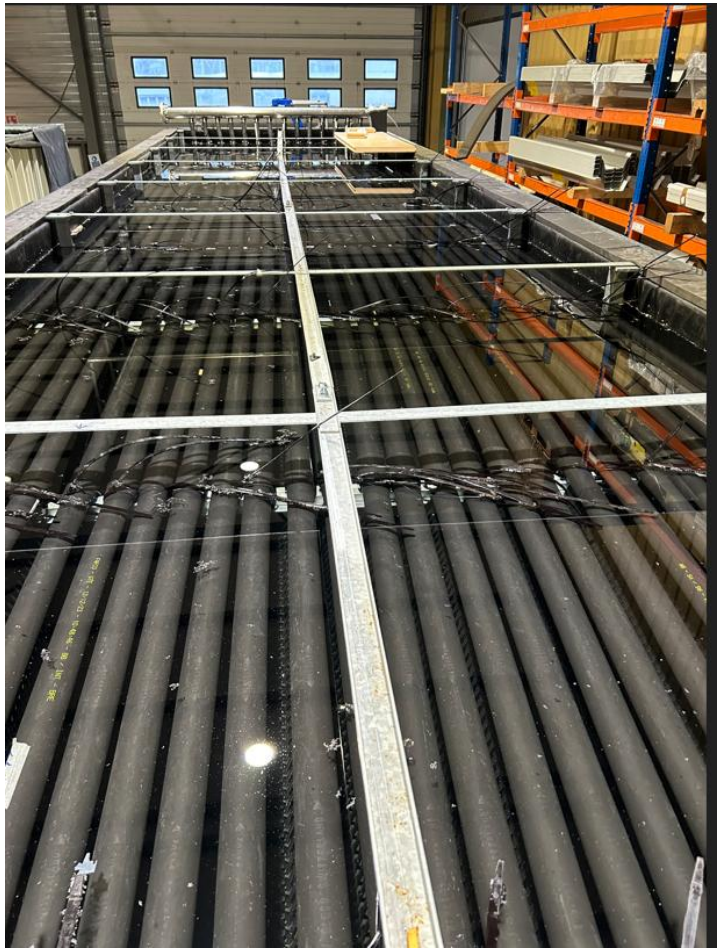
ICEBAT – UW 210 / 6 / 14 - CAPACITY 3 MWh



Lines of exchangers

Glycol water Manifold & pipes to connect the exchangers

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3D Cross Section

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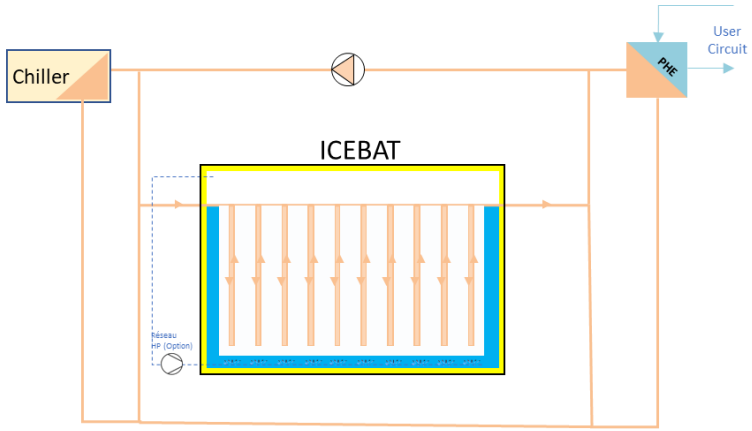
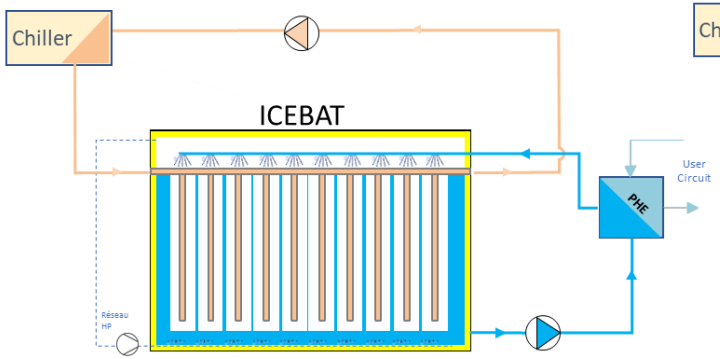
TYPES OF STORAGE - ICEBAT

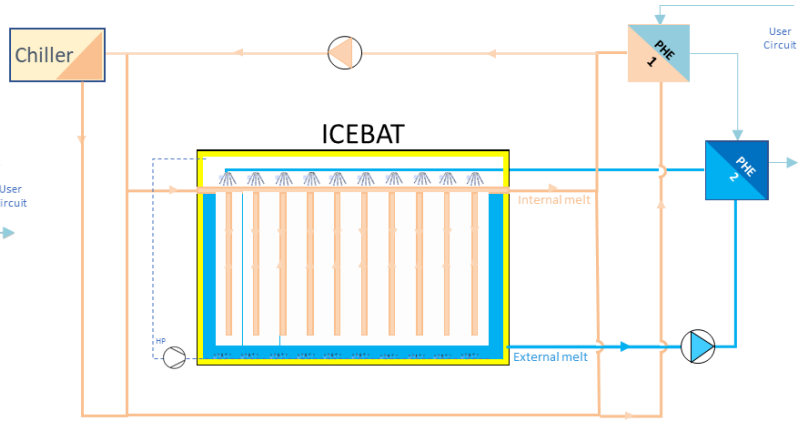
ICEBAT	Main applications	Charging time	Discharging time
1 **UW** Internal melt	Air conditioning for commercial, office, or public buildings...	6-8 hours from -5°C	6 to 8 hours Discharge temperature >= 3°C
2 **XM** External melt	Food industry, fine chemicals, pharmaceuticals, cosmetics...	6-8 hours from -5°C	discharge in 3 hours minimum deliver water @ 0.5°C
3 **HYE** hybrid internal & external combinated melt	Industry District cooling network Data centres, ...	6-8 hours from -5°C	Complete discharge in less than 1 hour Cooling power multiplied by 10



Internal melt



External melt



Hybrid melt

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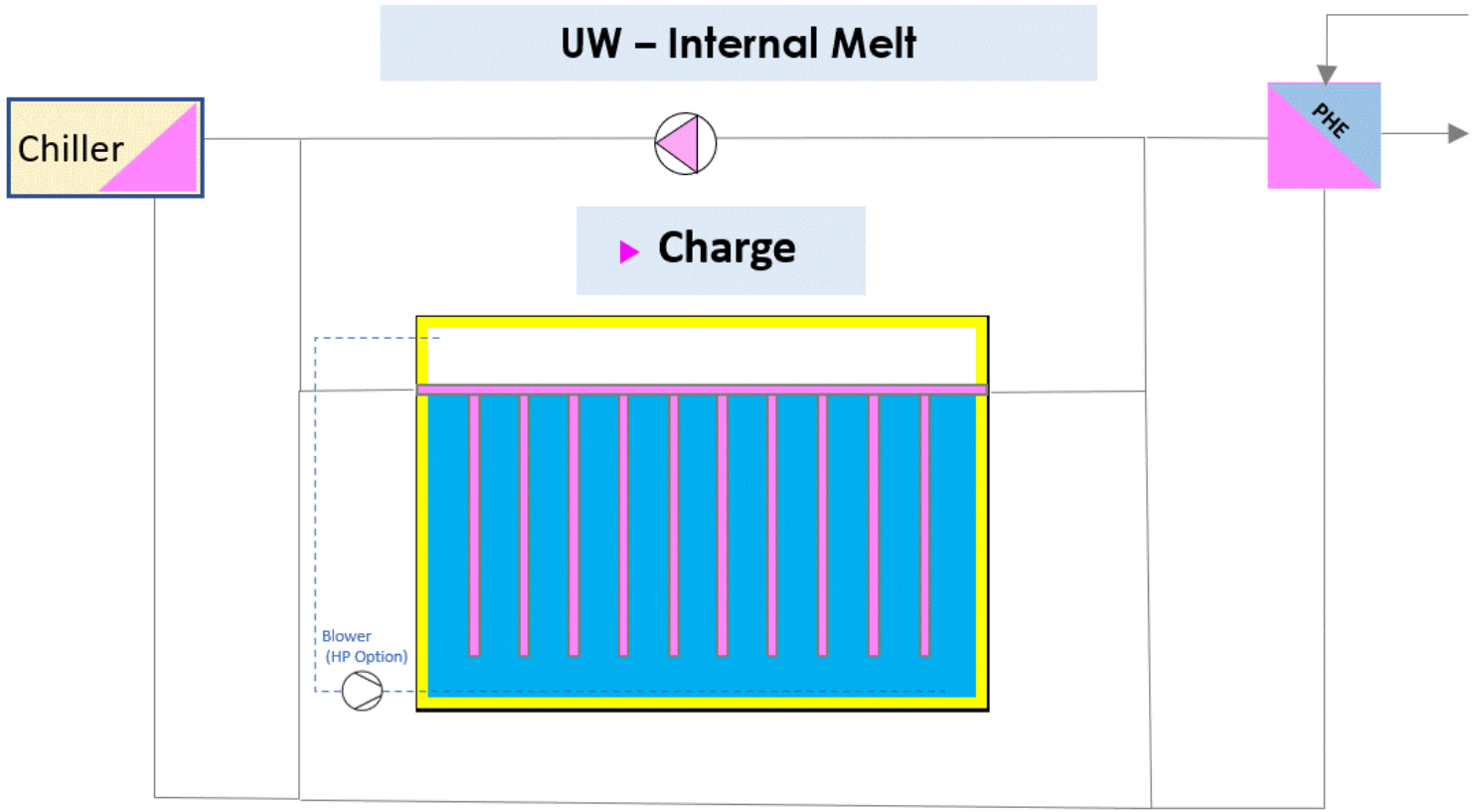
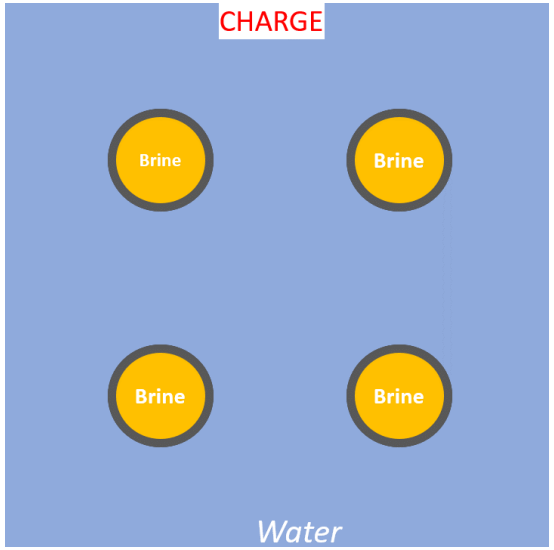
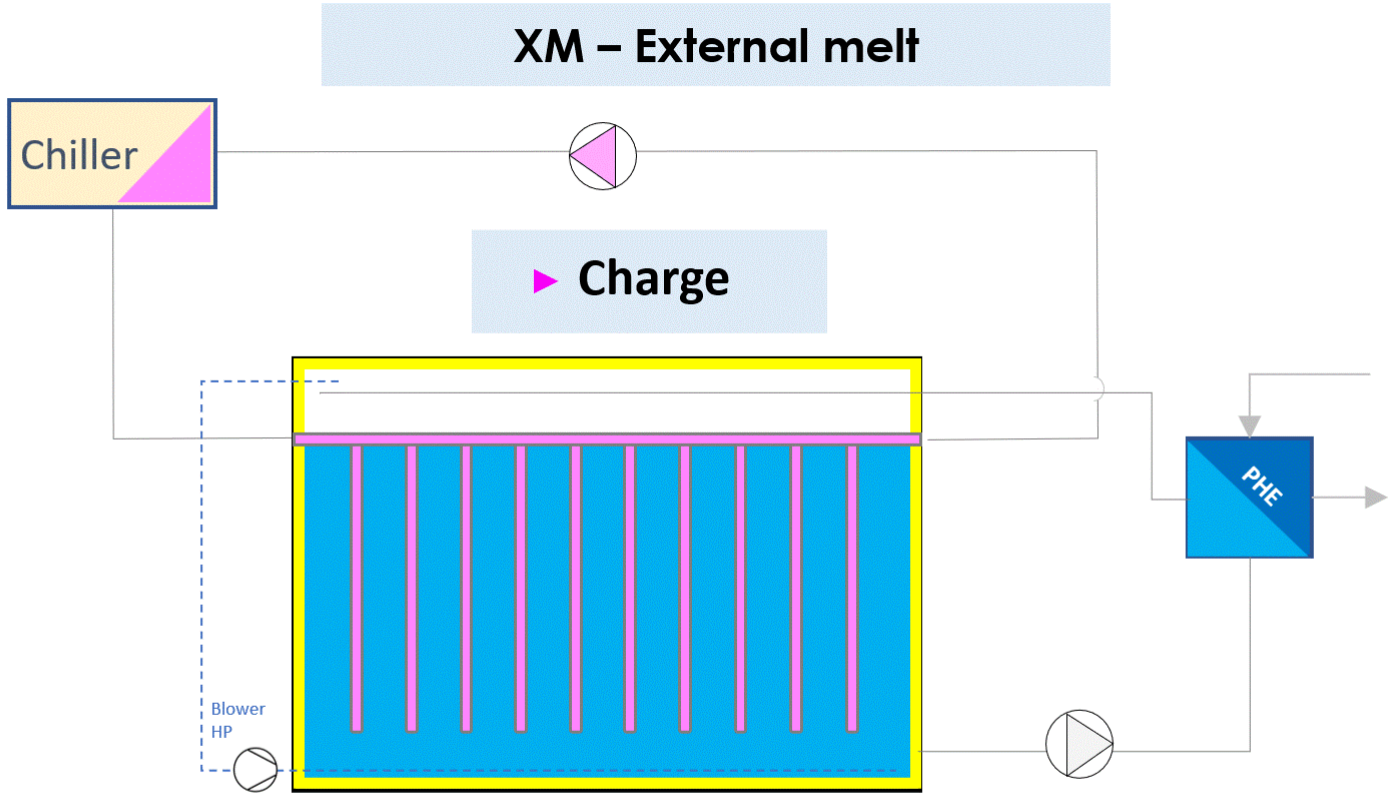
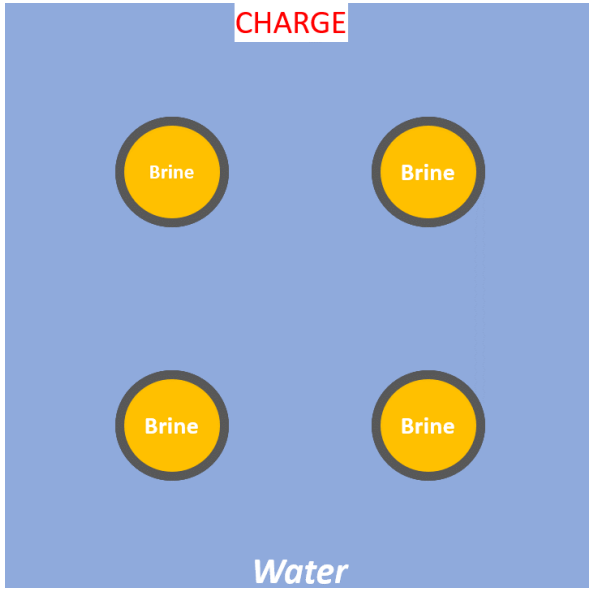
Internal Melt – UW



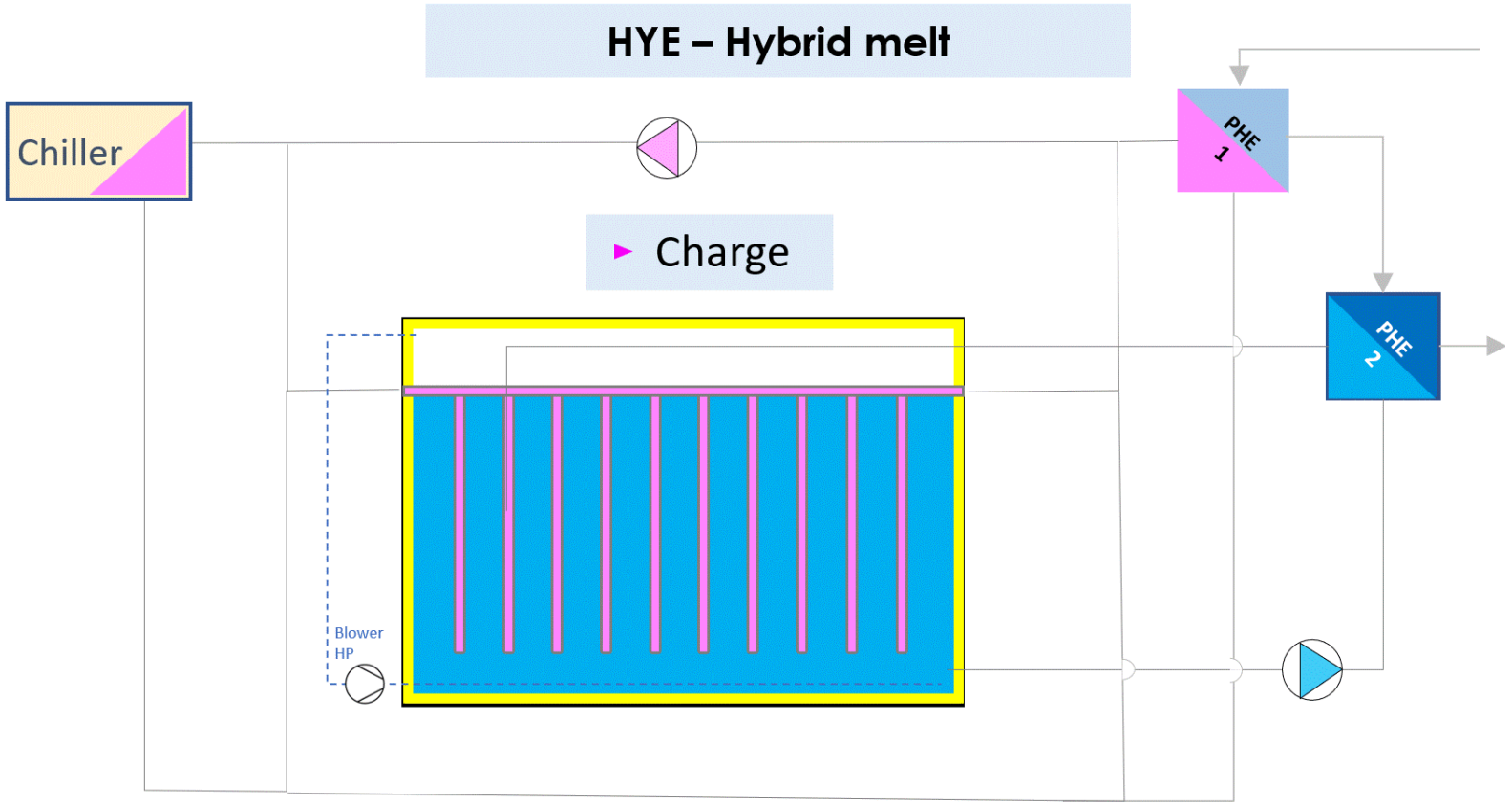


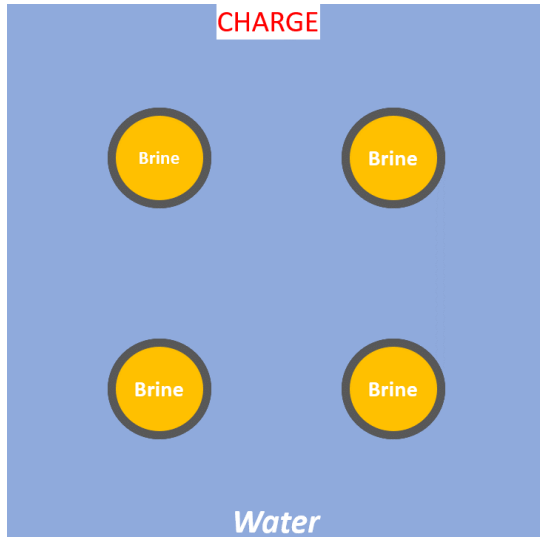
External Melt – XM





HYBRID MELT– HYE





Example ICEBAT Capacity 4 MWh

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