



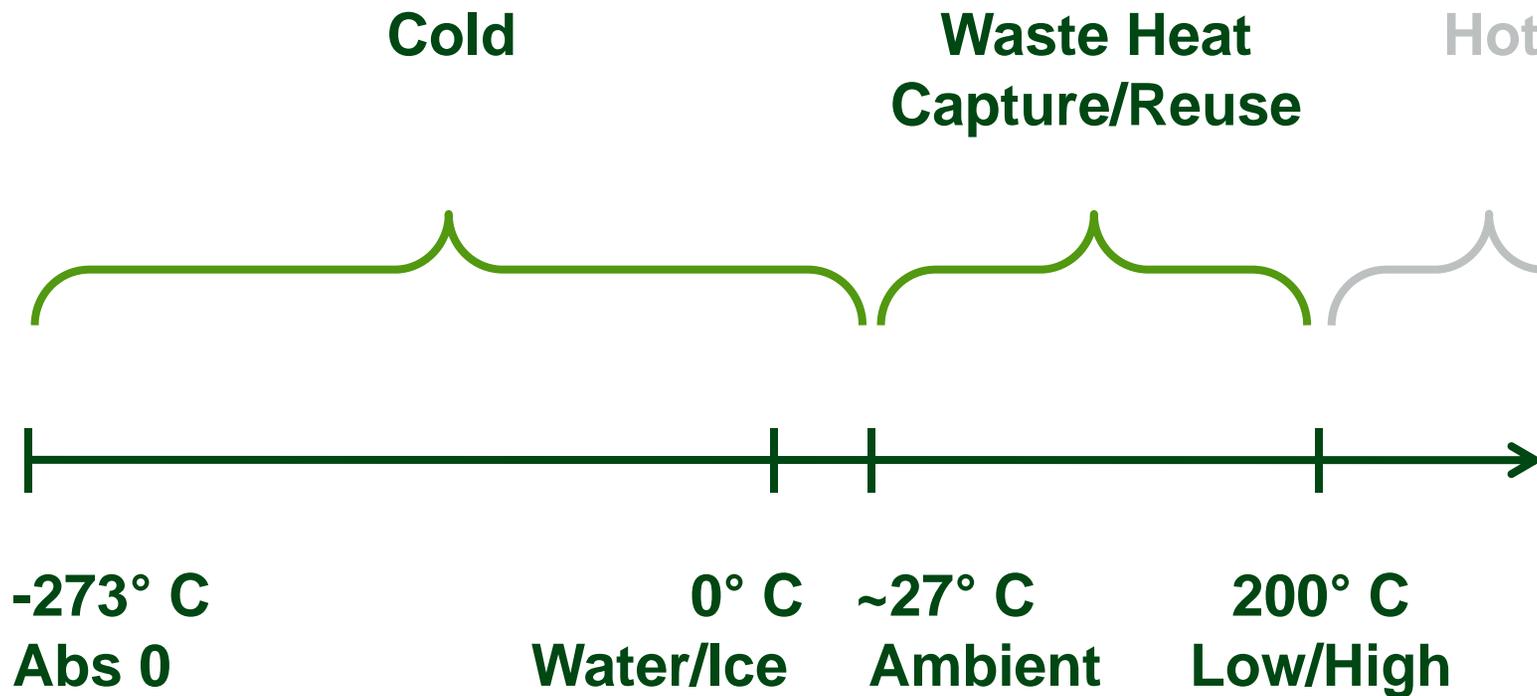
HIGH DENSITY THERMAL STORAGE WORKSHOP

BREAKOUT REPORT

LOW TEMPERATURE SYSTEMS

www.arpa-e.energy.gov

2 REGIMES



TOP APPS



- Buildings (human temps)
 - Increase Thermal mass
 - Load shifting and peak shaving (AC or heat)
 - District heating
- Energy Harvesting
 - Use locally, limited distribution
 - Or pool and
 - Upconvert (what app? Desalination)
 - Transport to homes
- Vehicles (human temps or hot or cold)

COST TARGETS



- Storage (\$/kWh) vs Delivery (\$/kW)
 - Application Specific
 - # cycles very clear
 - Charge and discharge disaggregated
- Compare to alternative
 - Vs Natural Gas (makes the challenge high)
 - Vs electrical storage
 - Can we make a value added product?
 - Water purification

DUAL PURPOSE



- Retrofit vs new build?
- SIPS (Structurally Insulated Panels), PCM in drywall
- PCM in thermal insulation
- High porous zeolite to store
 - Mechanical
 - Thermal
 - Electrical Energy
 - Works like supercapacitor

BEYOND ICE?



- Old solution: ice slurries
- Ammonia hydrates
- Individual heat pumps in each room (ground source)
- 2 HXs is an issue for in room cold battery

HIGH IMPACT R&D TEAM & PROGRAM



- Team
 - HVAC
 - Computation
 - Architect / Vehicle designer
 - Thermochemical / Thermophysical
- Programs
 - Max 50% volume & mass increase, material to system
 - More aggressive better
 - Upconvert to high grade heat
 - Thermal tank cars highly insulated
 - Buildings, PCM (\$3/lb), in HVAC system
 - Energy Harvesting
 - Vehicles