HIGH DENSITY THERMAL STORAGE WORKSHOP

BREAKOUT REPORT

LOW TEMPERATURE SYSTEMS

www.arpa-e.energy.gov
2 REGIMES

Cold

-273°C
Abs 0

Waste Heat
Capture/Reuse

0°C
Water/Ice

~27°C
Ambient

200°C
Low/High

Hot
- **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