

# STORWORKS

P O W E R

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TRANSFORMING ELECTRICAL AND HEAT GENERATION  
WITH THERMAL ENERGY STORAGE

TMCES Workshop  
August 3, 2022

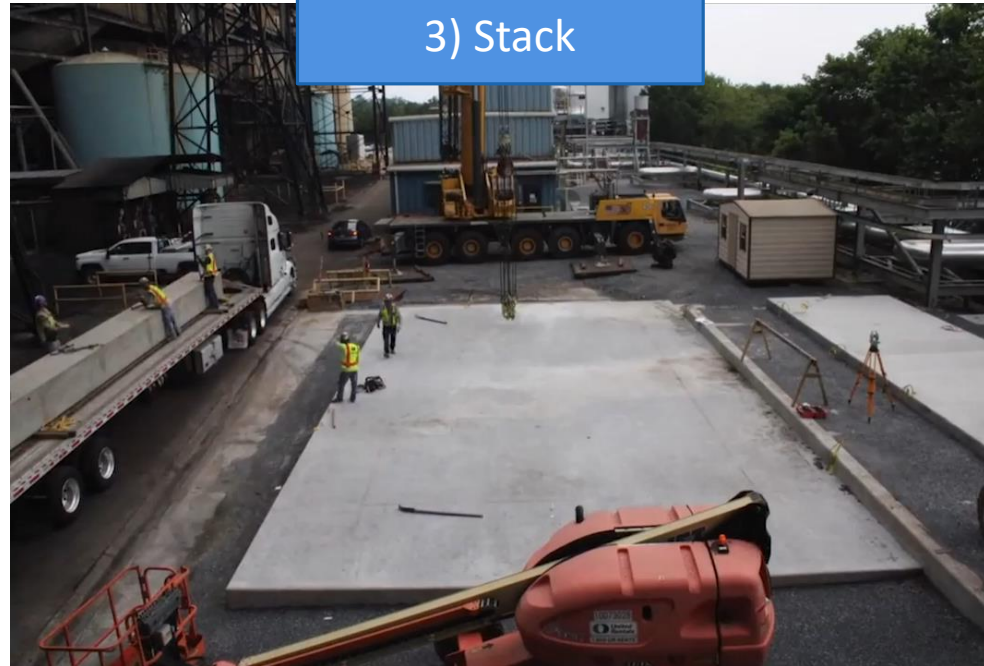
# PRODUCT | Bolderbloc™ Modular TES system



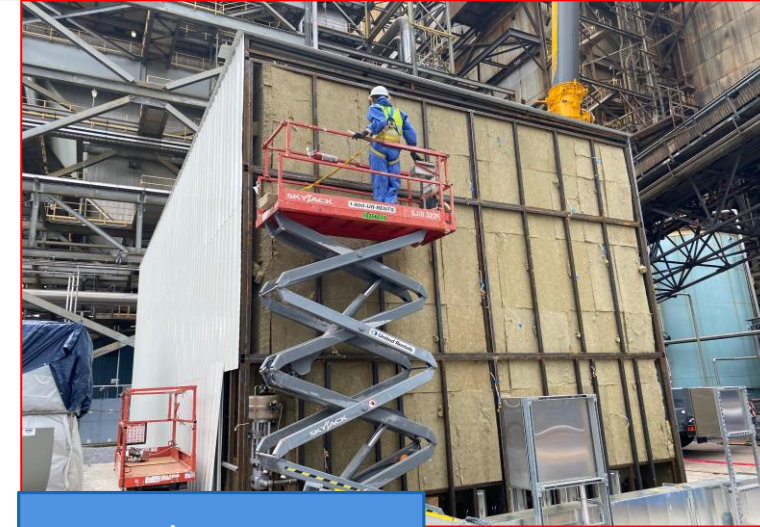
1) Manufacture  
(locally)



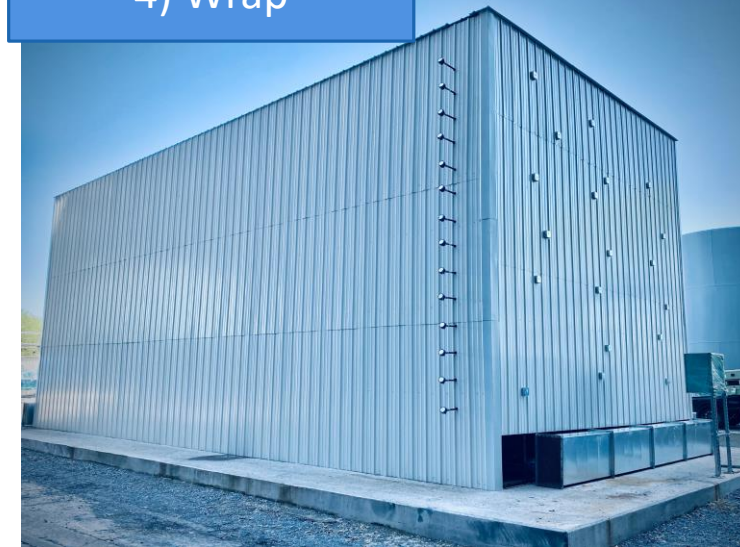
2) Ship (if needed)



3) Stack



4) Wrap





## Our Approach | **Electricity Storage**

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- Use existing / retiring steam assets to turn the stored heat back into electricity
  - Bolder Blocs discharge at full temp used by existing steam plants
  - Significant capital cost savings and synergy
- Heat storage in proprietary concrete formula
  - Very low marginal cost (<\$25/kWhe) more than offsets lower round-trip efficiency
- Variety of ways to get heat into concrete
  - Electricity to heat storage – use proprietary resistive heating element to heat air, which heats Blocs ("FlexJoule")
  - Utilize waste heat on site (e.g., from combustion turbine – convert to combined cycle)
- Duration; 8-20+ hours and unlimited discharge duration with hybrid operation



## Our Approach | **Industrial Heat Decarbonization**

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- Convert from fossil fuel resources to renewable energy for process heat
- Heat storage in proprietary concrete formula
  - Very low marginal cost (<\$25/kWhe)
  - Over 90% Round Trip Efficiency
- Variety of ways to get heat into concrete
  - Renewable electricity to heat storage – use proprietary resistive heating element to heat air, which heats Blocs ("FlexJoule")
  - Utilize waste heat on site (e.g., from combustion turbine running on hydrogen)
- Duration; 8-20+ hours and unlimited discharge duration with hybrid operation



# Solution | BolderBloc™ Modular TES System



- Patented high-performance concrete system (some using steel tube)
- Unique concrete formula utilizing fly ash
- Low-cost, modular, and factory-built
- Proven cycling performance at 600 °C
- Configurable and stacked on-site
- ~250 kWh<sub>e</sub> per BolderBloc
- Scales easily for different applications
- Low Maintenance
- 25+ year life



# Storworks TES | BolderBloc™ Family



## HRSG\* Bloc



**Charge:** hot air  
(CT exhaust or resistance heating)

**Discharge:** steam

**Uses:** convert fossil plants to electricity storage, achieve flexibility & fuel savings

## Steam Bloc



**Charge:** steam

**Discharge:** steam

**Uses:** convert CHP, solar thermal, biomass, geothermal plants to flexible operation, optional charging with surplus grid power

## Air Bloc



**Charge:** hot air  
(CT exhaust or resistance heating)

**Discharge:** hot air

**Uses:** convert fossil plants to long duration electricity storage

\*HRSG = Heat Recovery Steam Generator



# Demonstrated Progress

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- Proven Technology
  - Six Years of testing at Arvada, Colorado facility
  - Proprietary modeling matches actual performance
  - Full scale BolderBlocs fabricated at nearby concrete plant
- Electric Power Research Institute (EPRI)
  - Funded 2019 Storworks study of TES materials and assembly adequacy to application
  - Demonstrated successful operation under 600°C cyclic testing
- \$4 million DOE FOA Award
  - EPRI is Prime Contractor
  - Grant to build and test 10 MWhe Pilot at working generation plant at Southern Co
- \$1.1 million ARPA-e Award
  - Colorado State University is Prime Contractor
  - Award to develop a thermal energy storage system with flexible advanced solvent carbon capture
  - Phase 2, if awarded for Fall 2022, will test BolderBloc with resistive heater



# Demonstration Facility | Gaston Electric Generating Plant Pilot



10 MWh<sub>e</sub> pilot plant

Supercritical steam

- ~530 °C
- ~230 bar

Partners include:

- EPRI – Lead
- Southern Co – Site Host
- United E&C – EPC

Operational: Q4-2022





# Thank You



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