Liquid Salt Combined Cycle (LSCC)

Transforming the gas fleet with Hybrid Energy Storage

LDES National Consortium Annual Workshop

Salt Lake City

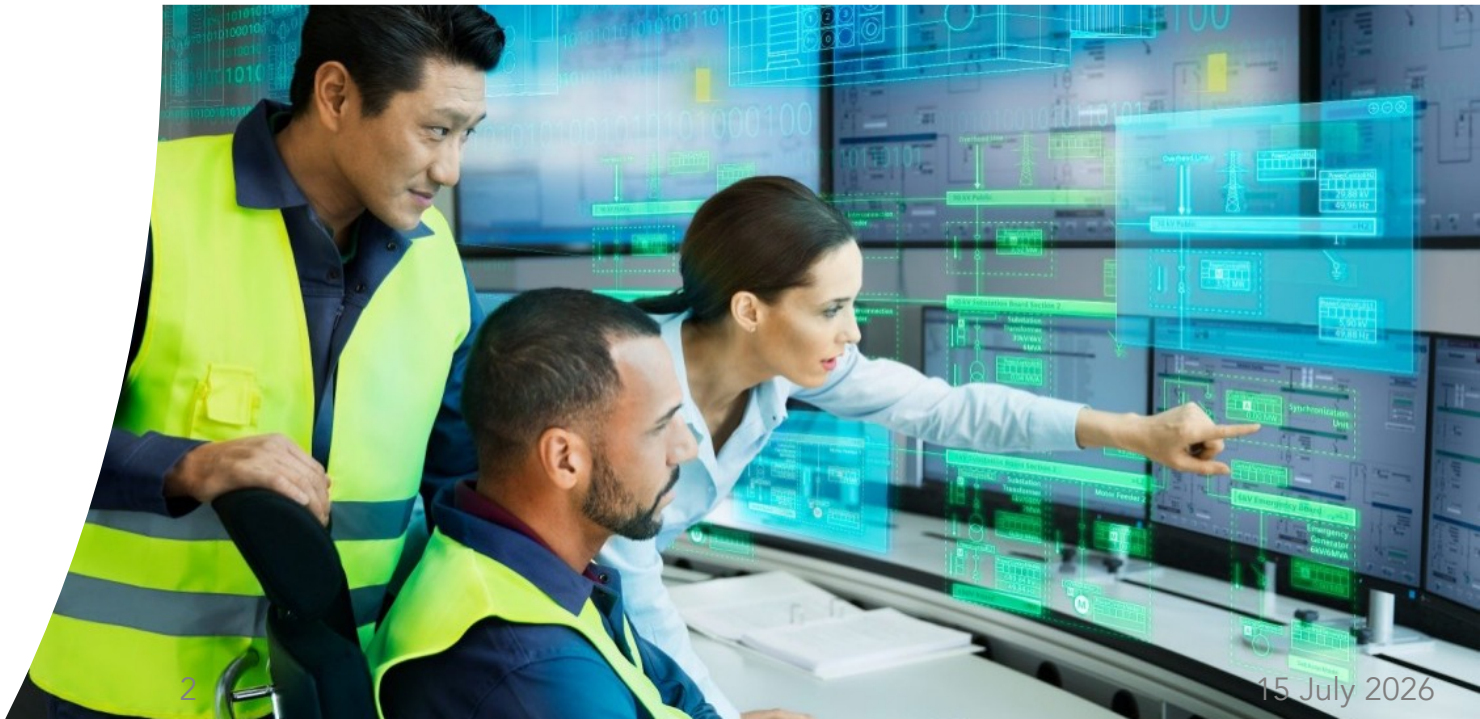
15 July 2026

Technology Provider of Hybrid Energy Storage

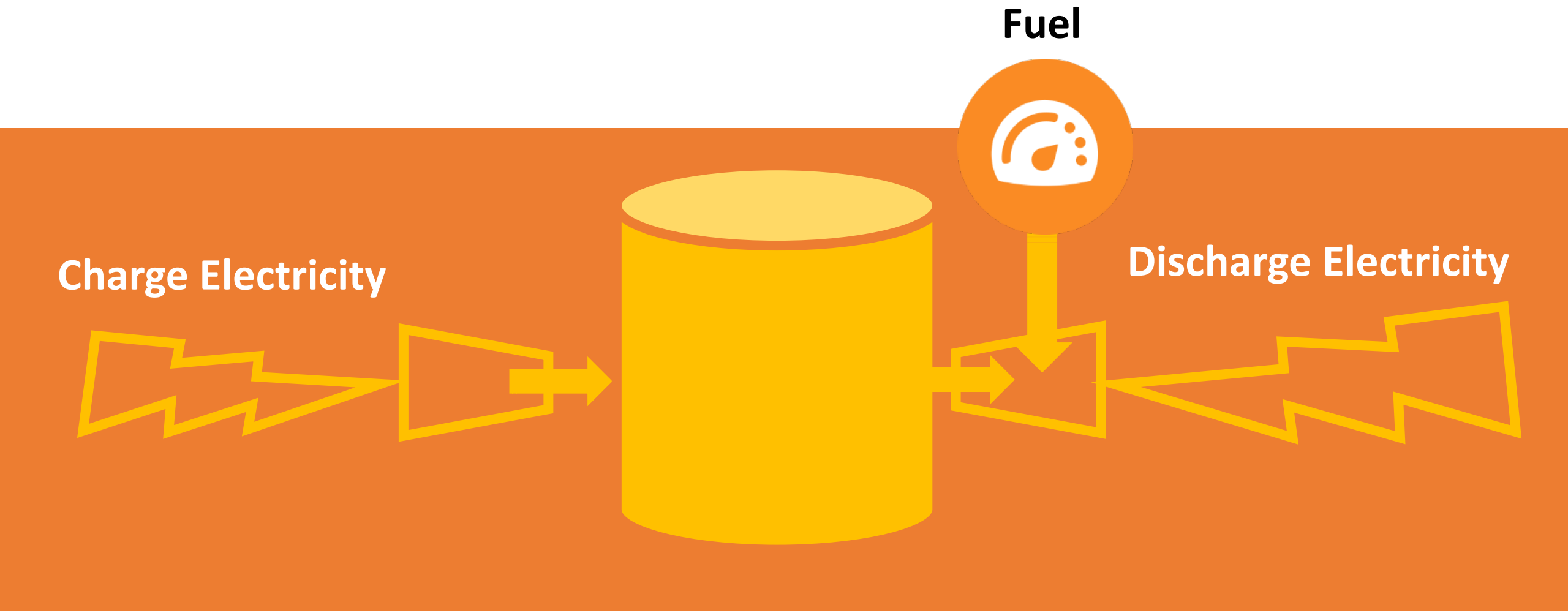
- Develop and patent technology
- License IP for hybrid systems
- Support design, integration, and operations

Platts Global Energy Awards

2025 Finalist



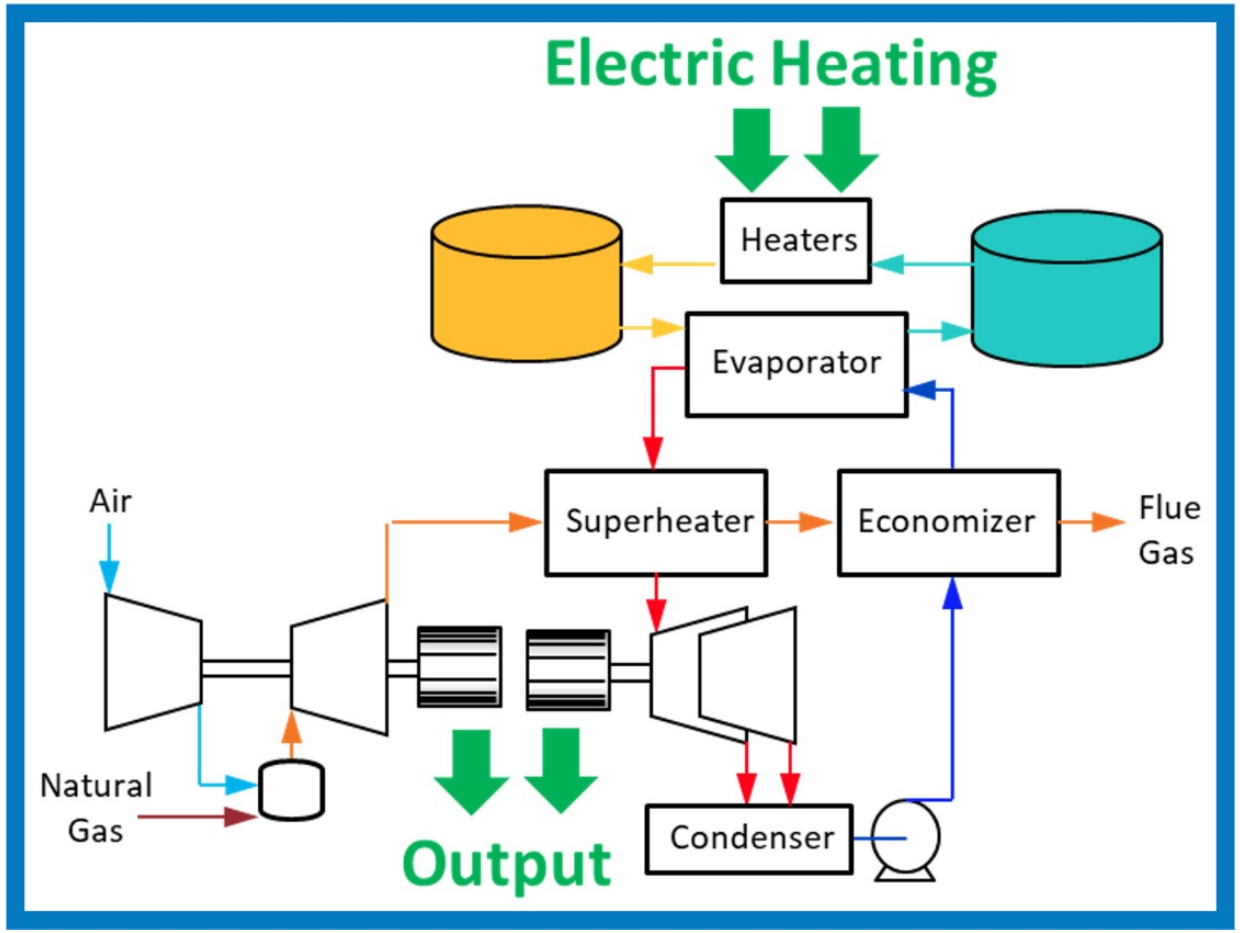
What is Hybrid Energy Storage?



Hybrid *Synergies*

- Better use of fuel and stored energy
  - RTE>100%
  - FHR ~ ½ simple cycle
- Less storage media
  - 6x-8x more energy (kWh/kg)
  - Lower capital cost of storage ($/kWh) and power ($/kW)
- Better asset utilization
  - Increased capacity factor
  - Uses existing hardware

Liquid Salt Combined Cycle



Source: Electric Power Research Institute. 2022. Retiring Fossil Plants: Utilizing Thermal Energy Storage Technology for Longer Duration Energy Storage Deployment

- Grid charged molten salt
  - Molten salt boils water
  - Gas turbine exhaust pre-heats feedwater & superheats steam
  - 2x more steam power than conventional combined cycle
- Fast start by preheating steam cycle without fuel

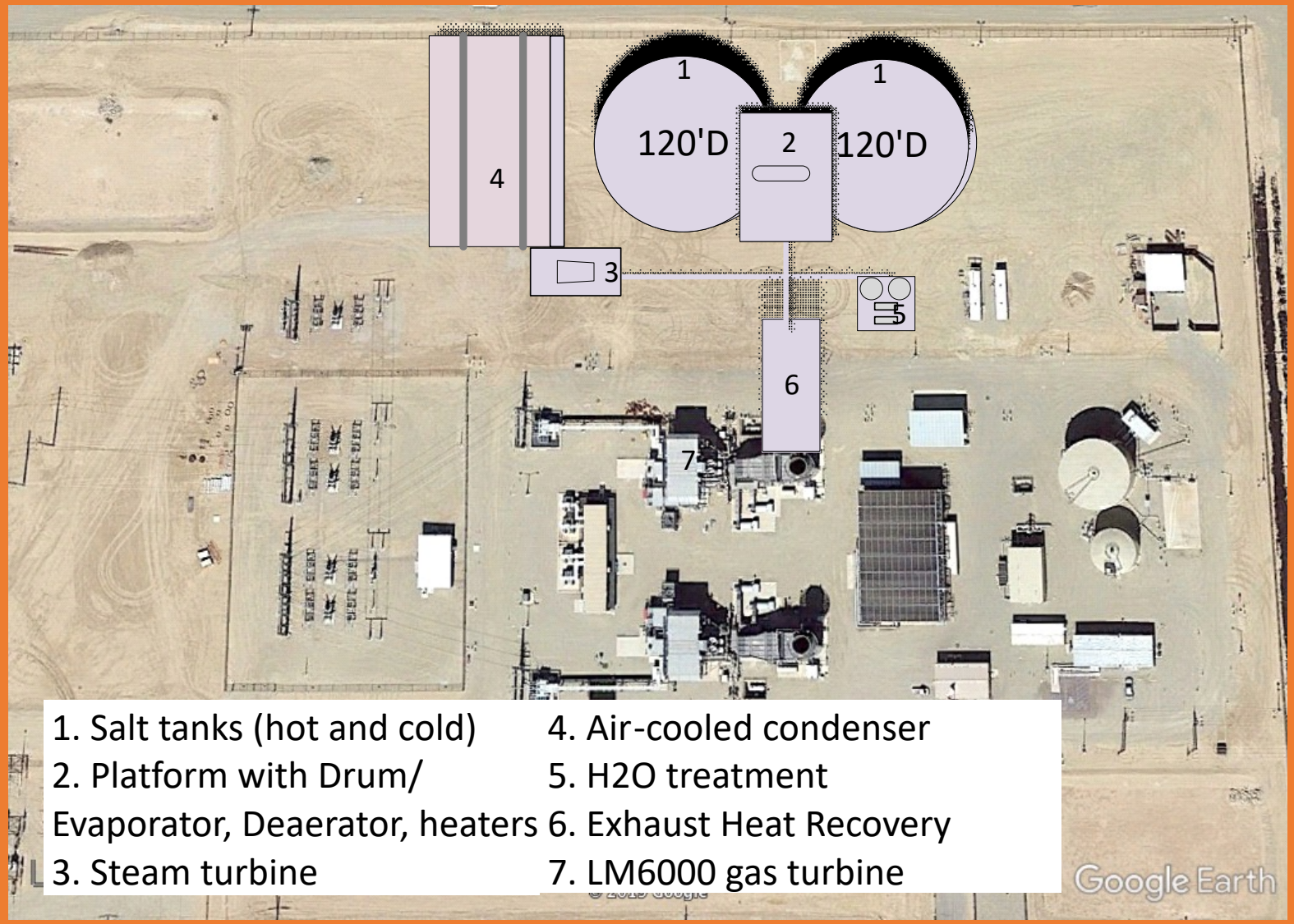
LSCC works with any gas turbine

Legacy or new; Frame or aeroderivative

	Simple Cycle		Liquid Salt Combined Cycle					
Combustion Turbine	Power (kW)	Heat Rate (Btu/kWh)	Power (kW)	Fuel Heat Rate (Btu/kWh)	Primary Energy Rate (kWh/kWh)	Salt Utilization (kg/kWh)	Discharge Energy (MWh)	Discharge Duration (h)
MS5001	26,830	12,025	66,707	4683	1.05	15.5	1444	21.6
MS6001B	42,100	10,644	95,820	4701	1.01	14.8	1508	15.7
MS7001EA	85,400	10,417	192,919	4636	0.98	14.98	1489	7.7
PG7241 (7FA)	171,716	9,166	362,228	4471	0.843	10.43	2138	5.9
GE LM6000	49,955	8,071	91,827	4631	0.91	12.37	1800	19.6
GE LM2500+	34,737	8,600	70,497	4237	0.92	13.53	1650	23.4

*Conditions: ISO, 1P, no-reheat, air-cooled, LHV. Calculated with Ebsilon Professional. *2P for 7FA*

DOE/EPRI/Pintail Study: LM6000 LSCC Add-



1. Salt tanks (hot and cold)
2. Platform with Drum/ Evaporator, Deaerator, heaters
3. Steam turbine
4. Air-cooled condenser
5. H2O treatment
6. Exhaust Heat Recovery
7. LM6000 gas turbine

- Specifications
  - 100MW charge
  - 92 MW discharge
  - 1746 MWh
  - 19.0 hours discharge
  - 15.8 hours charge
- Costs
  - TPC: $183 million
  - $105/kWh
- ERCOT 2019 DAM
  - MCOE: $25.59
  - COE: $82.41/MWh
  - CF: 31.7%

Source: https://doi.org/10.2172/1854364

Commercial Readiness

EPRI members funded an independent study under Program 217

- “The LSCC design aims for simplicity and reliability, avoiding issues seen in other molten salt systems.”
- “The system operates within specific temperature ranges to ensure safety and efficiency, with the steam cycle optimized for straightforward operation and fast startups.”
- “The design of the LSCC follows a strategy of simplification and conservatism …”
- “The System Readiness Level is high, attributed to the inclusion of mature technologies.”
- “This aligns with Pintail's perspective that advancing to a full-scale system is the imminent step.”

Sources: Product 3002026290. System Readiness Assessment of Thermal Energy Storage for Gas Turbine-Based Power Plants: Status, Risks, and Potential Paths Forward.

ASME GT2024-126653. TECHNOLOGY READINESS ASSESSMENT OF THERMAL ENERGY STORAGE INTEGRATED WITH GAS TURBINE POWER PLANTS

LSCC Scores Favorably on All Selection Factors

- Siting: geo-technical requirements, land use
- Cost: Capital and operating
- Safety: Fire, explosion, toxicity
- Scale: Power (capacity) and energy (duration)
- Durability: long-life without rate or state of charge limits
- Flexibility: Independent charging/discharging; fast start
- Operability: grid services and renewable integration
- Sustainability: Life-cycle environmental impact

Commercialization Path

- Seeking lead utility
  - Suitable peaking unit
  - Desire to own and operate
- Project Structure
  - Vendors guarantee proven equipment
  - Pintail guarantees performance via fee escrow and re-insurance
  - EPC guarantees cost and schedule
  - Performance tested per ASME PTC53
- Procurement “nice to have”: Include hybrid energy storage in RFO and IRP

Key Take Aways: Liquid Salt Combined Cycle

- Transforms the gas turbine fleet
  - Low-cost, large-scale energy storage
  - Uses proven equipment under conservative conditions
- Flexible, low carbon capacity
- Multiple revenue streams
- Ready for deployment now

Questions?

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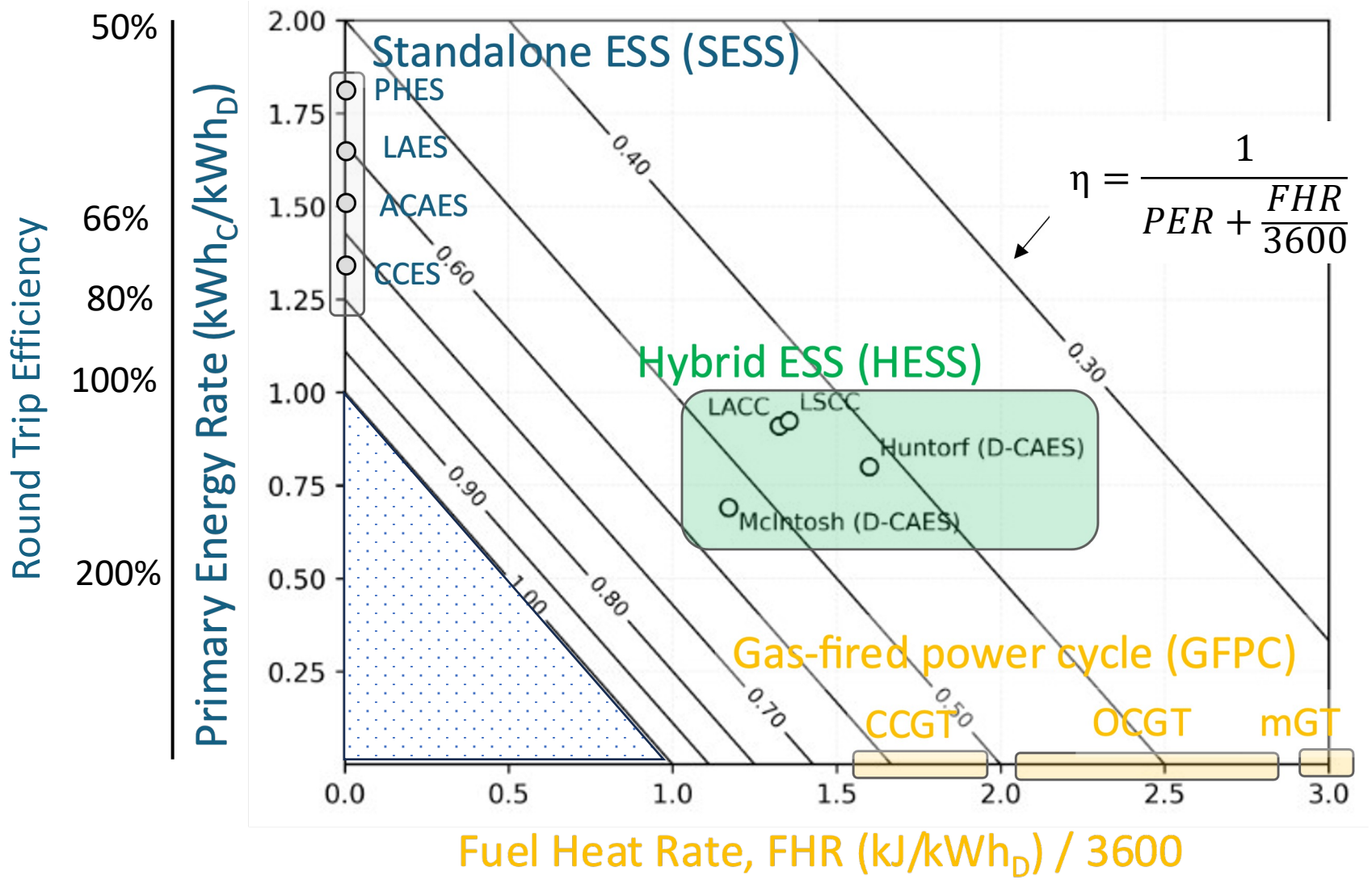
Performance Metrics (ASME PTC53-2022)



PHES: Pumped Heat Energy Storage
LAES: Liquid Salt Energy Storage
ACAES: Adiabatic Compressed Air
CCES: Compressed CO_2 Energy Storage
LACC: Liquid Air Combined Cycle
LSCC: Liquid Salt Combined Cycle
D-CAES: Diabatic Compressed Air

Source: Rodriguez-deArriba et al. GT2026-179140 APPLICATION OF A TECHNO-ECONOMIC FRAMEWORK TO THE ECONOMIC DISPATCH OF ENERGY STORAGE SYSTEMS