

Techno-Economic Assessment of SolarSteam's BendReality™ for Data Centre Cooling in Southern Alberta

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1 Why this Matters

16,229 MW Requested by 29 Alberta data-centre connection applications by 2025

12,384 MW Alberta January 2024 winter peak load

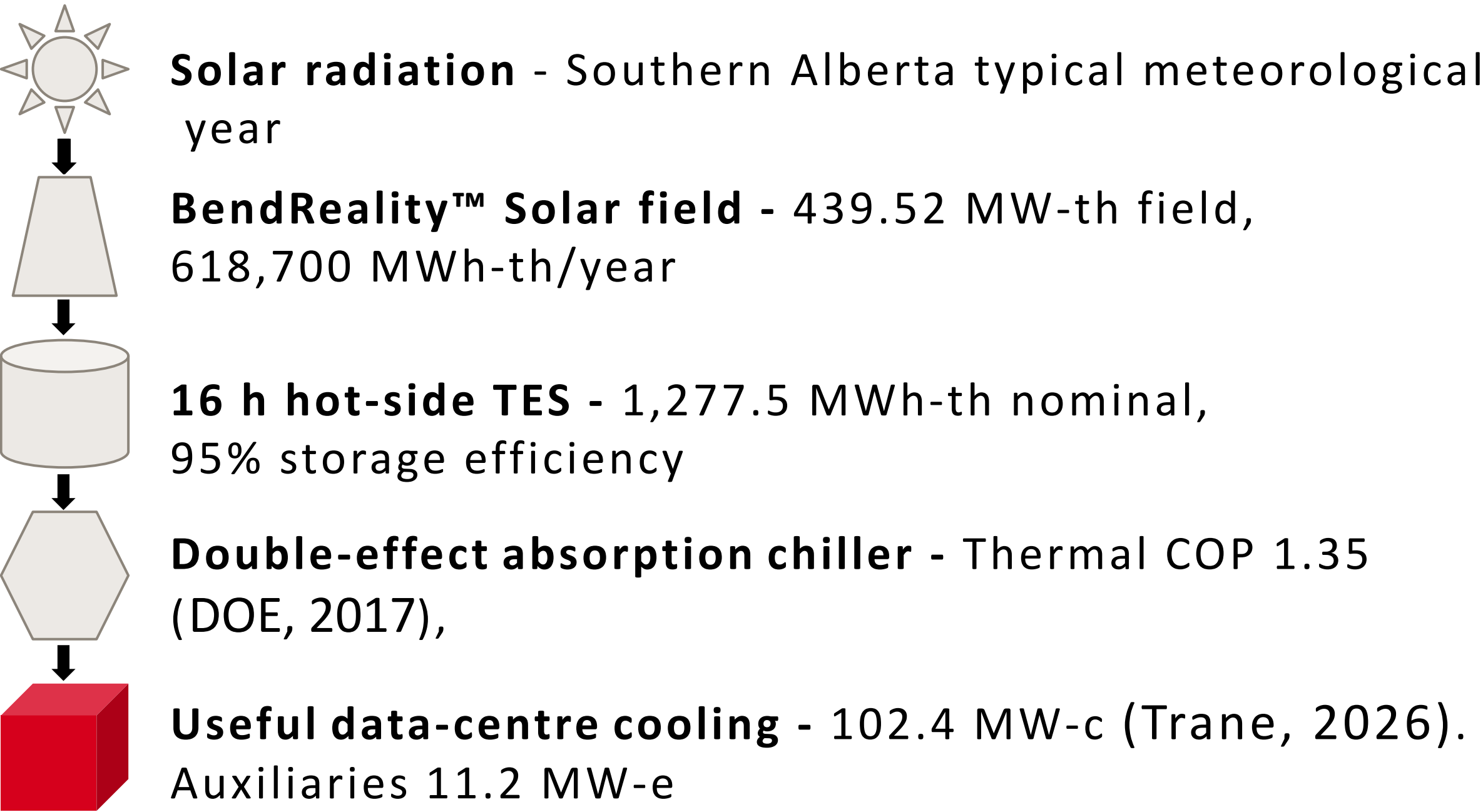
- AESO allocated interim **1,200 MW** limit for new large-load connections (AESO, 2025).
- Cooling is **7%** to over **30%** of data-centre electricity use (IEA, 2025).

Research Question: Can BendReality™ + 16 h TES + double-effect absorption cooling provide technically viable and cost-competitive cooling for a 102.4 MW-c data-centre block in Southern Alberta?

SolarSteam's BendReality™ Pathway



Image: © SolarSteam Inc.



Common study basis for all five pathways

102.4 MW-c cooling block **90%** annual utilization **807,321.6** MWh-c delivered per year

Sustainable Development Goals

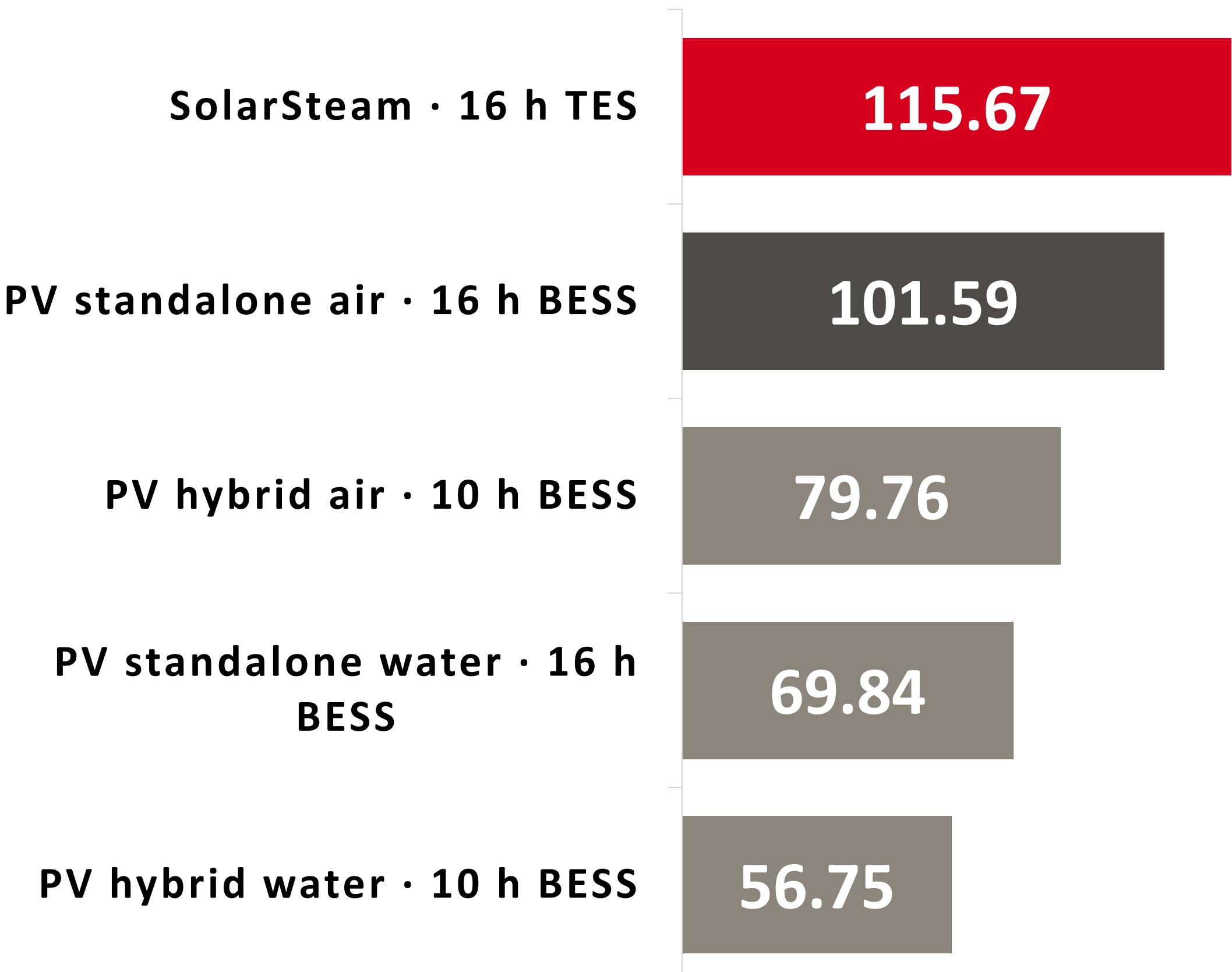


2 Result

Modelled SolarSteam base-case LCoC

115.67 \$/MWh-c

+14.08 \$/MWh-c (+13.9%) above the closest comparator, PV standalone, air-cooled, 16 h BESS at \$101.59/MWh-c.



Values in \$/MWh-c. All five pathways deliver the same annual cooling service of 807,321 MWh-c.

- Water-cooled COP **5.0** and air-cooled COP **3.0** are study assumptions informed by FPL and Gulf Power, respectively.
- Hybrid = **6 h** of grid supply per day. Standalone = no routine grid supply.
- Common basis: **25-year** life, **7.5%** real WACC.

Sensitivity Analysis



One-factor-at-a-time analysis. Total low-to-high LCoC swing in \$/MWh-c.

Uncertainty Analysis

≈ 9 % of 10,000 simulated scenarios put SolarSteam below the **\$101.59/MWh-c** PV+BESS benchmark in Monte Carlo simulation

- Mean: **\$114.87/** MWh-c
- Median: **\$114.62/MWh-c**
- 5th to 95th percentile: **\$99.26 to 131.62/MWh-c**

**All \$ values in Result are in CAD*

3 Cost is not the Whole Decision

A. Grid Capacity

SolarSteam auxiliaries **11.2 MW-e**

Water-cooled electric **20.5 MW-e** Air-cooled electric **34.1 MW-e**

≈ 2x electricity requirement ≈ 3x electricity requirement

SolarSteam auxiliary values based on CSIRO & AIRAH (2019).

B. Long-duration Storage Cost

16 h TES **\$30.1 M**

16 h BESS, water-cooled **\$139.4 M** 16 h BESS, air-cooled **\$232.4 M**

≈ 4.6x TES case ≈ 7.7x TES case

Cost bases from Wilson et al. (2025) and Cole et al. (2025). All values are in CAD

C. Land

SolarSteam field **439 acres**

PV standalone water **725 acres** PV standalone air **1,208 acres**

Biggest economic non-LCoC advantage against PV

PV land basis: Bolinger (2022); SolarSteam field basis: project data

D. Water & Heat Rejection

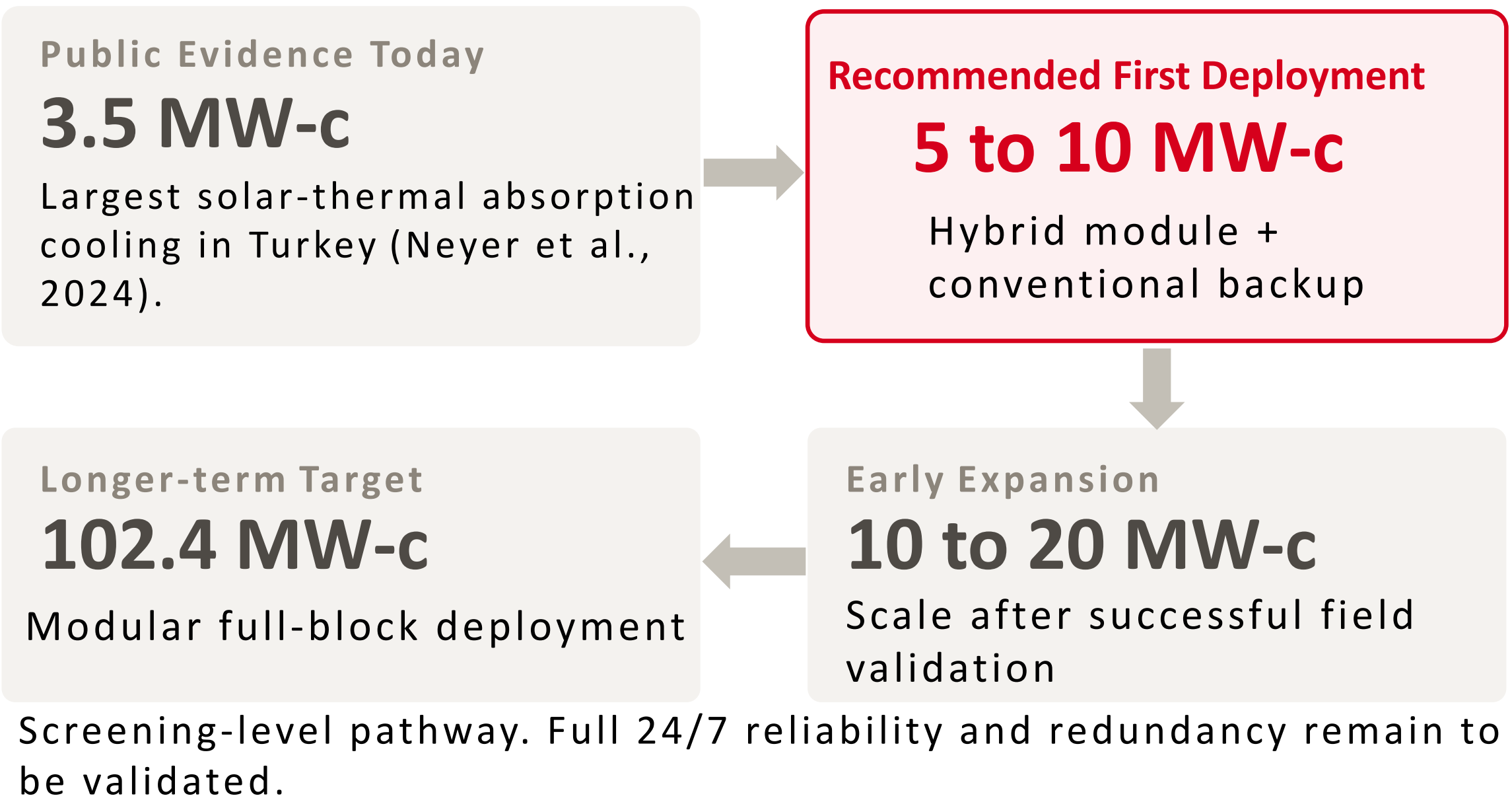
Dry heat rejection

Advantage vs water-cooled: no evaporative tower

No advantage vs air-cooled: also, dry-cooled

Trade-off: Based on ECCC (2025) value SolarSteam has higher grid emissions(operational) than the PV cases because its auxiliaries are grid-supplied. Lifecycle emissions were not assessed.

4 From Analysis to Staged Deployment



SolarSteam has a higher LCoC, but may reduce electrical-capacity, storage, and land constraints, which are not captured by LCoC. Costs reflect TRL 7-8 and may improve with field validation and scale. The study identifies a credible staged pathway.

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