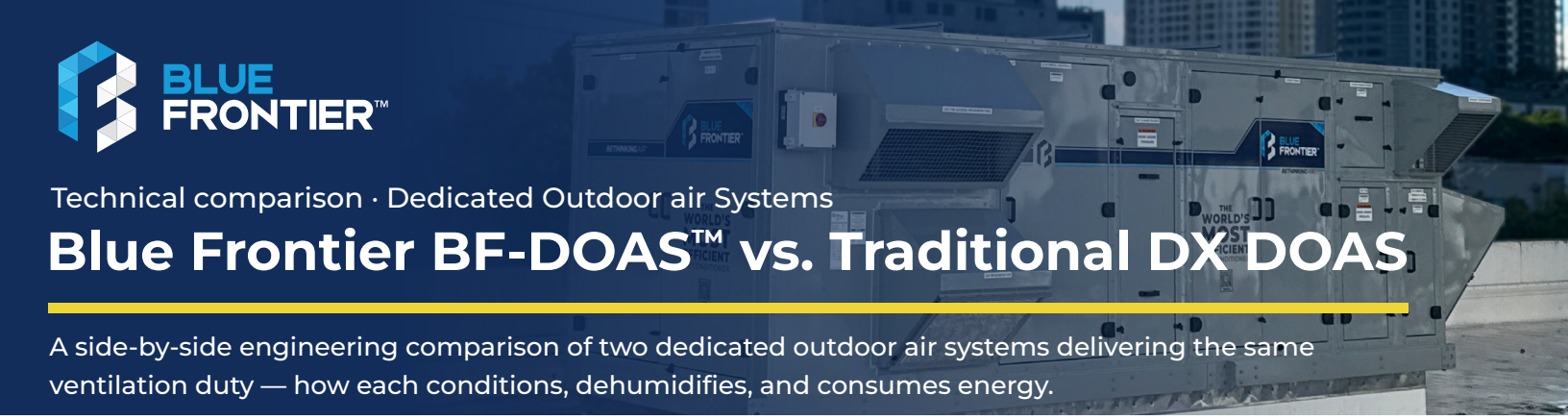


Technical comparison · Dedicated Outdoor air Systems

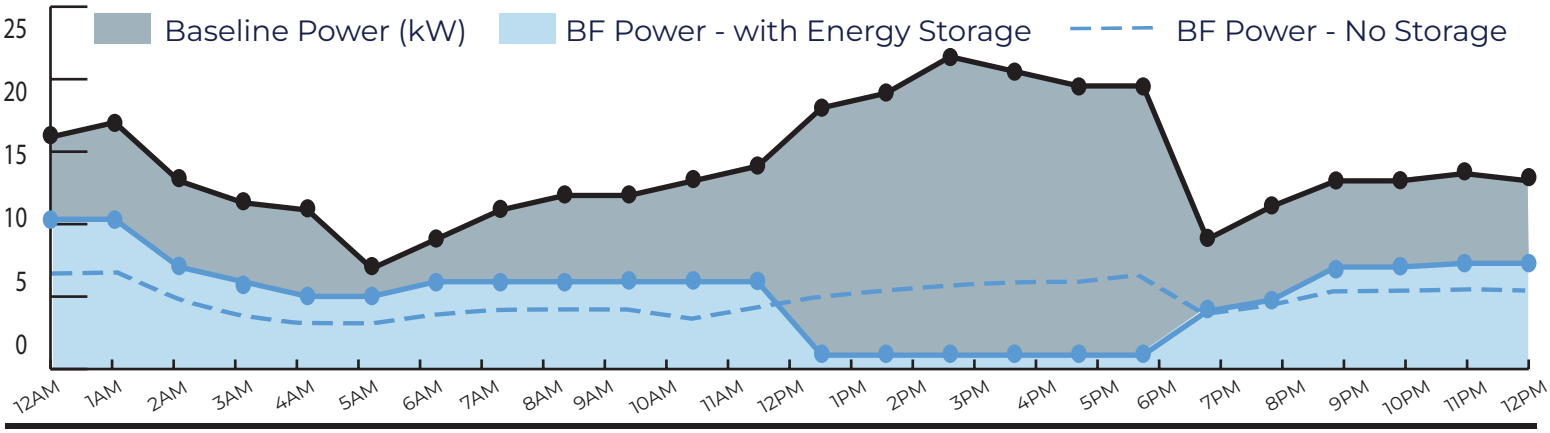
Blue Frontier BF-DOAS™ vs. Traditional DX DOAS

A side-by-side engineering comparison of two dedicated outdoor air systems delivering the same ventilation duty — how each conditions, dehumidifies, and consumes energy.

Comparison basis: Both systems sized to deliver 3,000 CFM of outdoor air at a 70°F dry-bulb / 55°F dew-point supply condition on a hot-humid summer design day (85°F DB / 80°F WB).

Parameter	Blue Frontier BF-DOAS LIQUID-DESICCANT + INDIRECT EVAPORATIVE COOLING	Traditional DX DOAS VAPOR COMPRESSION + REHEAT
Conditioning method	Decoupled TE-Sal™ liquid-desiccant dehumidification + ultraefficient indirect evaporative sensible cooling. No refrigerant in the airstream.	Single DX cooling coil overcools the air to dew point set point to wring out moisture, then reheats it back up to supply temperature.
Temperature & humidity control	Independent. Dry-bulb set by water & purge-air flow; dew point set by desiccant flow & concentration — controlled separately.	Coupled. Sensible and latent are tied to one coil; dew point is chased by overcooling, sacrificing efficiency.
Reheat required	None. Air is never overcooled, so no reheat energy is added.	Typically hot-gas, electric, or hot-water reheat to offset overcooling — an added energy penalty.
Installed cooling capacity to hit setpoint	**14 tons** via “free” indirect evaporative cooling	**21 tons** to reach the same supply condition (≈ 33% more installed tonnage)
Rated efficiency vs. ASHRAE 90.1 min.	EER 23.6 (min 11.0) IEER 23.0 (min 14.2) ISMRE2 10.5 (min 4.0) In storage mode, effective EER 90–130+	Meets code minimum: EER ≈ 11.0 IEER ≈ 14.2 ISMRE2 ≈ 4.0
Cooling power intensity	**0.14–0.51 kW/ton** via “free” indirect evaporative cooling	Baseline DX — several times higher kW/ton; efficiency degrades as outdoor temperature rises (higher head pressure).
Performance vs. heat	**Improves.** Hotter, drier ambient air offloads the compressor responsible for desiccant regeneration and boosts evaporative cooling — the hotter it gets, the more efficient the unit becomes.	**Declines.** Compressor lift and condenser load grow with ambient temperature, cutting capacity and efficiency.
Modeled annual energy Atlanta, GA · 20-ton	**22,622 kWh/yr** ≈56% lower than the DX baseline	**51,771 kWh/yr** code-compliant DX-DOAS baseline

DX DOAS versus a Blue Frontier DOAS



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BLUE FRONTIER™

Parameter	Blue Frontier BF-DOAS LIQUID-DESICCANT + INDIRECT EVAPORATIVE COOLING	Traditional DX DOAS VAPOR COMPRESSION + REHEAT
Built-in energy storage	150-gal TE-Sal tank ≈ 90 kWh thermal battery. Provides 4–6 hours of full-load cooling at <1.8 kW — no lithium-ion.	Single DX cooling coil overcools the air to dew point set point to wring out moisture, then reheats it back up to supply temperature.
Peak electrical Atlanta design day	**1.4 kW** dispat**c**hable off-peak via storage	**20.9 kW** peak coincident with grid peak (≈93% higher)
Grid interactivity	**Grid-interactive DER**. Load-shifting, demand response and VPPready; charges from on-site solar / off-peak power.	Passive load only — no inherent demandresponse or loadshifting capability.
Refrigerant & GWP	**R-454B today**; roadmap to **R-290 (GWP 0.02).** Refrigerant is confined to the regenerator, not the supply airstream.	Charge-intensive high-GWP refrigerant in the airstream circuit — e.g. R-410A (GWP ≈ 2,088) or R-32 (≈ 675).
Water use	Uses site water for evaporative cooling: ≈0.025 GPM/ton — below typical cooling-tower use.	Air-cooled DX uses **no process water** — the trade-off for its higher energy use.
Acoustics & footprint	**No external condenser** — quiet operation. Single packaged outdoor unit, 17'L × 6'W × 6'H, ETL-listed.	Requires condenser / compressor section; condenser-fan and compressor noise; rooftop or split arrangement.
monitoring	Every unit **digitally twinned** to Blue Frontier for continuous fault detection & optimization.	Conventional onboard controls; advanced analytics depend on add-on BAS integration.
LEED v5 alignment	**6–10+ EA points** potential (grid-interactive, peak-load, efficiency, refrigerant) plus water, comfort & resilience credits.	Limited — typically contributes only baseline energy-efficiency points.

3x More Efficient

90kWh Battery Equivalent

≥30% Tax-Credit incentive on unit & installation Costs

The bottom Line

The BF-DOAS reaches the same supply-air condition with less installed tonnage, no reheat, and a fraction of the energy and peak demand — while independently controlling temperature and humidity and shifting load off the grid. The traditional DX DOAS couples those loads, leans on reheat, and peaks with the grid. Same duty, fundamentally different physics.

Converting energy savings into operating cost savings based on your utility rate.

with Energy Storage

NET YEARLY SAVINGS FOR (QTY:1) 20-TON BLUE FRONTIER DOAS UNIT

TMY3 WEATHER DATA OF ATHENS EPPS & SCHEDULE TOU-EO-17 - TIME OF USE - ENERGY ONLY RATES

YEARLY ENERGY SAVINGS

Baseline energy usage* (KWH)	Blue Frontier usage (KWH)	energy Savings (KWH)	% Energy Savings
51,771	22,622	29,149	56%

YEARLY ENERGY SAVINGS

Baseline peak power* (KW)	Blue Frontier peak power (KWH)	peak power reduction (KWH)	peak power % Reduction
20.9	1.0	19.9	95%

YEARLY ENERGY SAVINGS

Energy Savings ($)	Peak Power Savings($)	Total Electrical Utility Savings ($)
51,771	22,622	$11,965

Carbon Equivalent Emission Reduction

US GRID REGION	YEARLY (metric-tons)	5 years (Metric-tons)	15 years (Metric-tons)
SERTP	25	127	380

Water Usage

Yearly Water Usage (GAL)	maximum water flowrate (GPM)	Yearly Water bill ($)
43,355	0.37	($360)

Net Savings

Utility Savings Minus water bill ($)
$11,605

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BLUE FRONTIER™

How Blue Frontier Is Different from Mojave & Other Liquid-Desiccant Technologies

Both platforms use liquid desiccants to dehumidify — and that is where the similarity ends. Blue Frontier pairs desiccant dehumidification with built-in thermal energy storage, a non-corrosive salt, and a grid-interactive design that decouples cooling from real-time power draw.

The read for channel partners: an honest look at where liquid-desiccant competitors still hold parity — or a temporary edge — and where Blue Frontier's architecture pulls decisively ahead.

≥30%
TAX-CREDIT INCENTIVE
ON UNIT & INSTALLATION

4–6 hrs
NEAR-ENERGY-FREE COOLING
FROM BUILT-IN STORAGE

TE-Sal
NON-CORROSIVE DESICCANT
NOT LITHIUM CHLORIDE

WHERE COMPETITORS STILL HOLD AN EDGE — FOR NOW

- **Both are highly efficient DOAS units.** Fine by us — it only validates what liquid desiccants can do.
- **Lower dew points, today.** That is the traditional low-DP, industrial liquid-desiccant market. Blue Frontier is targeting the comfort-cooling commodity DOAS space — our low-DP model is on the way.
- **Heating, today.** Competitors heat with their current design; Blue Frontier uses auxiliary heat now, with a heat pump on the roadmap (test-stand COPs are exceptional).

WHERE BLUE FRONTIER IS FUNDAMENTALLY DIFFERENT

PARAMETER	Blue Frontier BF-DOAS	Mojave & Other Liquid Desiccants
FIRST COST & INCENTIVES	The only air conditioner eligible for the **30% battery-storage ITC** — subtracted from the unit cost, so the owner never pays full price.	No comparable storage-based tax incentive; the owner pays the full installed cost.
ENERGY VS. OUTPUT	Consumption is **decoupled from output.** Built-in storage delivers up to 4–6 hours of near-energy-free cooling and shifts load off the grid.	Output is tied to real-time power draw. Even a highly efficient unit cannot shift away from the most expensive hours of the day.
PEAK DEMAND & GRID	**Eliminates peak electrical demand;** grid-interactive and load-shifting. Battery scales from 6 hours to days as the application requires.	Peak demand coincides with the grid peak. No storage, no load-shifting.
PERFORMANCE VS. HEAT	**The hotter it gets, the more efficient it becomes.** Hot, dry ambient air offloads the regeneration compressor and boosts evaporative cooling.	Efficiency declines as ambient temperature rises — the same limit as every conventional air conditioner.

WHERE BLUE FRONTIER IS FUNDAMENTALLY DIFFERENT (continued)

PARAMETER	Blue Frontier BF-DOAS	Mojave & Other Liquid Desiccants
DESICCANT CHEMISTRY	**TE-Sal desiccant — non-corrosive.** A decisive material advantage over any liquid-desiccant system on the market.	Mojave uses **lithium chloride — corrosive.** The same limitation applies to Kathabar and other legacy liquid desiccants.
ACOUSTICS & SITING	**No condenser section** — quiet operation. Installs indoors or on the ground.	Requires a condenser / compressor section, with condenser-fan and compressor noise.
REFRIGERANT PATHWAY	Roadmap to **R-290 (GWP 0.02).** No refrigerant in the supply airstream, and no vapor-compression cycle needed to cool or dehumidify.	Conventional refrigerant-based cooling and dehumidification.
WASTE-HEAT PATHWAY	A heat-driven machine with a roadmap to **free cooling from waste heat ≥122°F** — geothermal, heat-recovery chillers, hydronic/steam loops, even water-cooled server racks. Today's model already accepts a preheat hydronic coil at the regenerator intake.	No pathway to waste-heat-driven operation.
LEED & SUSTAINABILITY	**Significant LEED point potential** across grid-interactivity, efficiency, refrigerant, water, comfort, and resilience.	Limited — typically contributes baseline energy-efficiency points only.

THE BOTTOM LINE

We are not just another efficient DOAS. Blue Frontier decouples cooling from the grid with built-in storage, runs on a **non-corrosive** salt, gets **more efficient as it gets hotter**, and carries the industry's only 30% storage tax credit — with roadmaps to R-290 and waste-heat operation. Same liquid-desiccant category; a fundamentally different machine.