



Conserve Energy in Today's Demanding Mission Critical Environments

A Guide to Achieving Year-round Economization with Your Precision Cooling System

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What is Economization & Why is it Important?

E`con`o`mi`za`tion

n. 1. The act or practice of using to the best effect

During the cooler months of the year, in many locations, the outdoor ambient air is cooler than the air in the building. Economization is accomplished by taking advantage of that temperature difference between indoor and outdoor ambient conditions, rather than running compressors to provide the cooling.

When is economization effective and what should specifying engineers take note of when choosing between an airside or waterside economizer?

ECONOMIC DRIVERS

Q: Why are economization solutions important in today's data centers?

A: Energy costs are increasing at least 10% per year due to cost per kilowatt-hour (kwh) increases and underlying demand, especially for high power density servers. Approximately 10% of data center operating expenditure (OPEX) is power, and power is likely to be about 15% of datacenter OPEX by 2021.¹

Economization solutions (also called free cooling) have become a primary concern for mechanical engineers and data center managers. They must consider energy availability, especially from urban utility providers. Likewise, they need to think about how much money can be saved versus how much energy is being consumed.

In addition, changing state codes and requirements force engineers to examine their application designs to assure they meet current standards. It's become apparent, from the interactions Data Aire has, that customers are seeking an efficient precision cooling system that can greatly reduce their total cost of ownership.

Is Free Cooling Really Free?

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Types of Economization Solutions to Support Your Energy Savings Goals

An **Airside Economizer** brings cool air from outdoors into a building and distributes it to the servers. Instead of being re-circulated and cooled, the exhaust air from the servers is simply directed outside. If the air outside is particularly cold, the economizer may mix warm exhaust air with incoming air so its temperature and humidity fall within safe operating ranges for the data center equipment. An airside economizer is integrated into a central air handling system with ducting for both intake and exhaust; its filters reduce the amount of airborne particulate matter, or contaminants, that are brought into the data center.²

For data centers with water- or air-cooled chilled water plants, a **Waterside Economizer** uses the evaporative cooling capacity of a cooling tower to produce chilled water and can be used instead of the chiller during the winter months. (A chiller is a machine that removes heat from a liquid via a vapor-compression or absorption refrigeration cycle. This liquid can then be circulated through a heat exchanger to cool air or equipment as required.) Waterside economizers offer cooling redundancy because they can provide chilled water in the event that a chiller goes offline. This can reduce the risk of data center down time.³

Both airside and waterside economizers save enormous amounts of energy because they cool the data center without operating an air conditioner or mechanical chiller. That's why data center operators may refer to the use of economizers as "free cooling".⁴

¹ <https://www.gartner.com/smarterwithgartner/5-steps-to-maximize-data-center-efficiency/>

² PG&E. *Data Center Best Practices Guide*. http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/DataCenters_BestPractices.pdf

³ https://www.energystar.gov/products/low_carbon_it_campaign/12_ways_save_energy_data_center/water_side_economizer

⁴ https://www.energystar.gov/products/use_air_side_economizer

Industry Efficiency Standards

Effective on January 1, 2016, the U.S. Federal Department of Energy (DOE) enforced new energy efficiency requirements for Computer Room Air Conditioning (CRAC) equipment, which had not been federally regulated before. This has introduced some confusion to the heating, ventilating, and air conditioning (HVAC) & data center industry as to which efficiency rating to use for the computer room application for air conditioning equipment. The confusion should not come as a surprise though, prior to 2010 efficiency and rating tables specific to computer room air conditioning units did not exist and this type of equipment was treated as comfort cooling equipment which was predominantly evaluated by other efficiency ratings such as EER, SEER, and IPLV.

These efficiency ratings were created and used for comfort cooling equipment, which is optimized to perform to building occupancy periods and seasonal weather. Computer room spaces however, are designed to provide sensible cooling capacity 24/7/365 in mission critical environments. For example, EER examines equipment's net total cooling capacity whereas SCOP uses net sensible cooling capacity.

Mechanical Engineers of Record are constantly tasked with implementing the most energy efficient equipment in their facilities while ensuring the equipment is certified by the all governing authorities, including the Federal DOE.

How can an Engineer of Record ensure they are using the correct energy ratings and properly regulated equipment? The answer is to be knowledgeable of the correct efficiency rating and DOE certification system.

FAST FORWARD TO THE YEAR 2020

Q: What new or existing requirements are affecting economization considerations?

A: Industry standards are under continuous maintenance with numerous energy-savings measures being introduced regularly. **ASHRAE Standard 90.1** outlines economizer requirements for new buildings, additions to existing buildings and alterations to HVAC systems in existing buildings. For each cooling system, an airside economizer or fluid economizer is required. Exceptions to this exist, which are outlined in Standard 90.1. When airside economizers are in place, they must provide up to 100% of the supply air as outdoor air for cooling. Fluid economizers shall be able to provide 100% of the cooling load when outdoor conditions are below a specific range.

Other notable changes include updated climate zone classifications from ASHRAE 169, mandatory requirements for equipment replacements or alterations, which include economization and integrated economizer control and fault detection in direct expansion equipment.

Another important standard is **California's title 24 Energy Standard**, which has additional requirements for code compliance on both air and waterside economizers. In addition to standards, numerous technical committees provide recommendations that are beneficial to the performance. ASHRAE TC 9.9 is a technical committee that provides guidelines with updated envelopes for temperature and humidity class ratings. These updates are based on improved equipment ratings. which has additional requirements for code compliance on both air and waterside economizers. In additions to standards, numerous technical committees provide recommendations that are beneficial to the performance. ASHRAE TC 9.9 is a technical committee that provides guidelines with updated envelopes for temperature and humidity class ratings. These updates are based on improved equipment ratings.

Other cities like Washington and Colorado have efficiency codes as well. For example, you can reference [Chapter 51-11C WAC State Building Code Adoption and Amendment of the 2015 Edition of the International Energy Conservation Code, Commercial Provisions](#). The code "shall regulate the design and construction of buildings for the use and conservation of energy over the life of each building."

**ANSI/ASHRAE/IES
Standard 90.1-2019**
-- Energy Standard for
Buildings Except Low-
Rise Residential Buildings

**California's energy
code** is designed to reduce
wasteful and unnecessary
energy consumption in
newly constructed and
existing buildings.



Supporting Geographic Carbon Reduction Initiatives

Currently, 23 states and the District of Columbia have established economy-wide greenhouse gas emissions targets.

States may also set “carbon neutrality” or “net-zero” targets. Under these targets, states commit to address their remaining greenhouse gas emissions through an equivalent amount of “emissions removals” or “avoided emissions.”

As an example, Urban Green Council has a partnership with 80x50 Buildings to reduce NYC’s carbon footprint 80% by 2050.

The 80x50 Buildings Partnership is a collaboration between NYC’s leading building and energy stakeholders to develop smart climate change policies. First convened by Urban Green in November 2017, the Partnership set out to develop recommendations for the City of New York on the optimal design of a building energy reduction policy.

Existing buildings are the biggest piece in the New York City carbon pie, representing nearly 70 percent of emissions. Their energy use must be addressed in order for NYC to meet its target of 80 percent carbon reductions by 2050.¹

State Rebates

Some states provide rebates for energy efficient initiatives. According to ENERGY STAR®, the government-backed symbol for energy efficiency, the average commercial building wastes 30 percent of the energy it consumes. That means that if you haven’t done anything to save energy, chances are, you’ll find many opportunities to improve. The program’s popular online tool, ENERGY STAR Portfolio Manager®, was used to measure and track the energy, water, and/or waste and materials of more than 260,000 commercial properties, comprising nearly 24 billion square feet of floorspace, across the nation in 2019. For eligible buildings, the tool calculates a 1–100 ENERGY STAR score, which has become the industry standard for rating a facility’s energy performance. EPA’s ENERGY STAR tools for industrial plants include industry-specific Energy Performance Indicators (EPIs), which provide companies with the information they need to make smart investment decisions.²

Transforming the Digital Landscape with Energy Efficient Data Center Cooling Tech

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¹<https://www.urbangreencouncil.org/content/projects/80x50-buildings-partnership>
²<https://www.energystar.gov/buildings>

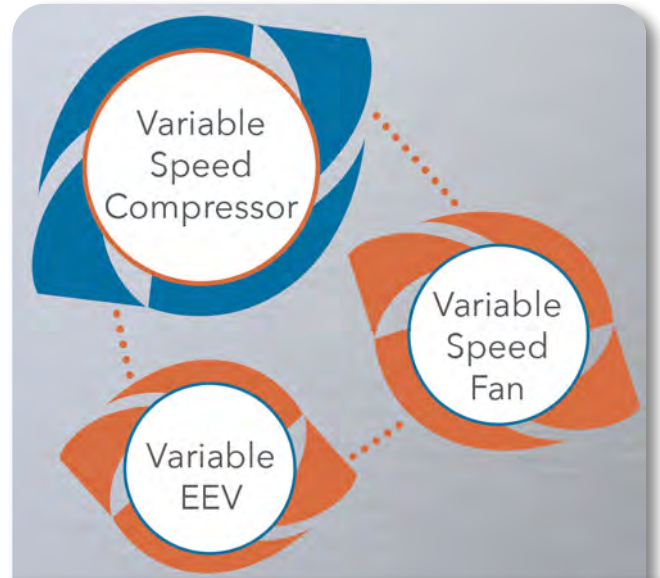
Scalable and Efficient Solutions for Data Center Growth | V3 Technology

Aligning variable speed componentry to deliver exceptional performance.

Some may say it's harder to design a data center compared to what it used to be. However, design has become very manageable since Data Aire came out with the gForce Ultra system with [V3 Technology](#). The system is so smart and innovative that it adapts to the day-to-day changes internally.

In concert with its intelligent controls, ASHRAE bin data, and V3 Technology a gForce Ultra is engineered to provide outstanding energy efficiencies by monitoring outdoor air conditions and choosing to cool the space through 1) mechanical cooling, 2) compressor assist to the Energy Saver Coil or 3) full cooling capabilities in the Energy Saver Coil.

- Variable speed compressor provides variable capacity modulation to accurately match the ever-changing loads of the environment.
- Variable speed fans with EC motors operate without shafts, bearings, belts or pulleys making them much more reliable and efficient.
- Variable Capacity Electronic Expansion Valves regulates the flow of refrigerant for maximum energy efficiency



Top Three Benefits of Variable Speed CRAC Technology

[READ MORE](#)

See How Load Matching Should Work

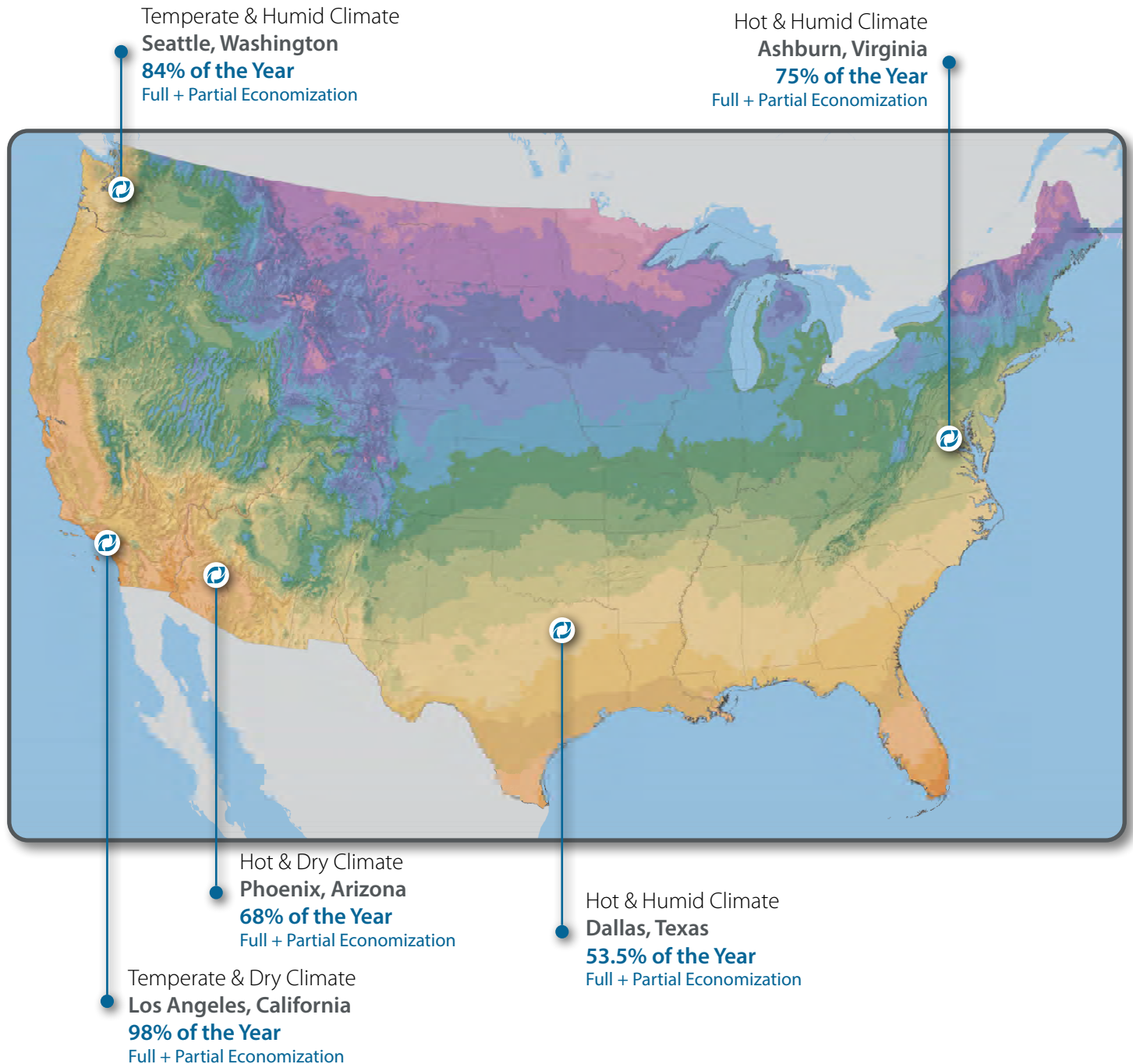
The [gForce Ultra](#) is the industry's first CRAC to incorporate variable speed technology for substantial energy savings, precise cooling and greater capacity modulation. Variable speed operation increases efficiency and energy savings because the systems can scale up or down in capacity to match the heat output of your facility. When running at lower capacities, systems use less energy and save money.



Annual Power Consumption by Climate

Efficiency gains from a waterside economizer can be realized with Data Aire's gForce Ultra.

Here are examples of how the system provides economization (full + partial) in several U.S. climate conditions.



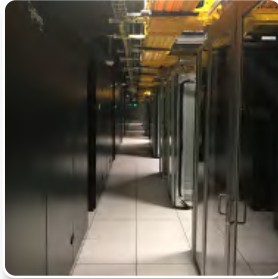
Wise Companies Taking Advantage of Economization Solutions

gForce Ultra Customer Spotlights

zColo



Coresite



World Trade Center



Academy of Motion Pictures



Defense Logistics Agency



"There is a certain pride that comes in knowing that you put in a solution that is leading in the industry that others will envy – my peers will envy; that's a good feeling."

- Michael Mann,
Data Center Manager,
GI Property Management

One Wilshire

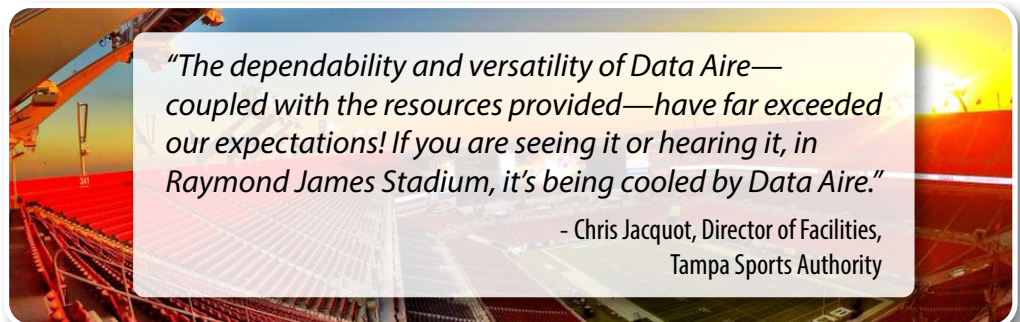
According to an article in Data Center Knowledge, "Many of the industry's best-known landmarks are carrier hotels, the huge connectivity hubs in major cities that bring together dozens (and sometimes hundreds) of networks and providers. They house large amounts of data center and telecom facilities, but typically also have office tenants. The most prominent of these include: ... One Wilshire: This Los Angeles carrier hotel is one of the best-known telecom buildings in the country, with more than half of the 665,000 square foot property occupied by communications companies..."

Watch the **One Wilshire** case study to learn how the project team worked through the power and cooling challenges of this 50+ year old building.

Hear how they questioned the status quo and developed a new way to efficiently scale the data center cooling with a site-optimized economization solution which helps minimize energy use and can provide 260 days a year of free cooling without a compressor.

Tampa Sports Authority

Tampa Sports Authority implemented a reliable multipurpose environmental control system that could match the impressive multi-million dollar renovation needs of the facility.



"The dependability and versatility of Data Aire—coupled with the resources provided—have far exceeded our expectations! If you are seeing it or hearing it, in Raymond James Stadium, it's being cooled by Data Aire."

- Chris Jacquot, Director of Facilities,
Tampa Sports Authority

Who Is Data Aire?

Precise by Design

Building on more than 50 years of experience, Data Aire produces innovative solutions to meet these developing demands. We are a solutions-driven organization with a passion for finding creative answers by working with our customers through a consultative process.

Data Aire combines extensive expertise in control logic with world-class manufacturing capability recognized by key international quality certifications. For those seeking reliable, scalable, customized technology, we provide the solutions of choice. Our precision air control equipment and intelligent energy management solutions serve customers worldwide in diverse applications ranging from enterprise computer rooms to colocation and hyper scale data centers.

Watch Our Company Video



Our Mission

To support critical facilities that rely on our consultative approach to invent, manufacture and deliver environmental control systems –securing operating continuity.

More Places.

More Spaces.

More Purpose-Built Solutions.



800-347-2473 | sales@DataAire.com
230 W. Blueridge Avenue
Orange, CA 92865



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