



# PUE, CFD, kW/ft<sup>2</sup>, DCiE. We'll Help You Gain the Upper Hand...

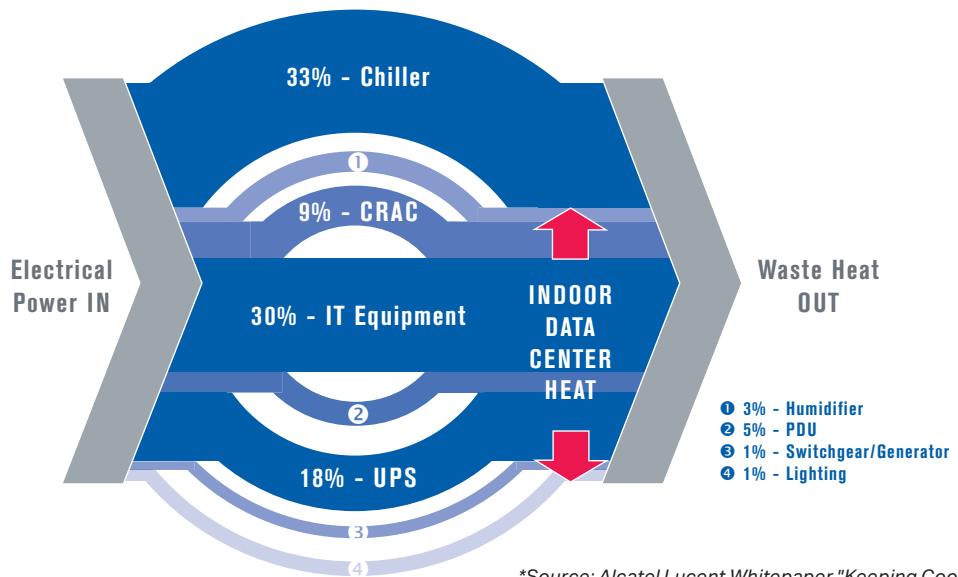
## ...In Your Data Center

You need reliable cooling to deliver on your primary need of uptime - helping to eliminate unplanned service interruptions. You also want to control and reduce your OpEx.

Industry reports show that as much as 45% of the power requirements of

a data center come from the cooling system. With integrated cooling solutions that are designed for part-load conditions, Armstrong can help you reduce those power requirements.

## Power Flow in a Typical Data Center



\*Source: Alcatel Lucent Whitepaper "Keeping Cool in the Data Center"

## Reliability

Cooling solutions from Armstrong are internationally recognized for design efficiency, long service life and operating economy. We have installations in hundreds of data centers worldwide. Integration is the key to system resilience, space savings and energy savings.

## Minimized Maintenance

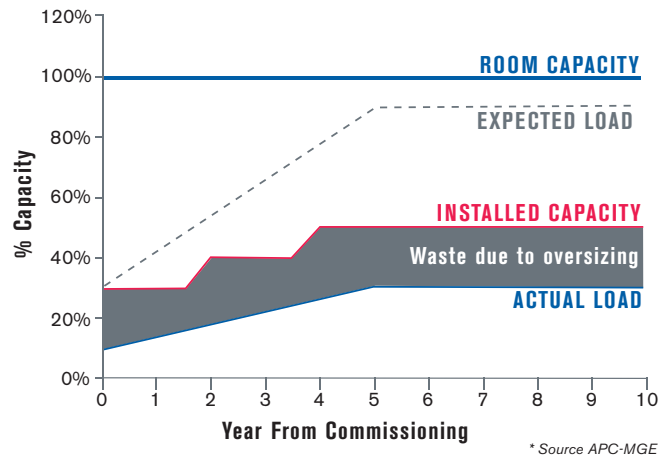
Armstrong products are designed for lowest life-cycle cost, and the key to this is minimizing maintenance. As an example, mechanical seal replacement on an Armstrong dualArm pump can be completed without compromising uptime.

## Energy Savings

Armstrong data center solutions are engineered to deliver the highest percentage of energy savings, significantly reducing your PUE. Armstrong chilled water plant automation systems save up to 50% in energy costs per year.

## Design Envelope Selection

With the growth of virtual servers, data center cooling is predominantly a part-load application. Even where organizations augment installed capacity in step with actual load, fixed speed components and oversizing of systems lead to waste (depicted in the graph below). The Armstrong Design Envelope selection methodology addresses the entire range of performance requirements and provides high efficiencies under part-load conditions through demand based control, minimizing waste due to oversizing.



Data Center Component	Armstrong Solutions	Armstrong Benefits
Base-mounted pumps with separately mounted drives	<b>Intelligent variable speed Vertical In-Line and dualArm pumps</b>	<ul style="list-style-type: none"> <li>• Reduction of inrush (soft start)</li> <li>• Savings in maintenance, space, installation, piping and friction</li> <li>• Up to 70% energy savings</li> <li>• No remote sensors</li> </ul>
Remote ON / OFF BMS control of pumps	<b>Integrated Pumping System (IPS) Control</b>	<ul style="list-style-type: none"> <li>• Automatically ensures delivery of the required pumping capacity to match key building loads with variable speed</li> <li>• Provides secondary loop control to ensure the pump station responds to system demand while using minimum speed and HP</li> <li>• Protects the Pumps</li> </ul>
Traditional new or aging chiller plant	<b>Pre-fabricated all variable speed chiller plant with all variable speed plant automation</b>	Armstrong Integrated Plant Package (IPP) combined with demand based control technology enables variable speed chillers to operate at their maximum efficiency.
CRAC unit economizer	<b>Chiller plant water-side economizer (heat exchanger that allows tower water to cool the chilled water directly)</b>	The Armstrong PFX S96X allows temperature approaches as low as one degree Fahrenheit to achieve the quickest return on investment and highest percentage of energy savings for water side economizer applications.

**Let Armstrong show you how ultra high efficiency can improve your business model by significantly extending performance for existing facilities or reducing infrastructure investment in new facilities.**