
//RESILIENT
TOGETHER//
2022 Partner Exchange
Building a Stadium
Value Engineering Lessons Learned
9/20/2022
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Building a Stadium

With rising costs coupled with strained supply lines, finding both construction and operational savings through design is more important than ever

01 **The Challenge**
You've been there before – overbudget and out of time

02 **The Big Idea**
A twist on traditional high-performance designs

03 **Making it Happen**
Ideas are one thing, pulling the team together and executing is another

04 **Really… It Works!**
The results speak for themselves – and they keep talking

01 The Challenge

$8M

Project was overbudget in Division 23

Mentimeter.com

Code:

How much did the team ultimately save?

A. $6.3M

B. $8.7M

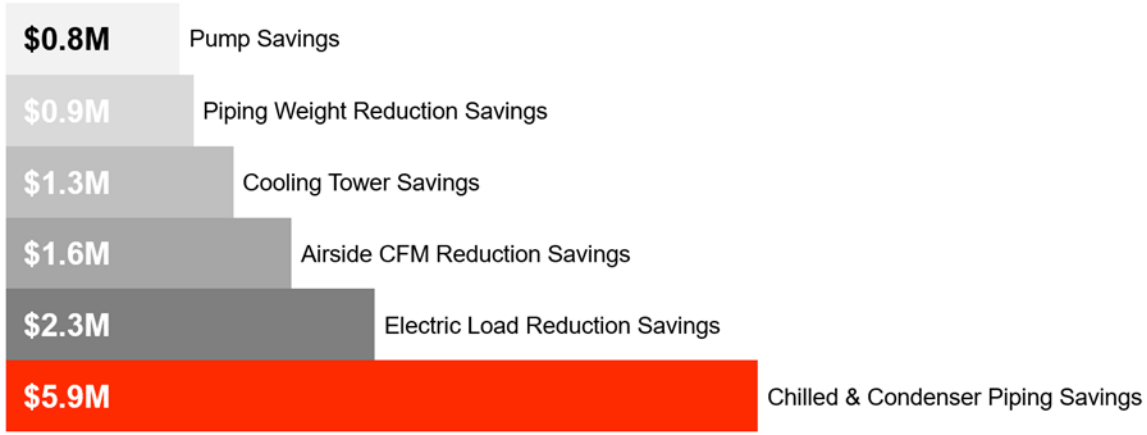
C. $10.2M

D. $12.8M

01 The Challenge

$8M

Project was overbudget in Division 23



Overcoming Adversity

How will the owner interact with the building?

How to navigate bid to alternative design?

What design will reduce cost, but meet operational goals?

What are expectations of the Building Automation System?

How can we accomplish efficient commissioning?

02 The Big Idea

6

Primary concepts investigated

Leveraging experience across multiple organizations, the team began putting pencil to paper – Extreme low flow, High Delta T, Series-Counterflow, Integrated Project Development, Air-Fi®, & Intelligent Services®

Extreme Low Flow

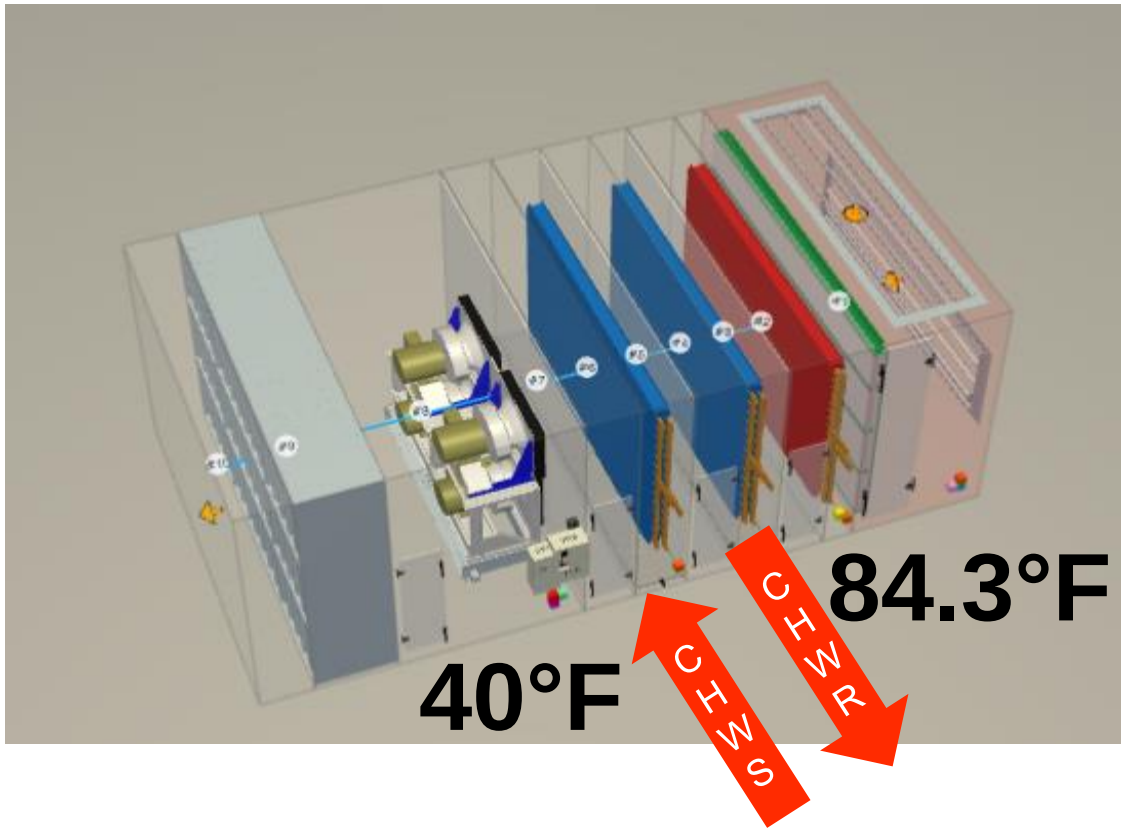
- Reduce flow on chilled water side
- Reduce flow on condenser side
- Reduce cooling tower size
- Reduce pump size

25%

- Reduce pipe nominal size
- Fewer cooling towers needed
- Smaller pumps needed

10%

Extreme Low Flow means High Delta T

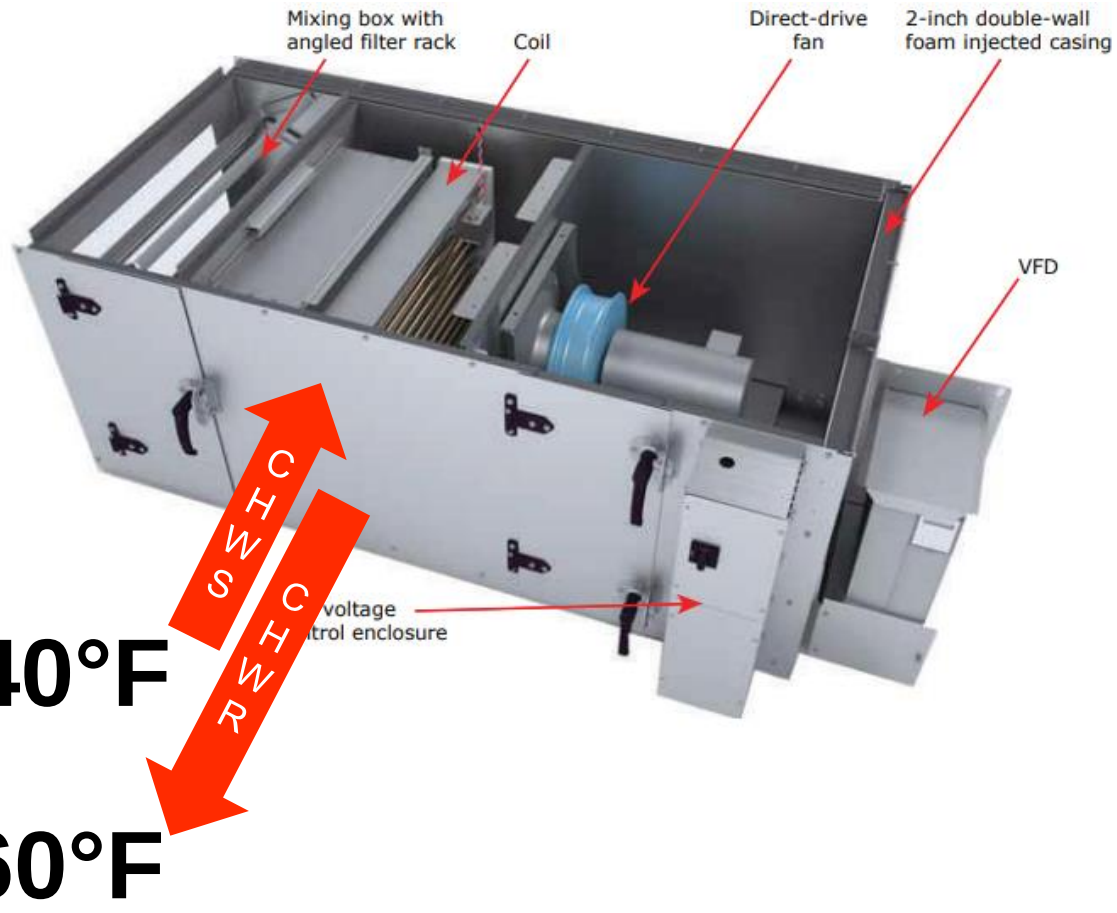


180 GPM

332.7 Tons

0.54 GPM/ton

High Delta T Considerations



0.61 GPM

0.5 Tons

1.22 GPM/ton

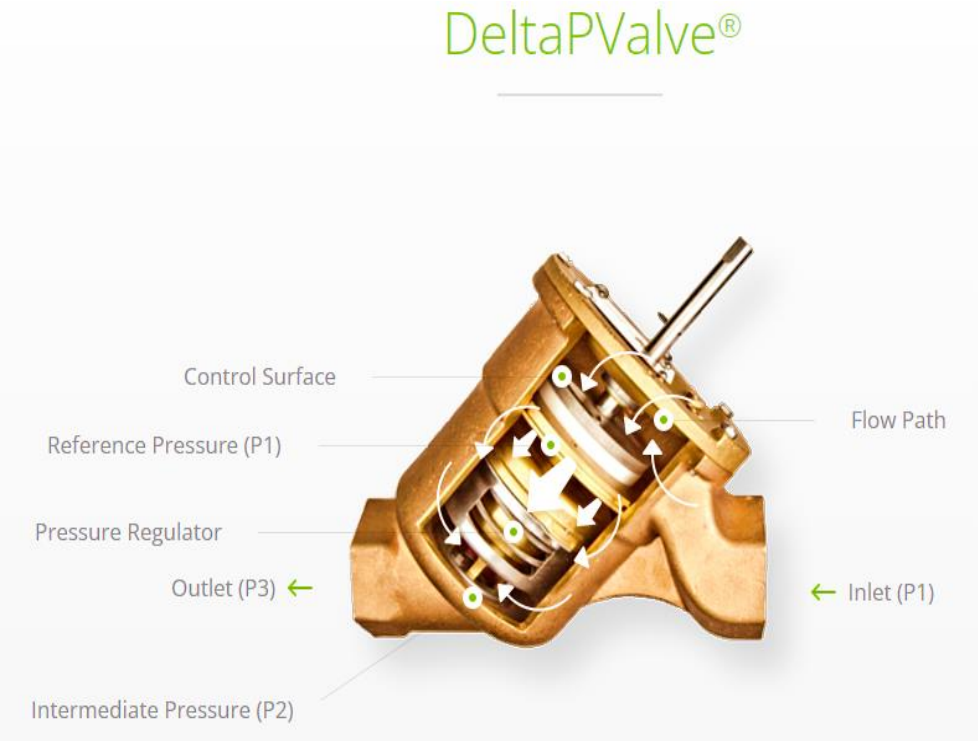
Mentimeter.com

Code:

What happens to Delta T at part load?

A. Nothing
B. Shrinks
C. Grows
D. When’s dinner?

Controlling High Delta T



100:1 Turndown

50% flow = 80% Heat transfer

Part load Delta T Rises

Mentimeter.com

Code:

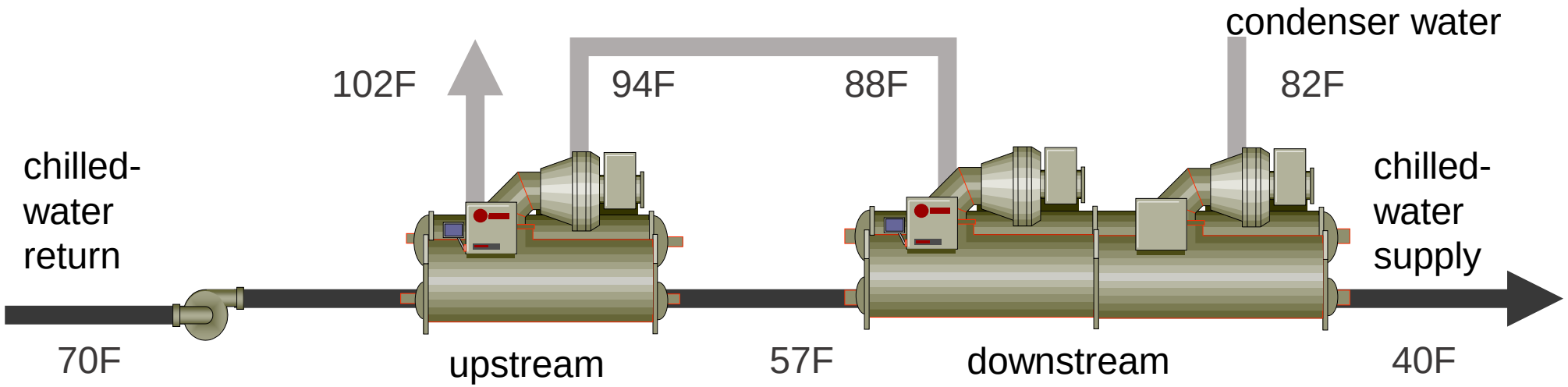
Can you put a simplex and duplex in a series-counterflow configuration?

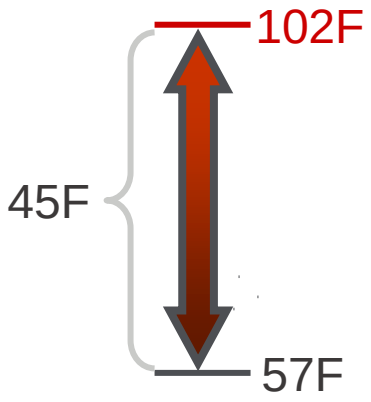
A. No way! Are you crazy?

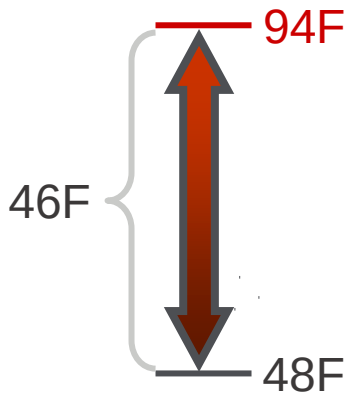
B. Sure, why not

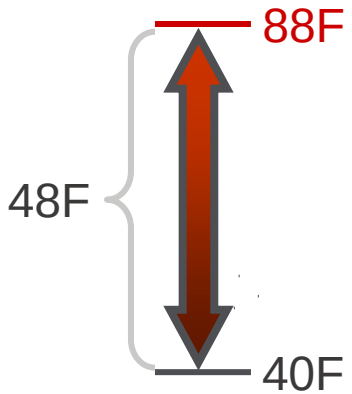
C. Again, when’s dinner?

The Power of Series Counter-Flow









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Code:

How much did the re-designed chiller plant end up saving on design kW?

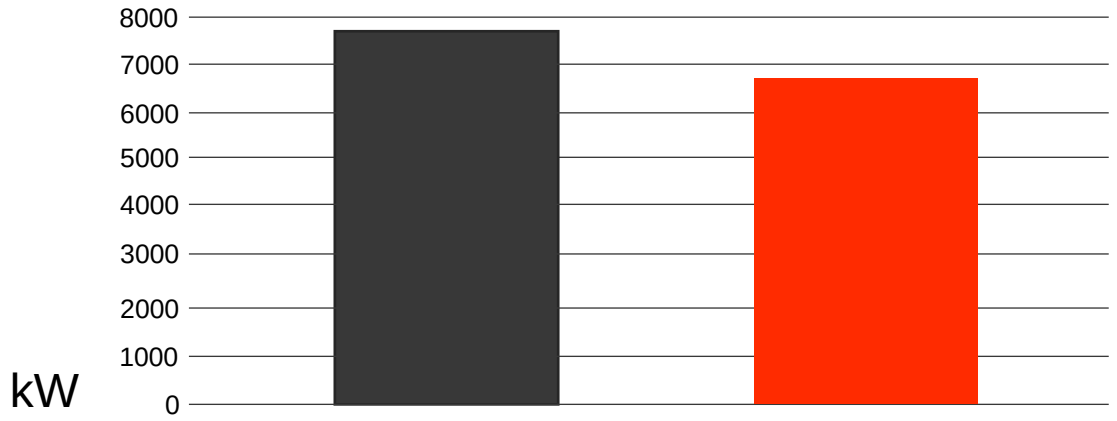
A. 10%

B. 12%

C. 14%

D. 16%

High Delta T System Impact



	Traditional	High Delta T	Savings
Chiller	4606	4433	4%
Cond Pump	413	218	47%
Evap Pump	440	310	30%
Cooling Towers	448	291	35%
Fans	1770	1482	16%
Totals	**7677**	**6734**	**12%**

Integrated Project Development

Reduce installation risk / time with factory installed controls

Reduce integration risk

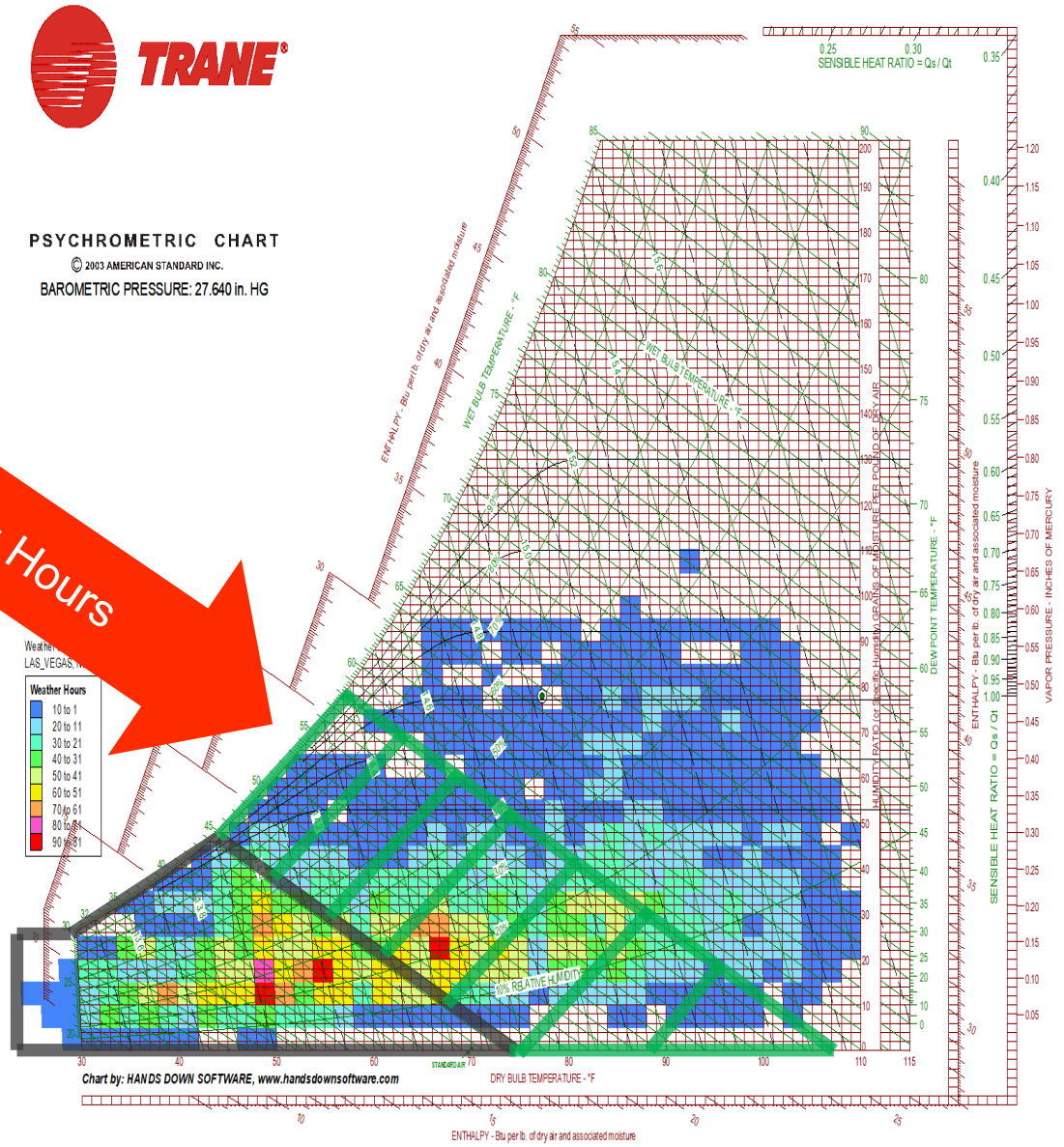
Reduce time / labor with remote commissioning

Operate as designed with Intelligent Services

Free Cooling

Free cooling initiation based on cooling tower & condenser pump model, instead of wet bulb

Prediction based on cooling tower performance giving you more hours (Extend from 45 to 58 Wet Bulb)



Wireless

Find a better way to organize information

Why Wireless?

- Reduced installation risk with no wires
- Project requirement – no exposed conduit
- Quickly able to make configuration changes
- Able to install without power on
- Secure, reliable mesh network

- 98 Wireless networks
- 550+ wireless devices
- Provided direct connection to cellular internet for all 14 BAS system controllers
- Enabled HVAC commissioning to begin prior to IT LAN network installation
- Provided one-time cut over from cell network to hard-wired LAN 4-weeks prior to opening

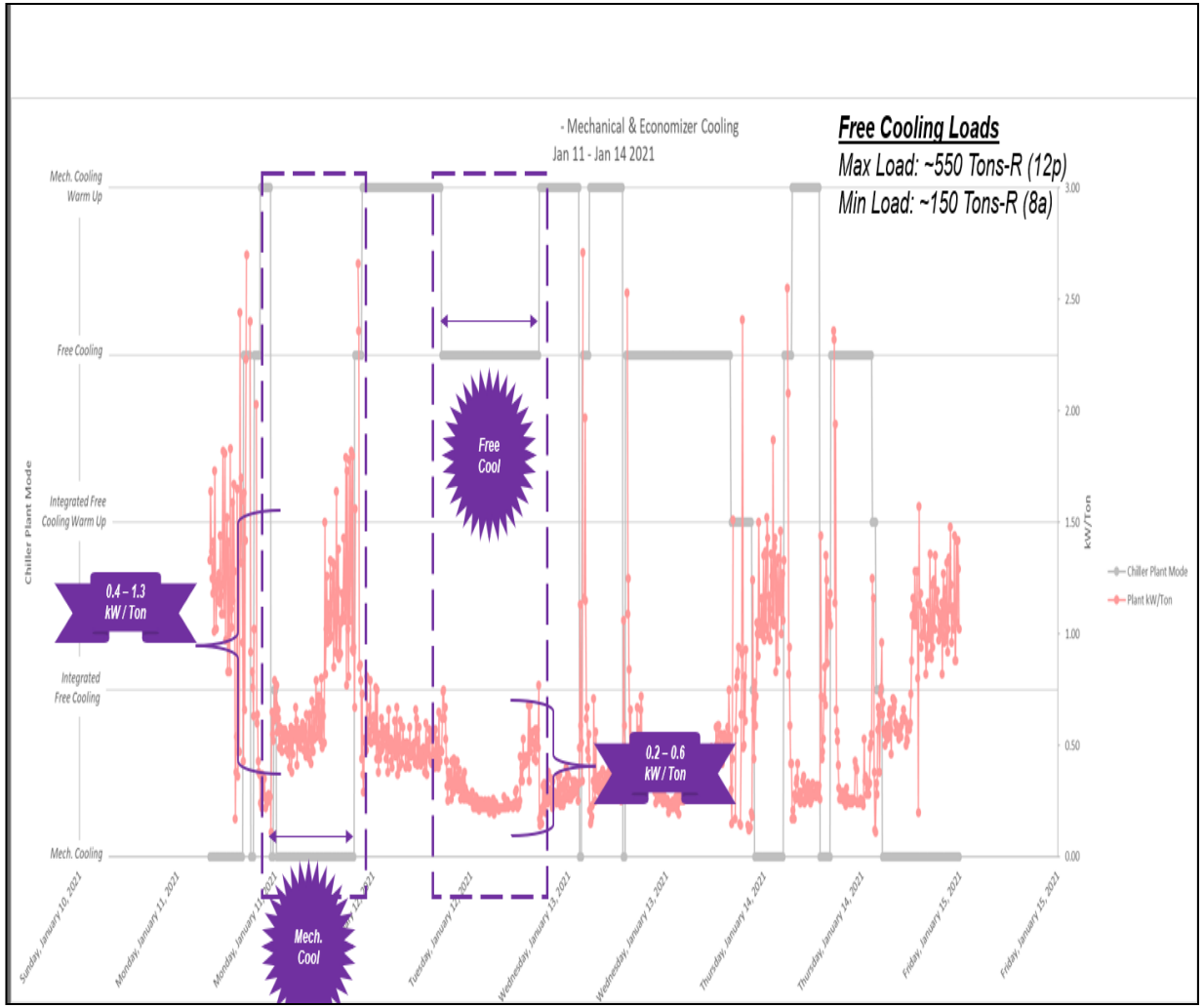
Intelligent Services

Identified Opportunities gathered from active monitoring

Chilled Water Supply Temp Reset
Increase IFC & FC cooling mode run hours
Reduce energy consumption

Lower speed of Condenser Pumps
Reduce energy consumption
Improved performance by matching required flow setpoint

Convert DAS plant to standard
Enable smaller chillers & pumps for “Non-Event” modes when loads are <500 tons



03 Making it Happen

6M+

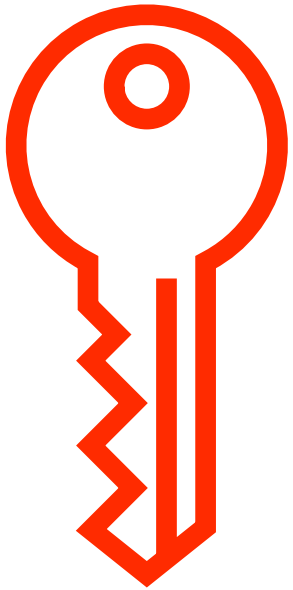
Labor hours to build the stadium

With ideas solidifying, alignment across the construction chain was the next step. Owner, GC, Trades, Engineer, Suppliers all had to come together to pull this off

Pulling the Team Together

Design	Planning	Execution
		
Worked closely with engineer to validate concepts and update designs	Coordinated with mechanical to determine best way to operationalize	Brought parties onsite to ensure design intent / plans were followed

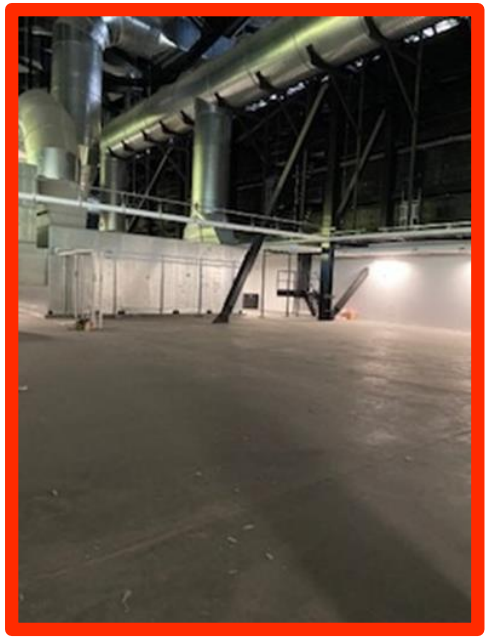
Keys to the Team's Success



- Strategic Communication & Teaming
- Aligning with customer/owner priorities
- Proactive Approach
- The power of Controls + Intelligent Services
- Long term operational commitment to alternate design

Construction Savings

$0.8M	Pump Savings
$0.9M	Piping Weight Reduction Savings
$1.3M	Cooling Tower Savings
$1.6M	Airside CFM Reduction Savings
$2.3M	Electric Load Reduction Savings
$5.9M	Chilled & Condenser Piping Savings



04 Really… it works!

$12.8M

Construction cost savings

With construction complete and a full season under its belt, the project continues to deliver on its design

Operational Savings

Average plant efficiency 0.6 kW/ton

Peak demand ~1MW less than design

Plant efficiencies as low as 0.2 kW/ton when in Free Cooling

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Key Take Aways

Delta Ts are a variable not a constant

Delta Ts are application specific not job specific

Proper Flow Control is CRITICAL

Series Chillers save energy and cost

Controls are critical to operationalize the savings


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