



# IDEA2021

Powering the Future: District Energy/CHP/Microgrids

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# IS BIGGER ALWAYS BETTER?

## Evaluating Central vs Distributed Generation in System Expansions



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# Agenda

Background

The Problem

The Challenges

Study Options and Results

The Solution

Q&A





# Background

## Manufacturing Plant 101

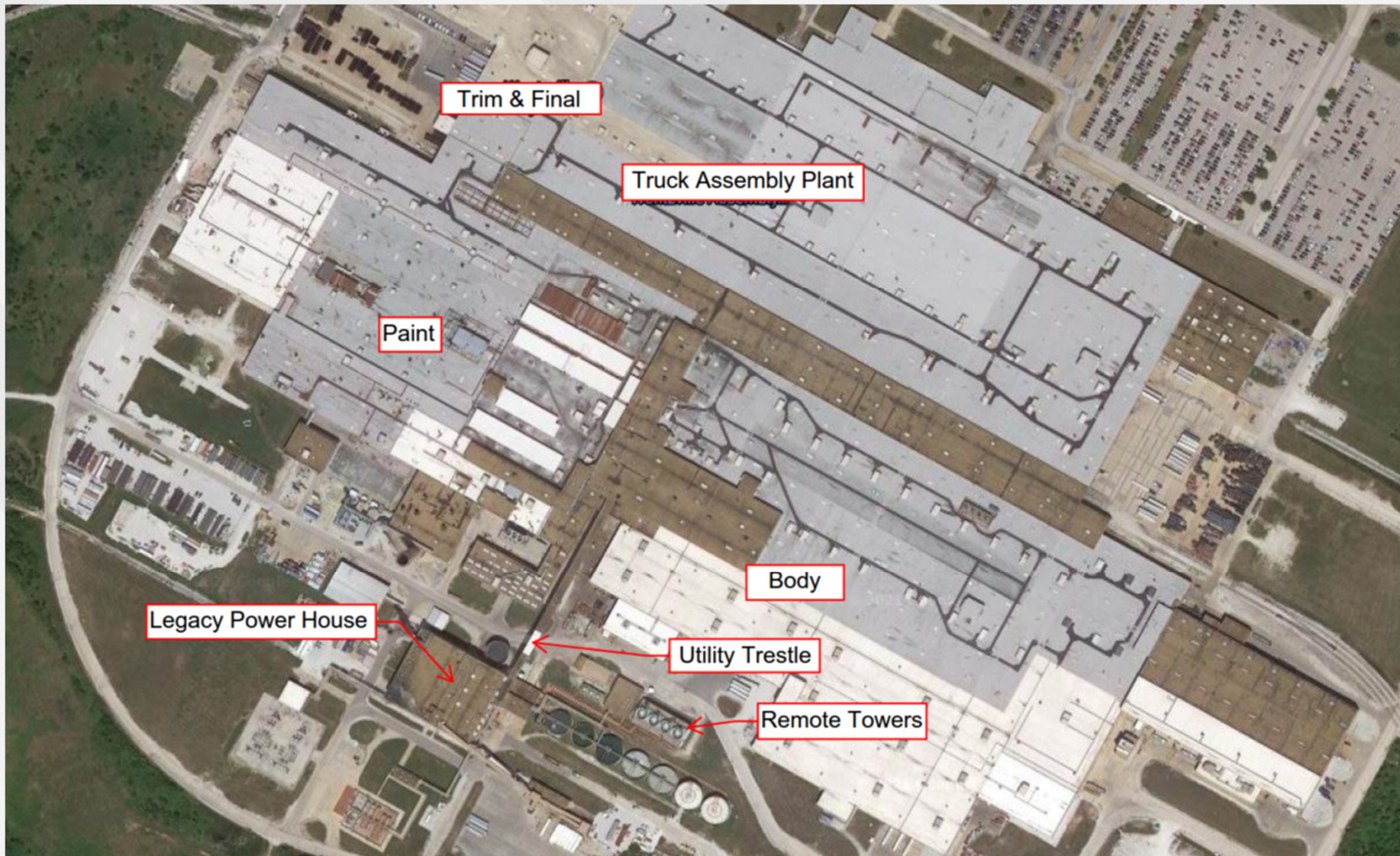
- 3-5Msqft per plant
- 4,000-6,000 employees across all shifts
- Utility Needs
  - ▶ Steam – up to 350kpph
  - ▶ Hot Water – up to 180mmBtu/hr
  - ▶ Chilled Water – 9,000-12,000+ tons
- Central generation + sitewide distribution and/or distributed generation close-coupled to loads





# ackground

Assembly Plant is about 3500' wide and 4M sqft

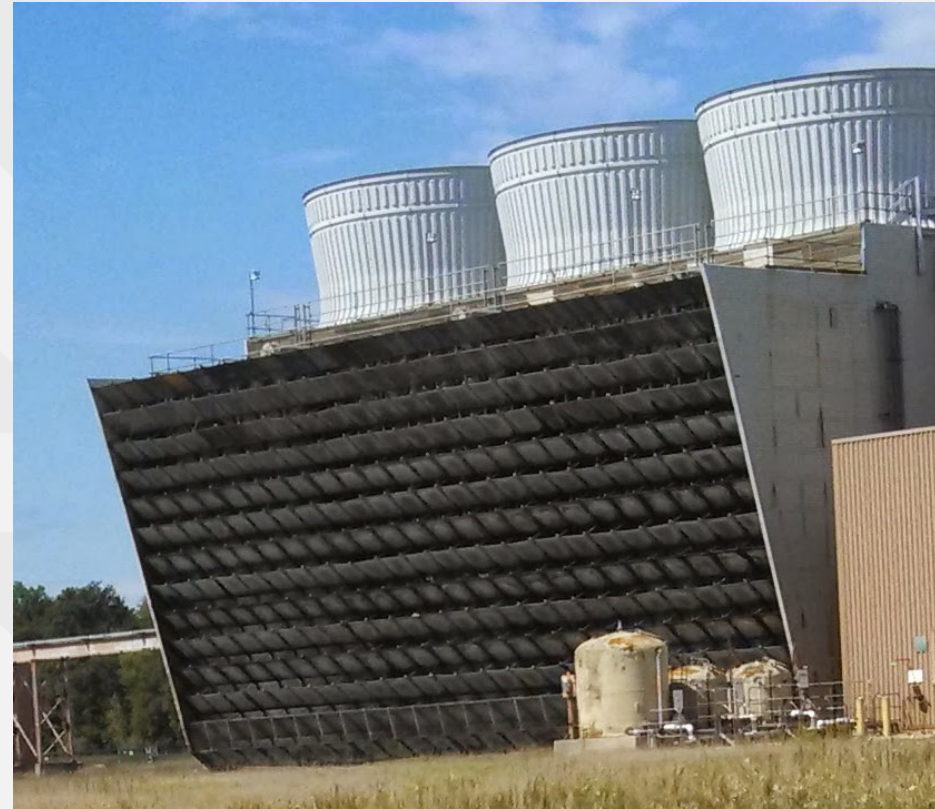




# the Problem

## Midwest Assembly Plant – Cooling Shortage

- Process issues in Paint threatening quality
- Labor issues with heat in plant threatening production
- Legacy powerhouse is failing
- Downtime costs \$2.5 million/hr.





# the Problem

Aging powerhouse chillers produce 7,200 tons, but ...

- Peak demand is over 12,000 tons
- Paint processes need chilled water in shoulder months
- Legacy 2-pipe seasonal loop can't heat/cool simultaneously
- 4,500 tons of new capacity urgently needed





# he Challenges

Fix required just 8 1/2 months after  
budget release in October (run May 30)

- No added downtime
- No production interference
- Zero tolerance on limited budget
- Labor may walk if cooling is late



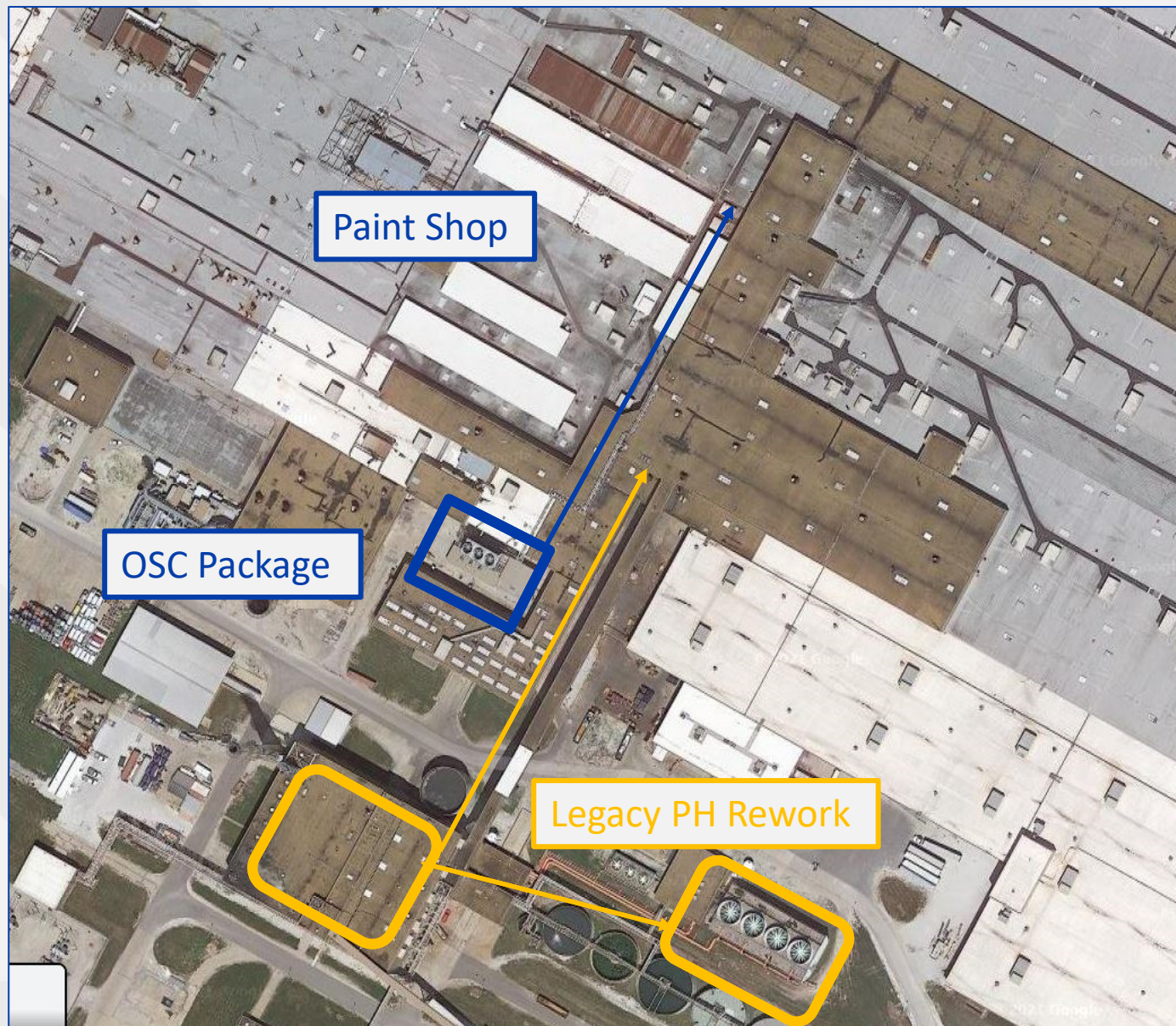


# Study Options

Work / Update the existing  
Warehouse, Cooling Tower,  
Distribution

Off-Site Constructed  
(C) Modular Chilled  
Water System

Each option addresses  
scope, schedule, and  
get OPR's



# dy Options - Analysis

Option 1A Update Central Powerhouse (PH)

Option 2A New Modular Plant

Option 2B New Paint Shop Modular Plant with Separate Distribution

Description	Existing	Option 1A	Option 2A	Option 2B
Total Installed Capacity (Tons)	7,200	12,300	11,700	11,700
Peak Demand (Tons)	12,865	12,865	12,865	12,865
Total Firm Capacity (Tons)	5,600	8,700	10,100	10,100
Firm Shortfall (Tons)	7,265	4,165	2,765	2,765
Independent Paint Cooling	NO	NO	NO	YES
<b>Total Estimated Cost</b>		<b>\$8,158,909</b>	<b>\$9,991,798</b>	<b>\$11,849,047</b>
<b>1-Year Net Energy Impact</b>		<b>\$(834,228)</b>	<b>\$(1,461,067)</b>	<b>\$(1,596,823)</b>
<b>2-Year Net Cost</b>		<b>\$6,490,453</b>	<b>\$7,069,664</b>	<b>\$8,655,401</b>
<b>5-Year Net Cost</b>		<b>\$3,987,769</b>	<b>\$2,686,463</b>	<b>\$3,864,932</b>



# Study Results - Package Option Benefits

Distributed Off-site Constructed (OSC) Solution vs. Central approach

New package leaves options for future PH modernization open

Location adjacent loads minimizes field connection costs

- Local system avoids disruptive cross-campus digs in District systems
- \$ for paint process loop instead of long connecting mains
- Dedicated process CHW loop from PH cost prohibitive

Offsite build

- Reduced field labor and site intrusion, budget risk
- Enable process loop
- Enabled aggressive schedule (8 ½ months from \$ approval)



# the Solution

off-site constructed, modular, pre-piped  
and wired system

engineered/built by Epsilon as  
specialty supplier

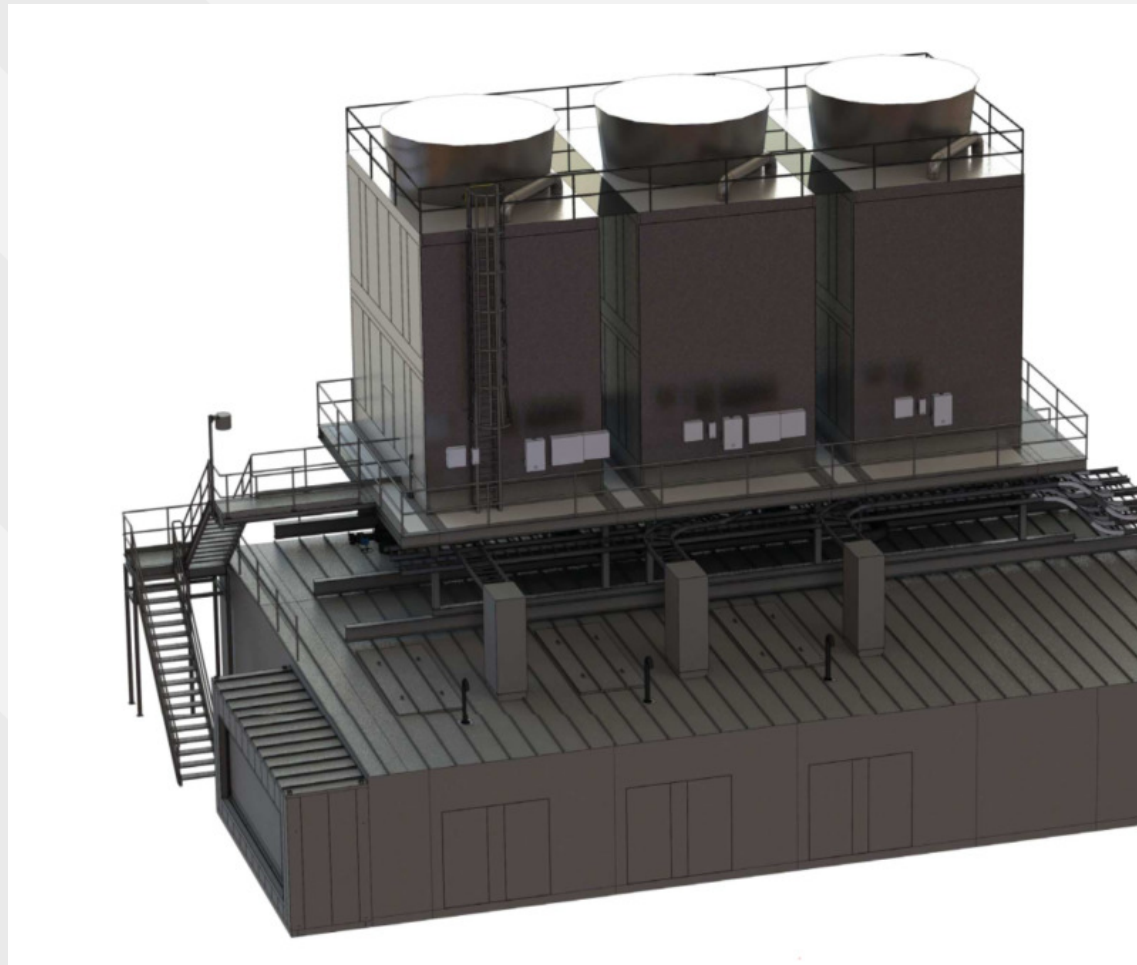
compliant to Customer's specs...

.But adapted to modular req's

reuse of designs from related  
epsilon projects at customer cut  
schedule by months

reduced field installation effort

new dedicated process CHW loop  
instead of rehab spends in old PH





# he Solution Installation



2:30 PM April 24 ... ready to lift



Substation ...



Sub Station Set Complete 5:00 PM April 25



First chiller module April 26 ...



# the Solution Installation



May 8 set ...fully wired and ready for startup: May 18 - 24





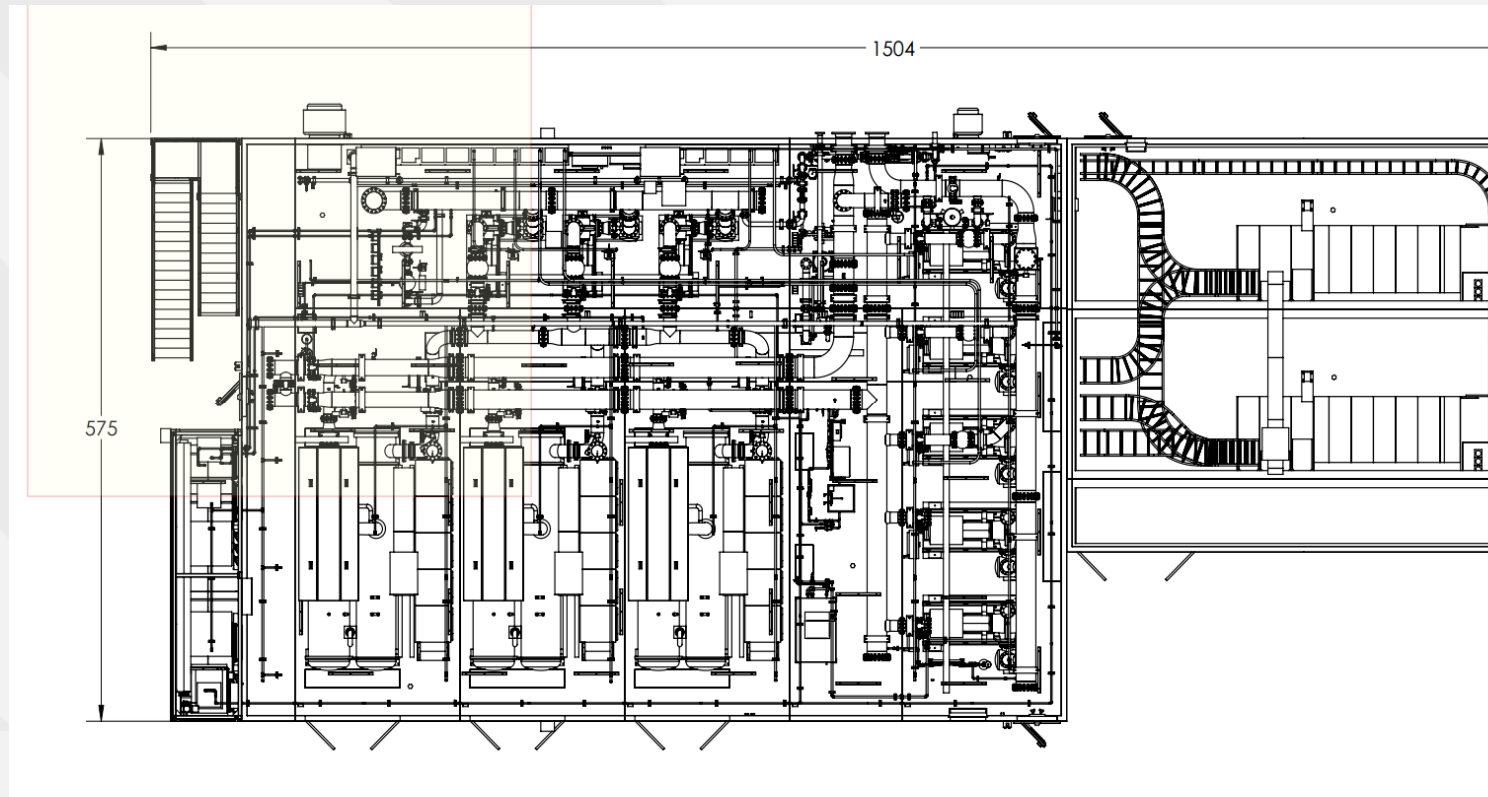
# the Solution

distributed OSC plants  
reduce field costs

local utility generation  
avoids costly piping  
in developed  
campuses

OSC packaged utilities  
minimize field  
activity/disruption

install schedule as short  
as 6 weeks, not 8  
months



# Lessons Learned

Distributed generation can be less disruptive than expansion of a district plant

SC package installation results in minimal disruptions

SC builds offer safety benefits

Less field labor

Easier tasks

Installation schedule reduced

Good packages are highly maintainable







April 24 ... ready to lift

# Questions?



# Thank you



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