
IDEA2021
Powering the Future: District Energy/CHP/Microgrids
Sept. 27-29 | Austin Convention Center | Austin, Texas

Challenges and Lessons Learned from the Austin Energy Downtown Plant

Imane Mrini, PE, PMP – Austin Energy
Michele Bryant, PE – Austin Energy
John Makar, PE, PMP, LEED AP – EEA Consulting Engineers
Mark Mikulin, PE – EEA Consulting Engineers

IDEA2021
Powering the Future: District Energy/CHP/Microgrids
Sept. 27-29 | Austin Convention Center | Austin, Texas

Presentation Agenda

Michele Bryant	Austin Energy District Cooling Program
John Makar	Design Elements
Mark Mikulin	Design Challenges and Solutions
Imane Mrini	Construction Challenges and Solutions

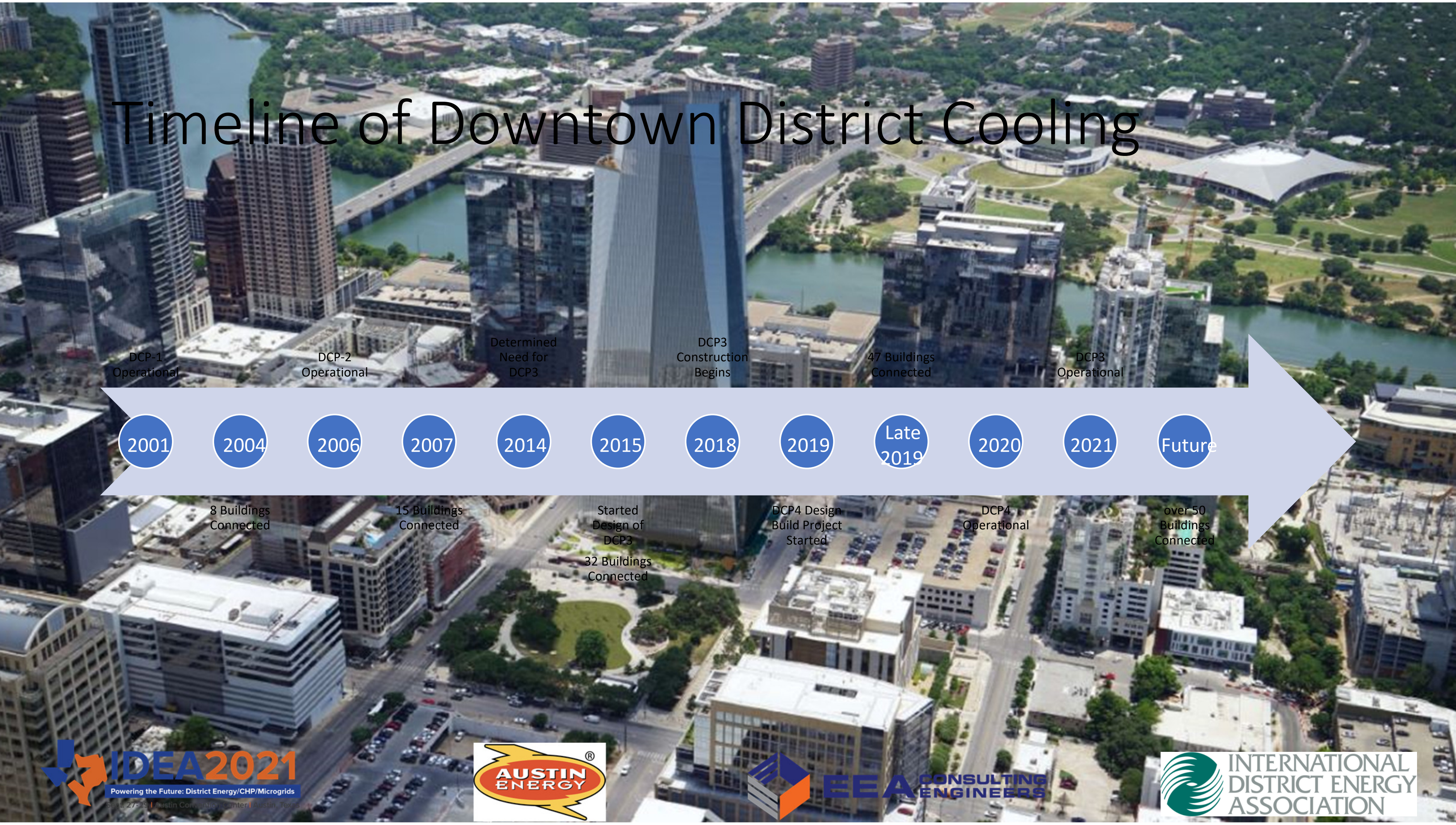
IDEA2021
Powering the Future: District Energy/CHP/Microgrids
Sept. 27-29 | Austin Convention Center | Austin, Texas

AUSTIN ENERGY®

EEA CONSULTING ENGINEERS

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

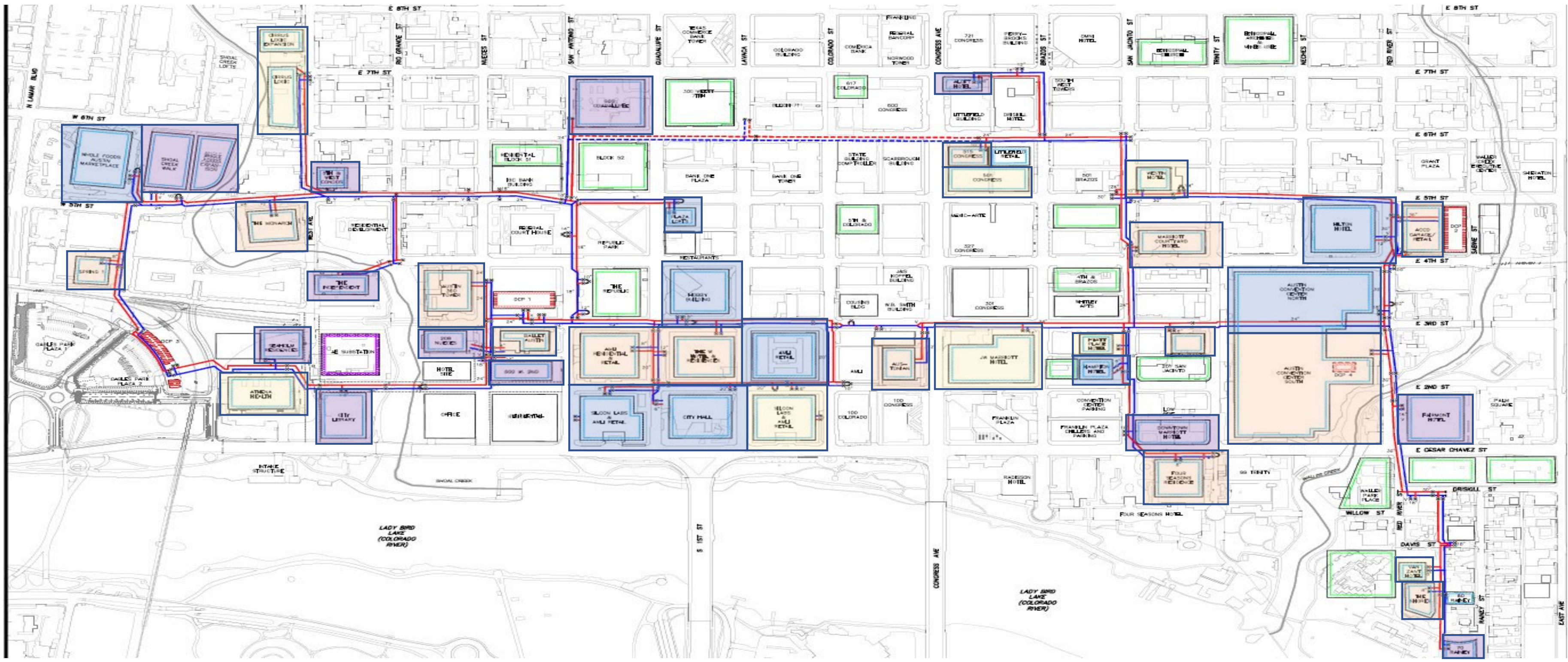
Timeline of Downtown District Cooling



- 2001 – DCP-1 Operational
- 2004 – 8 Buildings Connected
- 2006 – DCP-2 Operational
- 2007 – 15 Buildings Connected
- 2014 – Determined Need for DCP3
- 2015 – Started Design of DCP3; 32 Buildings Connected
- 2018 – DCP3 Construction Begins
- 2019 – DCP4 Design Build Project Started
- Late 2019 – 47 Buildings Connected
- 2020 – DCP4 Operational
- 2021 – DCP3 Operational
- Future – over 50 Buildings Connected

Downtown District Cooling Plants Overview

2006 - PRESENT



IDEA2021
Powering the Future: District Energy/CHP/Microgrids
Sept. 27-29 | Austin Convention Center | Austin, Texas

AUSTIN ENERGY

EEA CONSULTING ENGINEERS

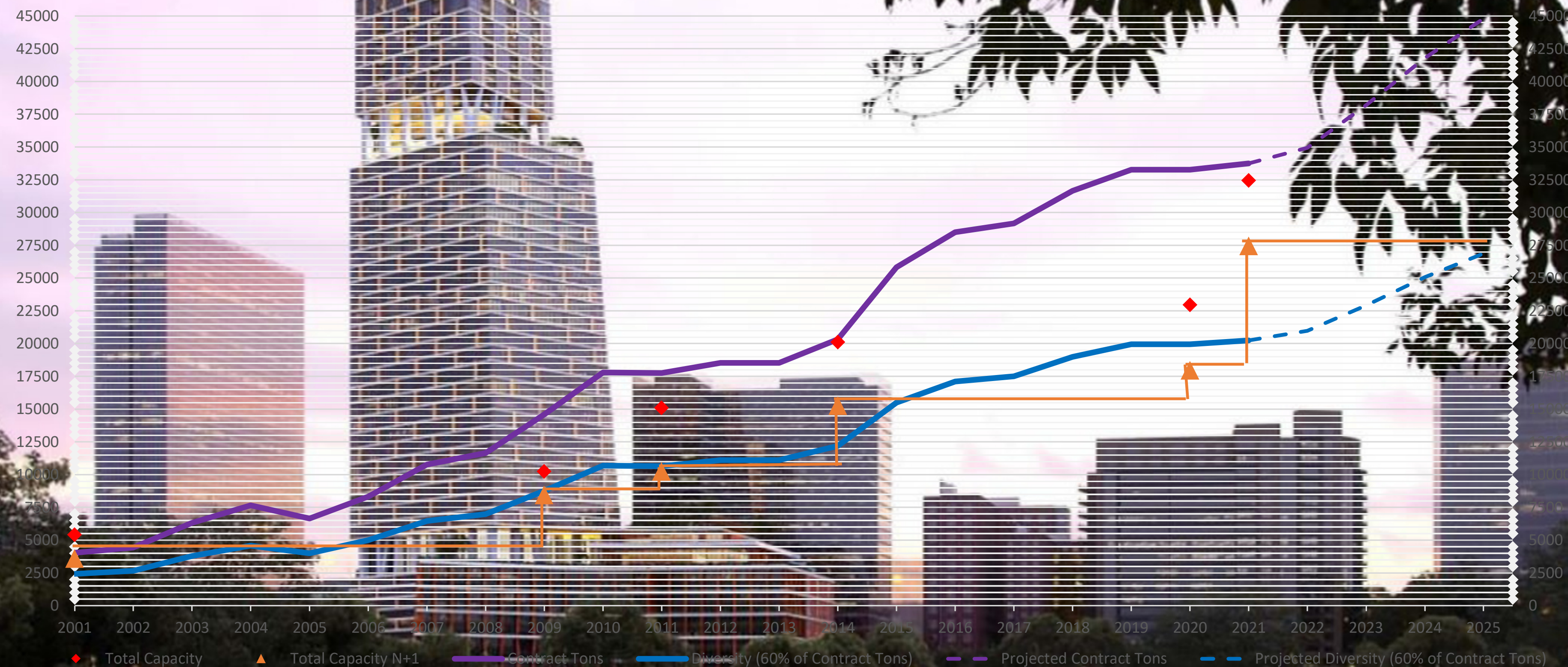
INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Plant Capacities

DCP1	DCP2	DCP4	DCP3
			

	DCP1	DCP2	DCP4	DCP3	Summary
Water Chiller	6000 Tons	14700 Tons	3000 Tons	10000 Tons	33700 Tons
Ice Chillers	2000 Tons	5000 Tons	NA	NA	7000 Tons
ICE TES	24000 Ton Hrs	52600 Ton Hrs	NA	NA	76600 Ton Hrs
Temperature	32-36 F	32-36 F	36 F	36 F	32-36 F
Pumping Capacity	9200 GPM	20000 GPM	4000 GPM	15000 GPM	Primary & Secondary Configuration

District Cooling System Growth Projections



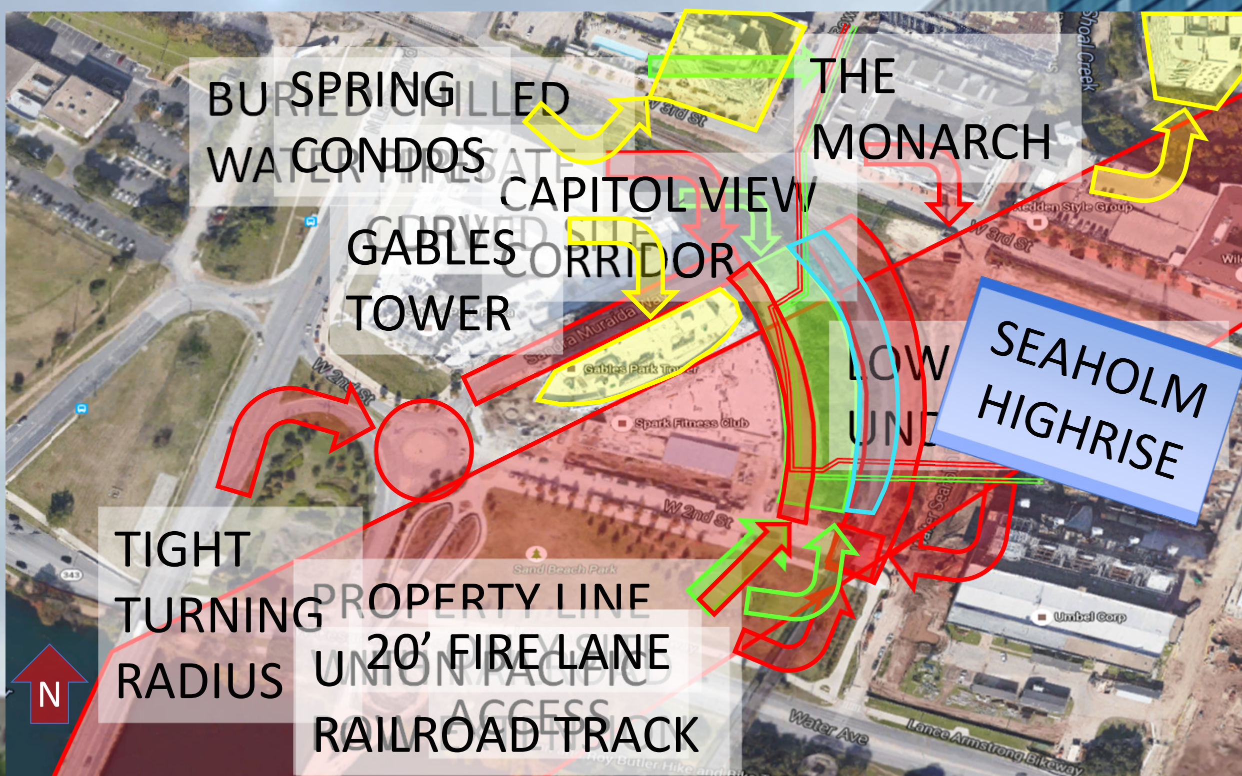
IDEA2021
Powering the Future: District Energy/CHP/Microgrids
Sept. 27-29 | Austin Convention Center | Austin, Texas

AUSTIN ENERGY

EEA CONSULTING ENGINEERS

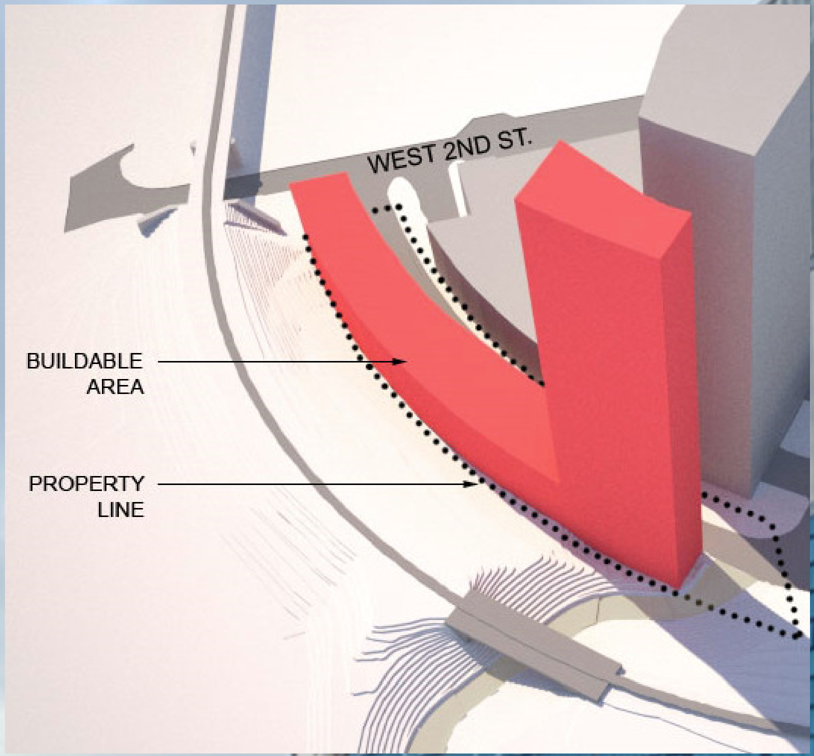
INTERNATIONAL DISTRICT ENERGY ASSOCIATION

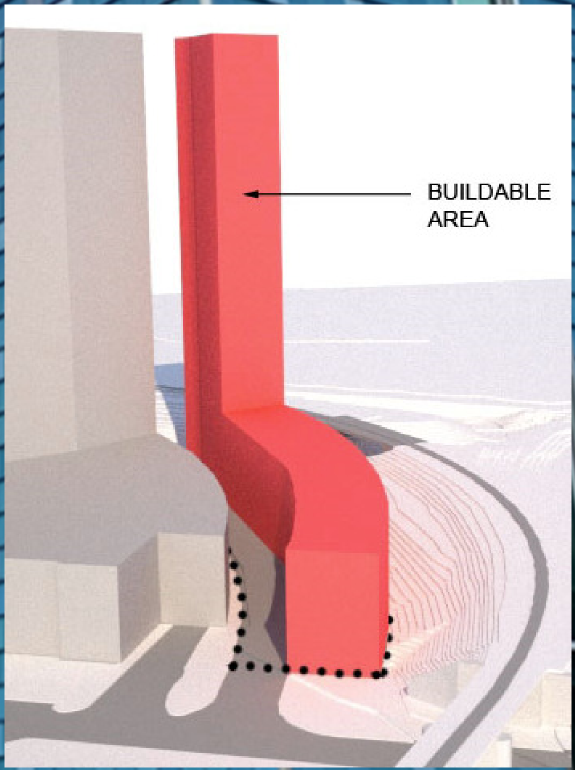
Design Elements - Constraints



1. Curved Site Shape
2. Challenging Site Access
3. Union Pacific Railroad Track
4. Capitol View Corridor
5. Buried Chilled Water Pipes
6. 20' Fire Lane
7. Sound Level Limit for Neighbors

Design Elements – Buildable Area





Design Elements - Requirements and Equipment

<u>Design Conditions</u>

CHW Side:
- 10,000 – ton capacity
- 36°F CHWS / 52°F CHWR

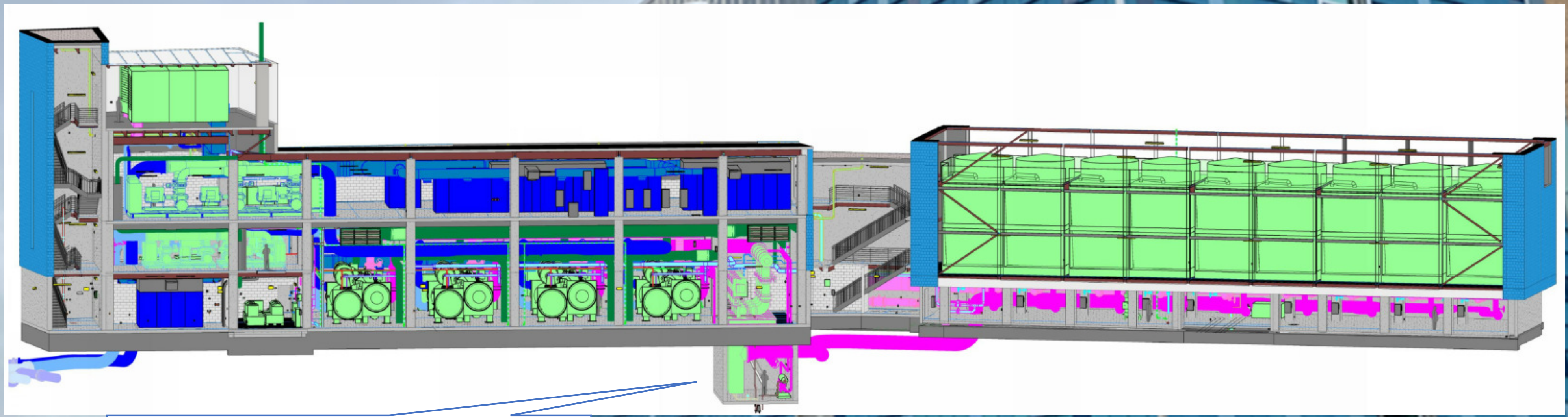
CW Side:
- 10,000 – ton capacity
- 85°F CWS / 94.4°F CWR @ 80°F WB

<u>Austin Energy Design Requirements</u>

- Variable-Primary/Variable-Secondary CHW Pumping
- Redundant PLC Controls
- N+1 Primary Equipment Capacities
- Redundant Plant Electrical Feeds
- Fully Electric Plant (No Pneumatics)
- Sulfuric Acid CW Treatment (H-3 Occupancy Room)
- Conditioned Chiller Room

Design Elements – Material Considerations

Design Challenge & Solution – CWP NPSHa



Condenser Water Pump Pit
Vertical Turbine Pumps with Cans

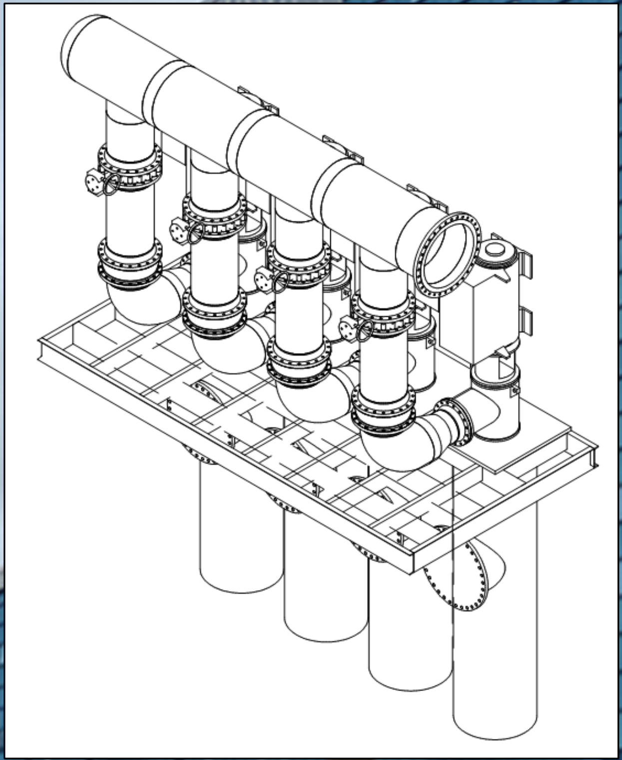
IDEA2021
Powering the Future: District Energy/CHP/Microgrids

AUSTIN ENERGY

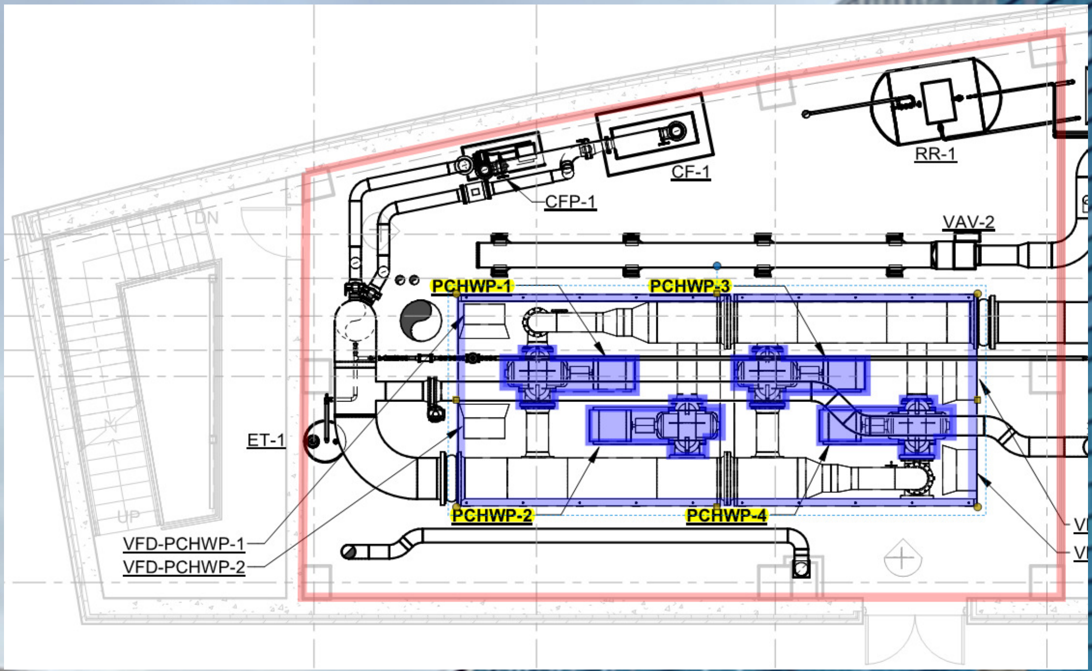
EEA CONSULTING ENGINEERS

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

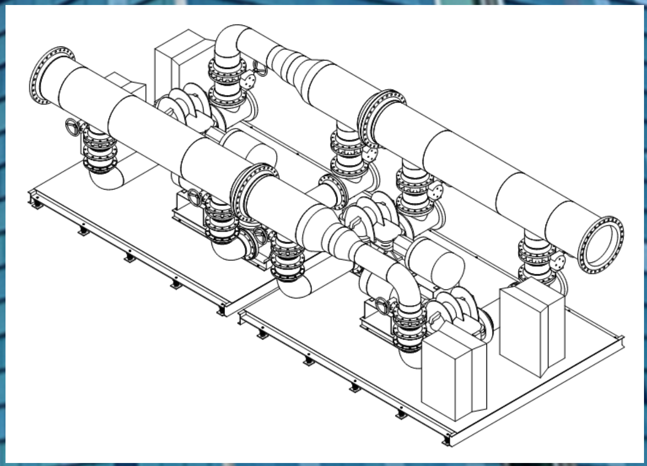
Design Challenge & Solution – CWP NPSHa



Design Challenge & Solution – PCHWP N+1



Pump Mezzanine



PCHWP Skid

Design Challenge & Solution – PCHWP N+1

PUMP SCHEDULE

MARK	SERVICE	TYPE	MAKE	MODEL	SIZE	IMPELLER (IN)	DESIGN POINT FLOW (GPM)	HEAD (FTDH)	EFF (%)	BHP	NPSHR MAX (FT)	MOTOR POWER (HP)	SPEED (RPM)	V/PH	TYPE	REMARKS
PCHWP-1	PRIMARY CHILLED WATER	FRAME MOUNTED HORIZONTAL SPLIT CASE	BELL & GOSSETT	HSCS	14x16x17	14	3,750	35	76.0	43.6	10.5	100	1,018	460/3	ODP - INV	STANDARD OPERATION
							5,000	40	77.4	66.1	10.7		1,185			"N+1" OPERATION (ASSUME 1 PUMP FAILED)
PCHWP-2	PRIMARY CHILLED WATER	FRAME MOUNTED HORIZONTAL SPLIT CASE	BELL & GOSSETT	HSCS	14x16x17	14	3,750	35	76.0	43.6	10.5	100	1,018	460/3	ODP - INV	STANDARD OPERATION
							5,000	40	77.4	66.1	10.7		1,185			"N+1" OPERATION (ASSUME 1 PUMP FAILED)
PCHWP-3	PRIMARY CHILLED WATER	FRAME MOUNTED HORIZONTAL SPLIT CASE	BELL & GOSSETT	HSCS	14x16x17	14	3,750	35	76.0	43.6	10.5	100	1,018	460/3	ODP - INV	STANDARD OPERATION
							5,000	40	77.4	66.1	10.7		1,185			"N+1" OPERATION (ASSUME 1 PUMP FAILED)
PCHWP-4	PRIMARY CHILLED WATER	FRAME MOUNTED HORIZONTAL SPLIT CASE	BELL & GOSSETT	HSCS	14x16x17	14	3,750	35	76.0	43.6	10.5	100	1,018	460/3	ODP - INV	STANDARD OPERATION
							5,000	40	77.4	66.1	10.7		1,185			"N+1" OPERATION (ASSUME 1 PUMP FAILED)

Standard Operation: 4 pumps @ 1,080 RPM 3,750 GPM x 4 = 15,000 GPM

N+1 Operation: 3 pumps @ 1,185 RPM 5,000 GPM x 3 = 15,000 GPM

Anticipated Construction Challenges

1. Project risks: potential soil contamination, buried debris and adjacent active railroad.
2. Constrained site- tight construction tolerances and multiples trade contractors.
3. Excavation shoring and railroad approvals.
4. Neighborhood impact.

IDEA2021
Powering the Future: District Energy/CHP/Microgrids
Sept. 27-29 | Austin Convention Center | Austin, Texas

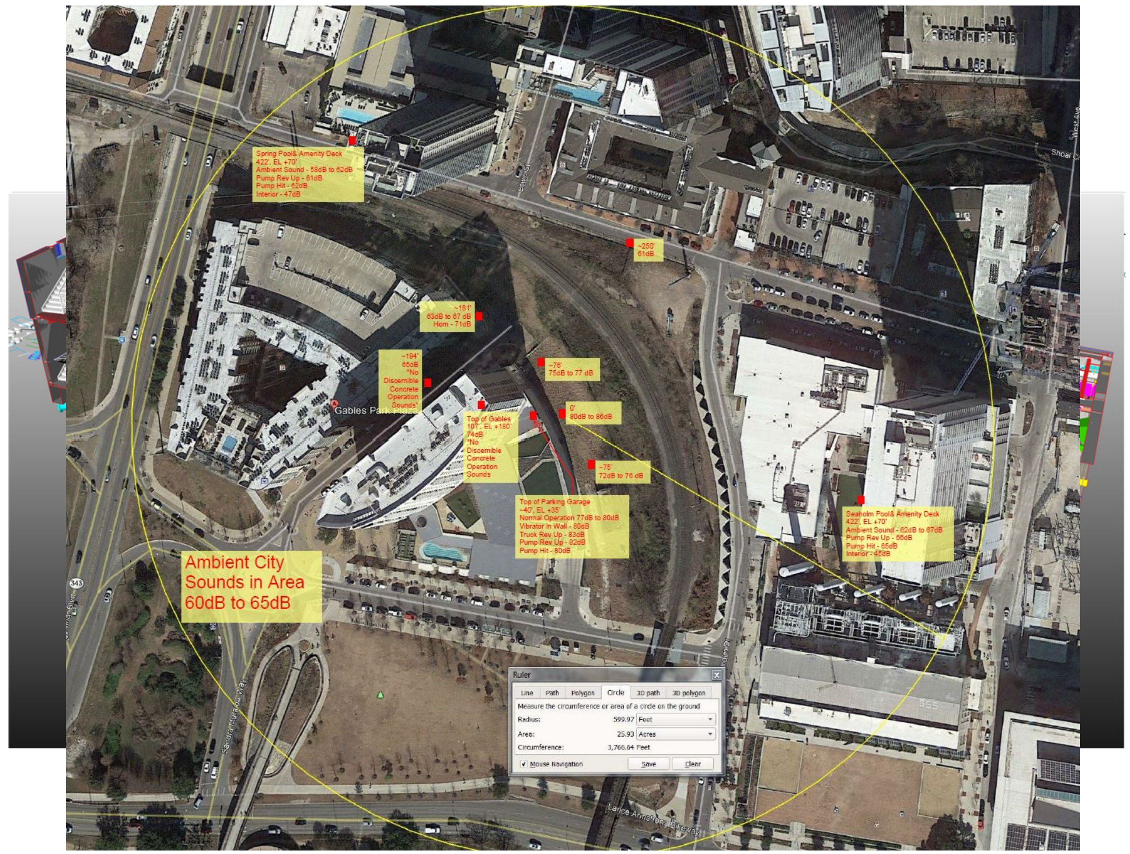
AUSTIN ENERGY

EEA CONSULTING ENGINEERS

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Measures to address anticipated risks

- Construction allowances
- BIM Modeling, contract packaging and contingency
- Prior coordination with UPRR and design approvals. Cutback versus shoring.
- Public Outreach effort



IDEA2021 Powering the Future: District Energy/CHP/Microgrids Sept. 27-29 | Austin Convention Center | Austin, Texas

AUSTIN ENERGY

EEA CONSULTING ENGINEERS

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

What went wrong and solutions

- **Issue #1** : Wastewater line conflict during tunneling

***Solution** : hand tunneling and encasement*

- **Issue #2**: High thermal and pressure conditions during flushing & passivation

***Solution:** Heat exchangers to dissipate heat*

IDEA2021 Powering the Future: District Energy/CHP/Microgrids Sept. 27-29 | Austin Convention Center | Austin, Texas

AUSTIN ENERGY

EEA CONSULTING ENGINEERS

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Successful outcomes and lessons learned

- Effective risk mitigation measures- 2.7% change orders
- Team collaboration and flexibility from all parties to solve problems- Partnership meeting at project start
- Risk based investment in subsurface utility exploration
- Robust and effective system for project communication, submittal review, change and variation approvals and safety plan adherence. Not taking shortcuts despite schedule delays.

Q&A

Thank You!

Imane Mrini
Imane.Mrini@AustinEnergy.com

Mark Mikulin
MarkMikulin@EEAce.com

Michele Bryant
Michele.Bryant@AustinEnergy.com

John Makar
JohnMakar@EEAce.com