The County of
Orange, California

Civic Center Campus
Central Utility Facility

Strategic Development Plan

2014 IDEA Annual Conference
Seattle

JACOBS

Agenda

1. Plant History / Background
2. Planning Process
3. Findings (CHW, Steam, CHP)
4. Results / Recommendations
5. Next Steps

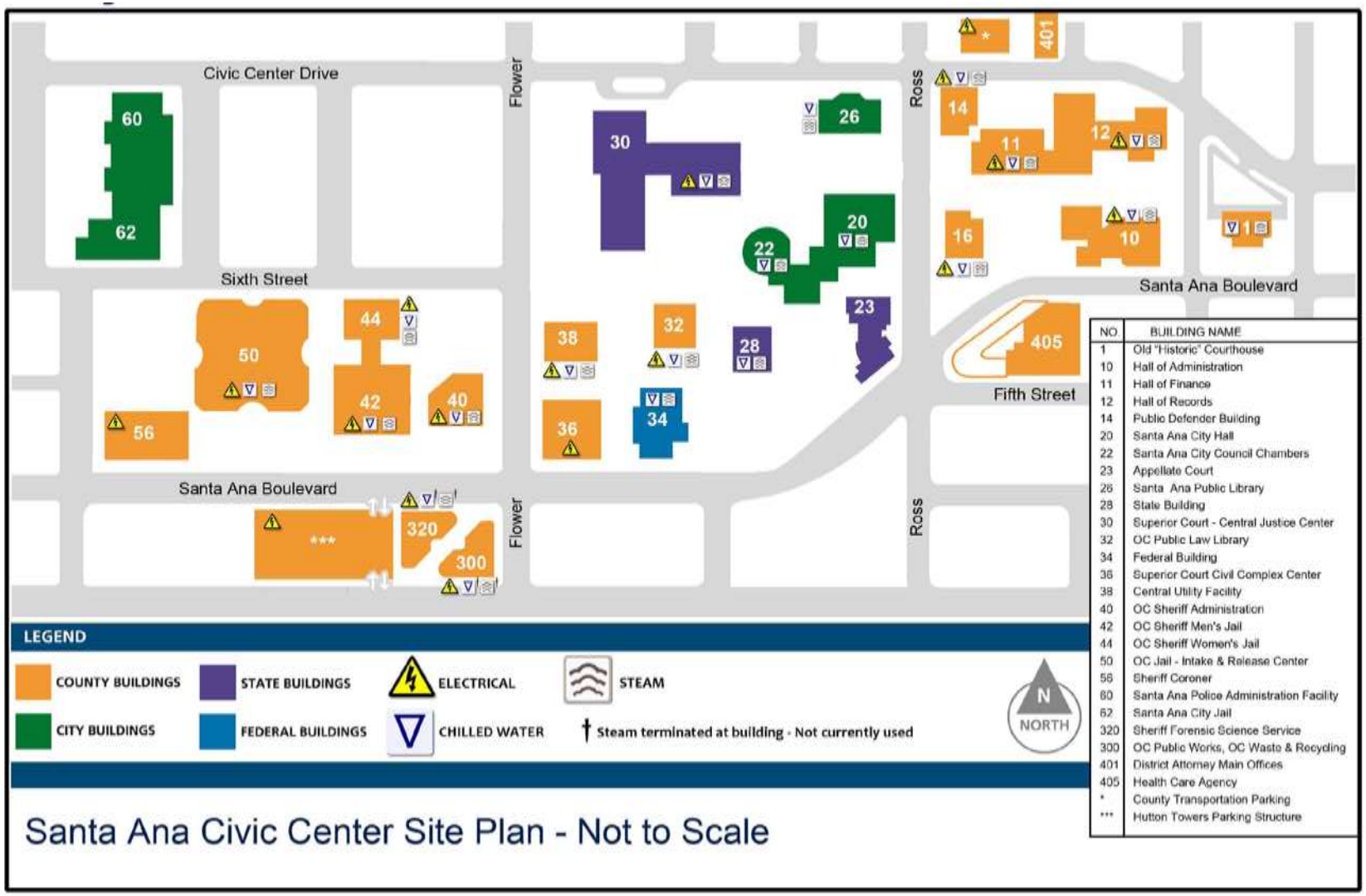
History / Background

- Orange County Central Utility Facility (CUF)
  - District energy facility in downtown Santa Ana
  - Constructed in 1968
  - Civic Center Campus
  - Cooling, Heating, Electricity

History / Background

LOOP	FACILITY	FACILITY NAME	OWNER	CHW PIPE SIZE (IN)	STM PIPE SIZE (IN)	CW PIPE SIZE (IN)	CONDITIONED AREA (FT^2)	GROSS SQUARE FOOTAGE [FT^2]	CHW SUPPLY	STM SUPPLY
WEST LOOP	28	STATE	STATE	8	4	2	116,382	155,176	Y	Y
	32	LAW LIBRARY	COUNTY	2	3	2	41,595	47,454	Y	Y
	40	SHERIFF'S HEADQUARTERS	COUNTY	8	-	-	55,864	61,323	Y	N
	42	MEN'S JAIL	COUNTY	8	4	2	72,092	286,577	Y	Y
	44	WOMEN'S JAIL	COUNTY	8	4	2	70,508	76,030	Y	Y
	50	INTAKE AND RELEASE CENTER	COUNTY	8	5	2	263,500	264,000	Y	Y
EAST LOOP	1	OLD COURTHOUSE	COUNTY	3	1.5	1.5	24,490	36,239	Y	Y
	10	HALL OF ADMINISTRATION	COUNTY	6	3	2	85,939	185,880	Y	Y
	11	ENGINEERING ADDITION	COUNTY	6	2	1.5	219,516	273,039	Y	Y
	12	ENGINEERING & FINANCE	COUNTY	8	2	2			Y	Y
	14	PUBLIC DEFENDERS	COUNTY	3	1.5	2	28,880	38,240	Y	Y
	20	CITY HALL	CITY	6	2.5	3	83,250	111,000	Y	Y
	22	CITY COUNCIL CHAMBERS	CITY	3	-	-	98,598	131,464	Y	N
		MEZZANINE	CITY	-	-	-	-	-	Y	N
	26	PUBLIC LIBRARY	CITY	4	1.5	1.25	15,946	21,261	Y	Y
	30	CENTRAL JUSTICE CENTER	STATE	10	4	2	413,733	542,425	Y	Y
HUTTON LOOP	34	FEDERAL	FEDERAL	8	2	2	184,752	246,336	Y	Y
	300 & 320	HUTTON TOWER	COUNTY	8	-	-	344,007	375,557	Y	N
	38	CENTRAL UTILITY FACILITY	COUNTY	-	-	-	806	18,078	Y	Y
						TOTAL	2,119,858	2,870,079		

History / Background



NO.	BUILDING NAME
1	Old "Historic" Courthouse
10	Hall of Administration
11	Hall of Finance
12	Hall of Records
14	Public Defender Building
20	Santa Ana City Hall
22	Santa Ana City Council Chambers
23	Appellate Court
26	Santa Ana Public Library
28	State Building
30	Superior Court - Central Justice Center
32	OC Public Law Library
34	Federal Building
36	Superior Court Civil Complex Center
38	Central Utility Facility
40	OC Sheriff Administration
42	OC Sheriff Men's Jail
44	OC Sheriff Women's Jail
50	OC Jail - Intake & Release Center
56	Sheriff Coroner
60	Santa Ana Police Administration Facility
62	Santa Ana City Jail
320	Sheriff Forensic Science Service
300	OC Public Works, OC Waste & Recycling
401	District Attorney Main Offices
405	Health Care Agency
*	County Transportation Parking
***	Hutton Towers Parking Structure

History / Background

- Original Plant - 1968
  - 3 steam driven chillers
  - 2 absorption chillers
    - 6,800 tons CHW
  - 3 NG steam boilers
    - 50,000 PPH steam
- Cogen Addition - 2008
  - 2 combustion turbines
    - 5.2 MW each
  - 2 HRSGs w/duct firing
    - 265 PSIG
  - NG compressors
  - New steam piping
  - $34M project cost

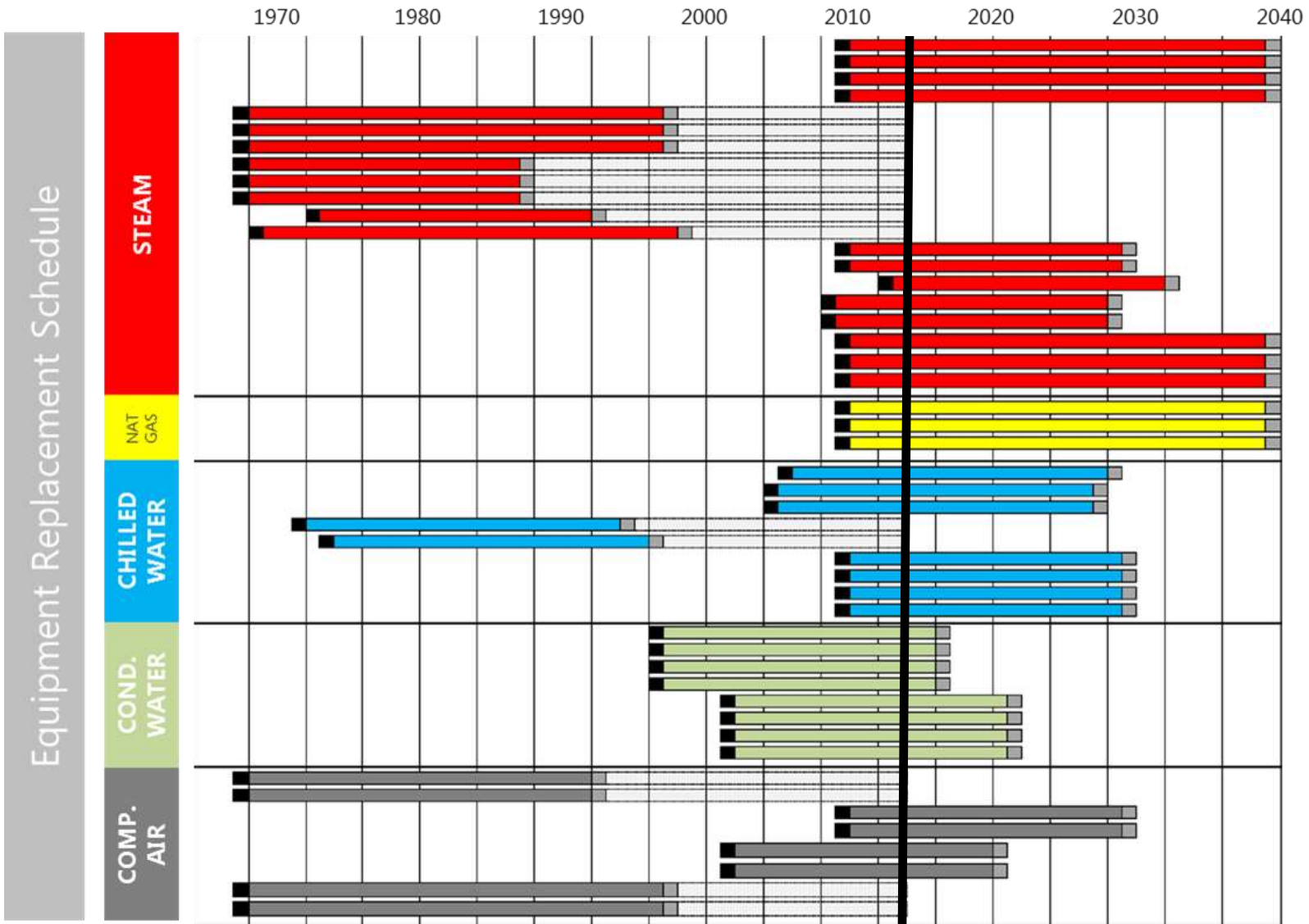
Planning Process

- Strategic Development Plan – Goals:
  - Renew aged infrastructure
  - Improve efficiency of CUF
  - Improve utility safety and reliability
  - Convince the Board of Supervisors

Planning Process

- Traditional Utility Master Plan:
  - Condition assessment
  - Operator interviews
  - Data gathering
  - Defining assumptions
  - Establish baseline loads
  - Energy production modeling
  - Distribution modeling
  - Evaluating improvement options
  - Cost estimating
  - Life cycle cost analysis
  - Define recommendations
  - Make case for Board of Supervisors

Planning Process



SDP Evaluation - Findings

- Chilled Water
  - Chillers beyond useful service life
  - Marginal redundancy
  - Obsolete controls
  - No automation, systems run on intuition
  - Distribution bottlenecks
    - Negative differential pressure
  - Inaccessible piping
  - Bottleneck in plant
    - $100K/year in pressure loss
  - Delta T average - 4.8 deg F
  - No backup on loss of steam

SDP Evaluation - Findings

Project M-4 Existing Conditions and Solutions

Gas Turbine Outage - Campus Effects

Causes

- Gas Interruption
- Electrical Outage
- Controls Failure
- Service Outage

Effect

Loss of HVAC (heating, ventilation, and air conditioning) to Civic Center Campus

Impacts

2.1 million SF without heating and/or cooling service

7 critical facilities with compromised heating and/or cooling:

- 4 jails
- 3 courts
- Over 1 million SF

Solution

Project M-4 chiller and boiler addition to provide as heating/cooling system backup in the event of an outage

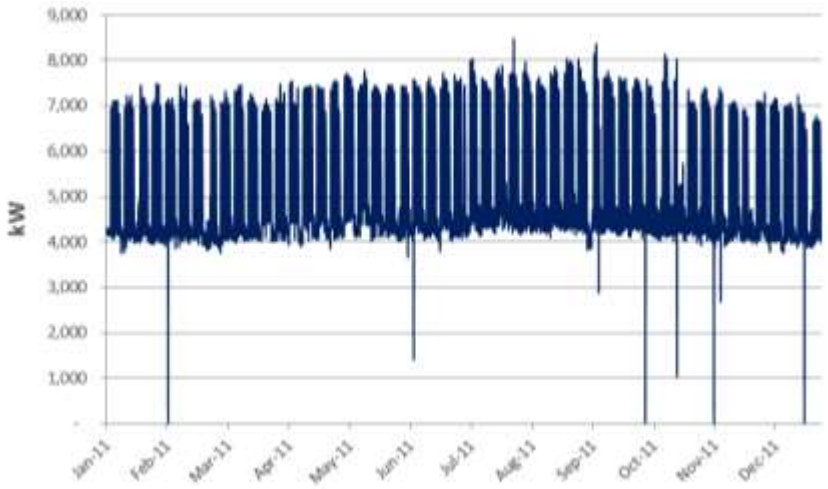
CUF

The Numbers

Current Cost for Backup Electricity	Existing Heating / Cooling Backup	M-4 Heating/Cooling Backup Project	Project Benefit
$1.2M annually	None	$4.9M one-time cost	24/7 uninterruptible service

SDP Evaluation - Findings

- Steam System
  - BFW system not sized for cogen
  - Lack of operational flexibility
  - Combustion turbines - electric load following
    - Sized for complete load coverage
    - Challenge of 8AM/5PM, M-F operation
  - Excessive steam production / dumping
    - Capacity of 2,600 tons, based on available steam



Results/Recommendations

- Replace Steam Turbine Driven Chillers
- Replace Plant CHW Piping & Pumps
- Replace Plant Steam Piping
- Replace Cooling Towers
- Replace Campus CHW Piping
- New Plant Automation System
- New Backup Boiler & Electric Centrifugal Chiller
- Turbine Operating Modification
- New BFP/Dearator
- *…and show cost recovery!*

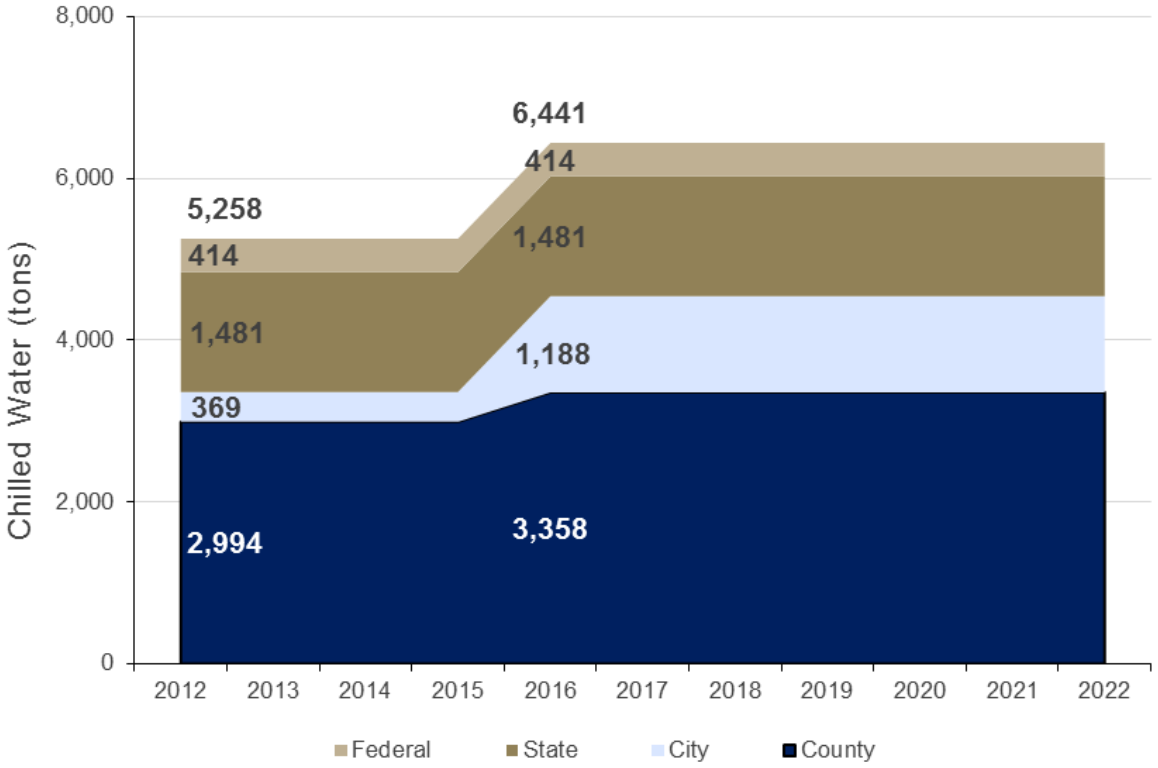
Results/Recommendations

- New Thermal Customers
  - Improve load match
  - Public Works revenue

Future Potential Cogen Users

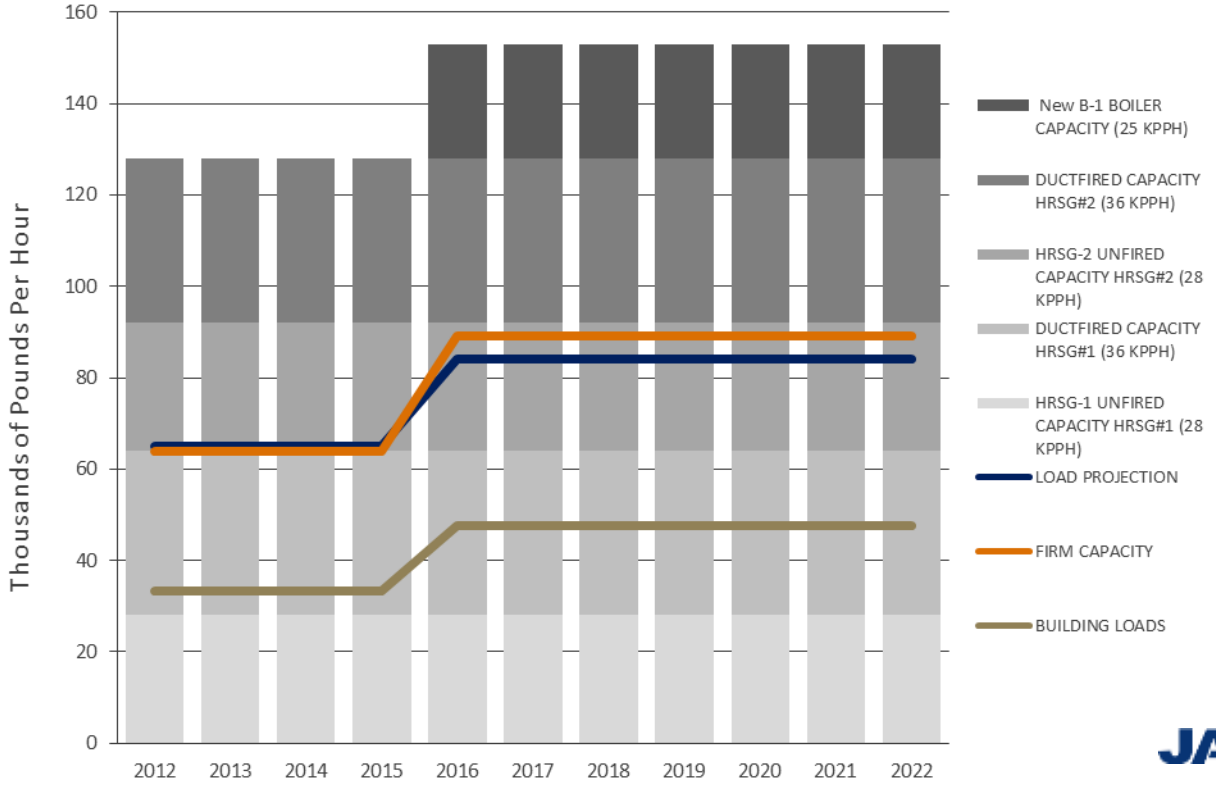
Results/Recommendations

- Chilled Water
  - 1,180 ton load growth
  - 6,400 ton new peak
  - $1.21M annual revenue



Results/Recommendations

- Steam
  - 1,300 PPH load growth
  - 47,795 PPH new peak
  - $1.29M annual revenue, net of additional fuel



Results/Recommendations

- LCCA Results
  - Baseline assumed some reinvestment
  - Life Cycle Cost savings: ~$10.5M over the study term
  - Cost recovery

Option	Description	LCC	LCC Savings	IRR
Baseline	Business as usual CUF	$119,742,510	-	-
CUF Improvement	CUF and Civic Center Distribution Improvements	$109,241,902	$10,500,609	27%

Results/Recommendations

Project	Description
M-1A	Demolish boilers in CUF
M-1B	Asbestos abatement in CUF
M-2	Distribution system upgrade in CUF
M-3	Replace and upgrade chillers and SCADA
M-4	Emergency thermal system in CUF
M-5	New cooling towers and pumps in CUF
M-6	DA tank and flash recovery system in CUF
M-7	Replace condensate and clarifier tank
M-8	Replace air compressors and driers
M-9	Replace CUF chilled water line to Civic Center Campus
C-1	Sub-metering for campus distribution loads
C-2	Substation SSC and switchgear GSC metering

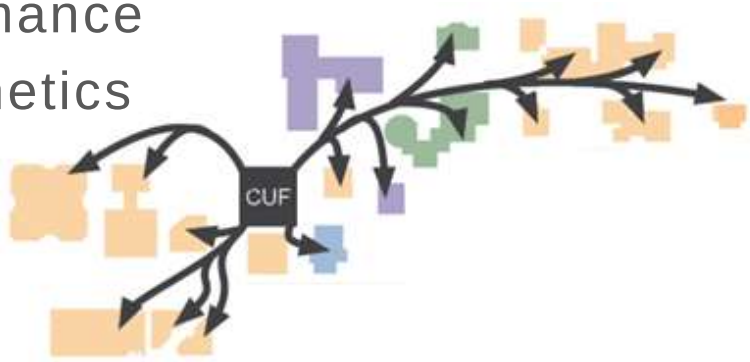
Total Project Cost $67,447,789

Results/Recommendations

- CUF redevelopment will provide:
  - New, efficient, reliable equipment
  - Emergency electric chiller and steam boiler
  - Campus distribution improvements
  - Maximize benefits of CHP
  - Improved control and diagnostics
  - Enhanced redundancy
- Key - Reliable and uninterrupted heating and cooling
- Key - Infrastructure for campus expansion
- Key – Revenue to offset debt service

Next Steps

- Sell the Board of Supervisors
  - Remind them of their investment
  - Remind them of the benefits
  - Communicate clearly
- Benefits of District Energy
  - Enhanced reliability and redundancy
  - Optimal energy efficiency and life cycle cost
  - Centralized operation and maintenance
  - Enhanced building performance
  - Footprint, acoustics, aesthetics
  - Reduced GHG emissions



Next Steps

- BOS Approved Design Funding
- Intent to Approve Bond Financing for Construction
- Design!
  - SD underway
  - Extensive phasing plan – no downtime
  - Coordinate with other projects
  - Campus distribution corridor
  - Campus metering improvements

Thank You!


Civic Center Dr W
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Boyd Way
N Flower St
W 6th St
N Ross St
Orange County Walk of Honor
N Broadway
N Sycamore St
W Santa Ana Blvd
W 5th St
N Broadway
Sasscer Park
N Ross St
Ana Blvd
N Parton St
N Birch St
W 4th St
W 3rd St