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The University of Texas at Austin
Utilities and Energy Management

THE EVOLUTION OF THE UT AUSTIN UTILITY PLANTS

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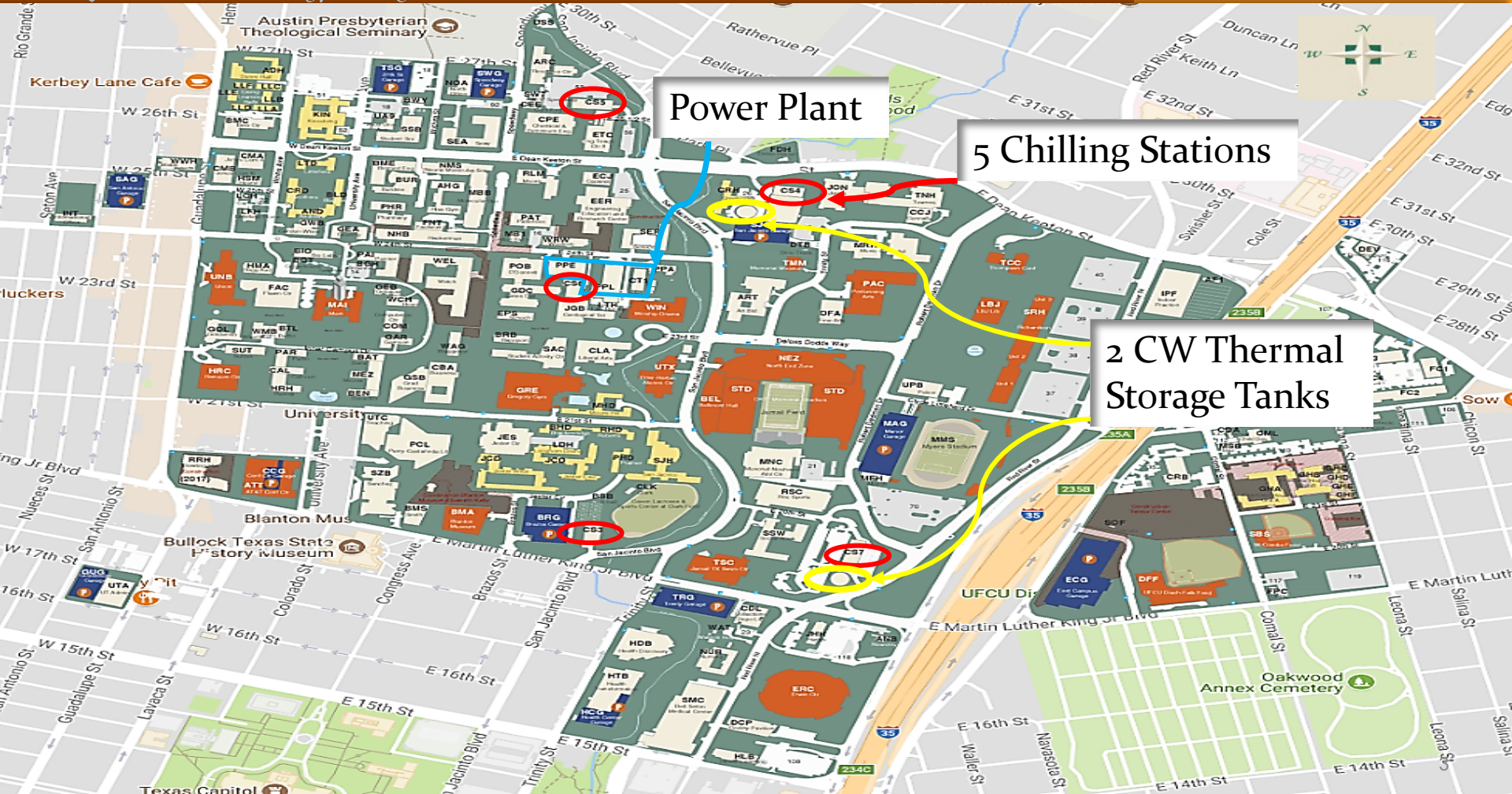
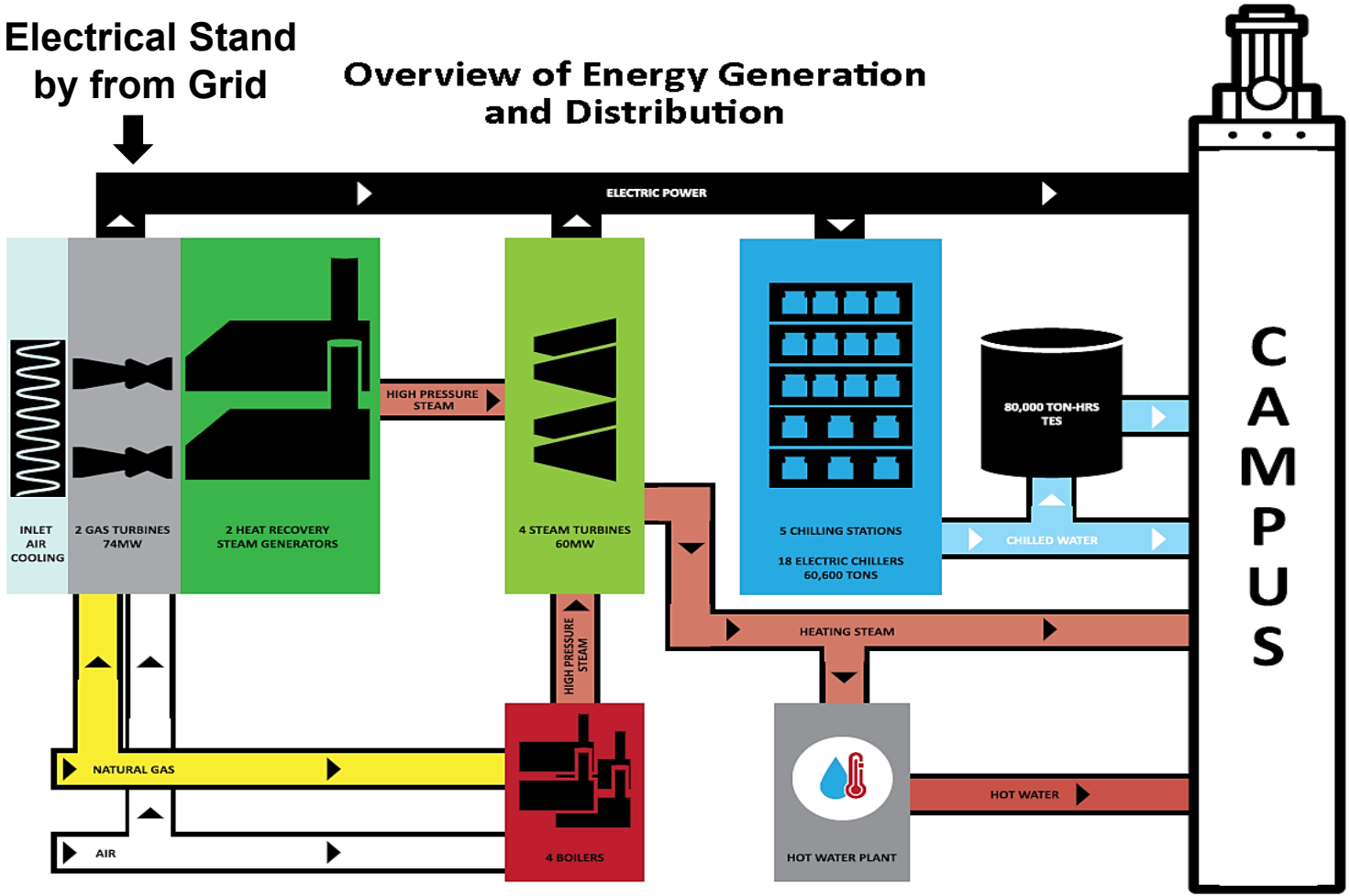
The University of Texas at Austin

Presentation Objectives

- **Background**
- **Assessment**
- **Action Plan**


Power Plant
5 Chilling Stations
2 CW Thermal Storage Tanks
Austin Presbyterian Theological Seminary
Kerbey Lane Cafe
W 26th St
W 27th St
E 27th St
W 23rd St
W 21st St
W 17th St
W 16th St
W 15th St
E 16th St
E 15th St
E 31st St
E 32nd St
E 30th St
E 29th St
E 28th St
E 14th St
Rathervue Pl
Bellevue Pl
Duncan Ln
Red River St
Keith Ln
Swisher St
Cole St
Trinity St
Nueces St
San Antonio St
Guadalupe St
Lavaca St
Colorado St
Congress Ave
Brazos St
San Jacinto Blvd
Waller St
Navasota St
Comal St
Leona St
Salina St
Chicon St
Red River St
E Martin Luther King Jr Blvd
Dean Keeton St
Dolores Dodge Way
University
Blanton Mus
Bullock Texas State History Museum
UFCU Di
Oakwood Annex Cemetery
Texas Capitol
CS1
CS2
CS3
CS4
CS5
CS6
CS7
N
S
E
W

Energy Generation and Distribution



BY THE NUMBERS

85%
Overall Campus Thermal Efficiency (gas btus consumed vs. thermal energy delivered to buildings)

134 MW
Generation Capacity (two CTGs and four STGs)

60,600 TONS
Chilled Water Production Capacity (18 chillers among five chilling stations)

9.1 MILLION GALLONS
Thermal Energy Storage Capacity (two independent CHW tanks totaling 80,000 ton-hours)

1.2 MILLION POUNDS PER HOUR
Steam Production Capacity (two HRSGs and four boilers)

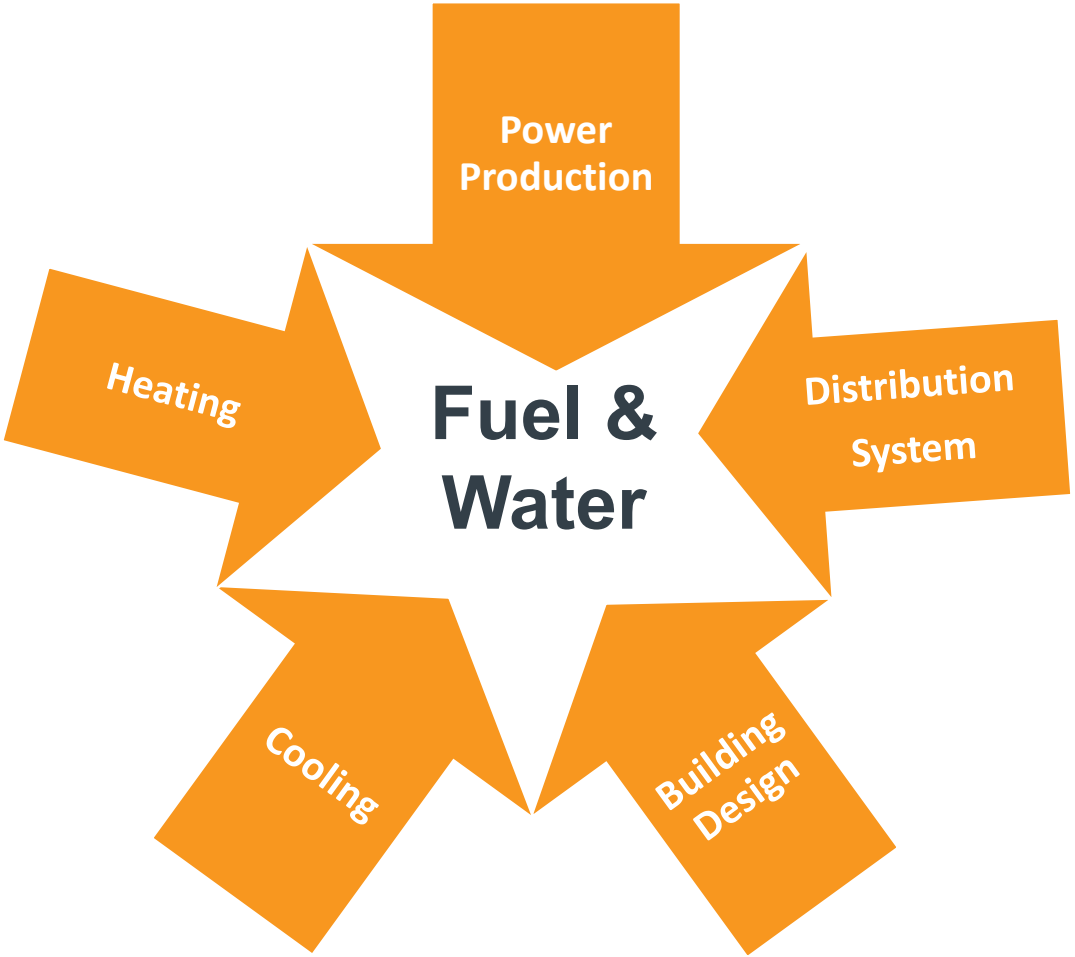
4 – 50 MVA TRANSFORMERS
in ring-bus configuration
City Electric Grid Connection (provides N+4 redundancy during 80% of operating hours)

360,000 GPD
Distributed Deionized Water at < 15 microSiemens and < 0.5 ppm TOC

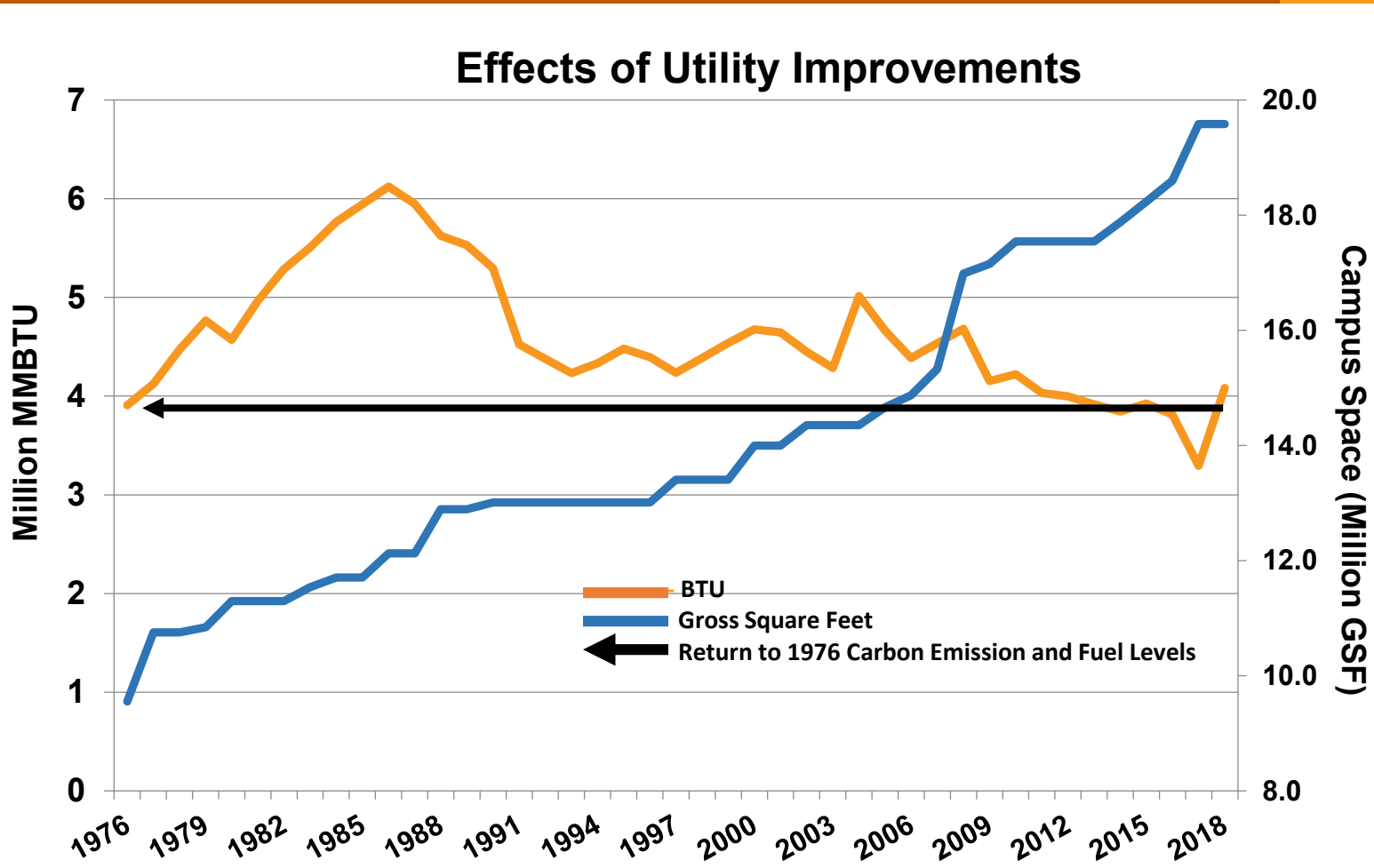
9 MILES
Distribution Tunnels

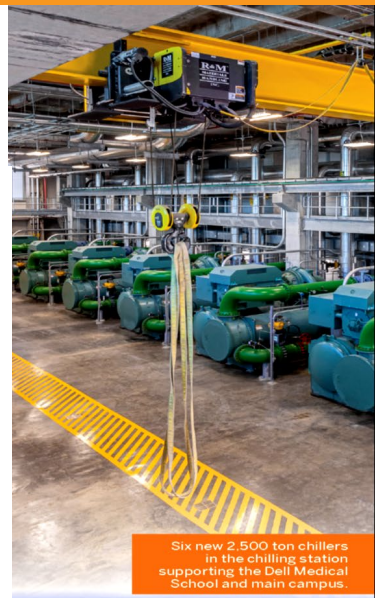
60 MILES
Electrical Distribution Duct Bank

Holistic Approach to Total Energy



Effects of Utility Improvements




Six new 2,500 ton chillers in the chilling station supporting the Dell Medical School and main campus.


Exterior view of the new Chilling Station #7 serving Dell Seton Medical Center.


The 32 MW GE LM-2500. +4. DLE combustion turbine.

Improvement Path Taken

- **Audited Operation**
- **Action Plan**

3rd Party Assessment

- Assessed Equipment
  - Remaining Useful Life
- Operational Opportunities
- Organizational Structure
- Personnel Skill Level

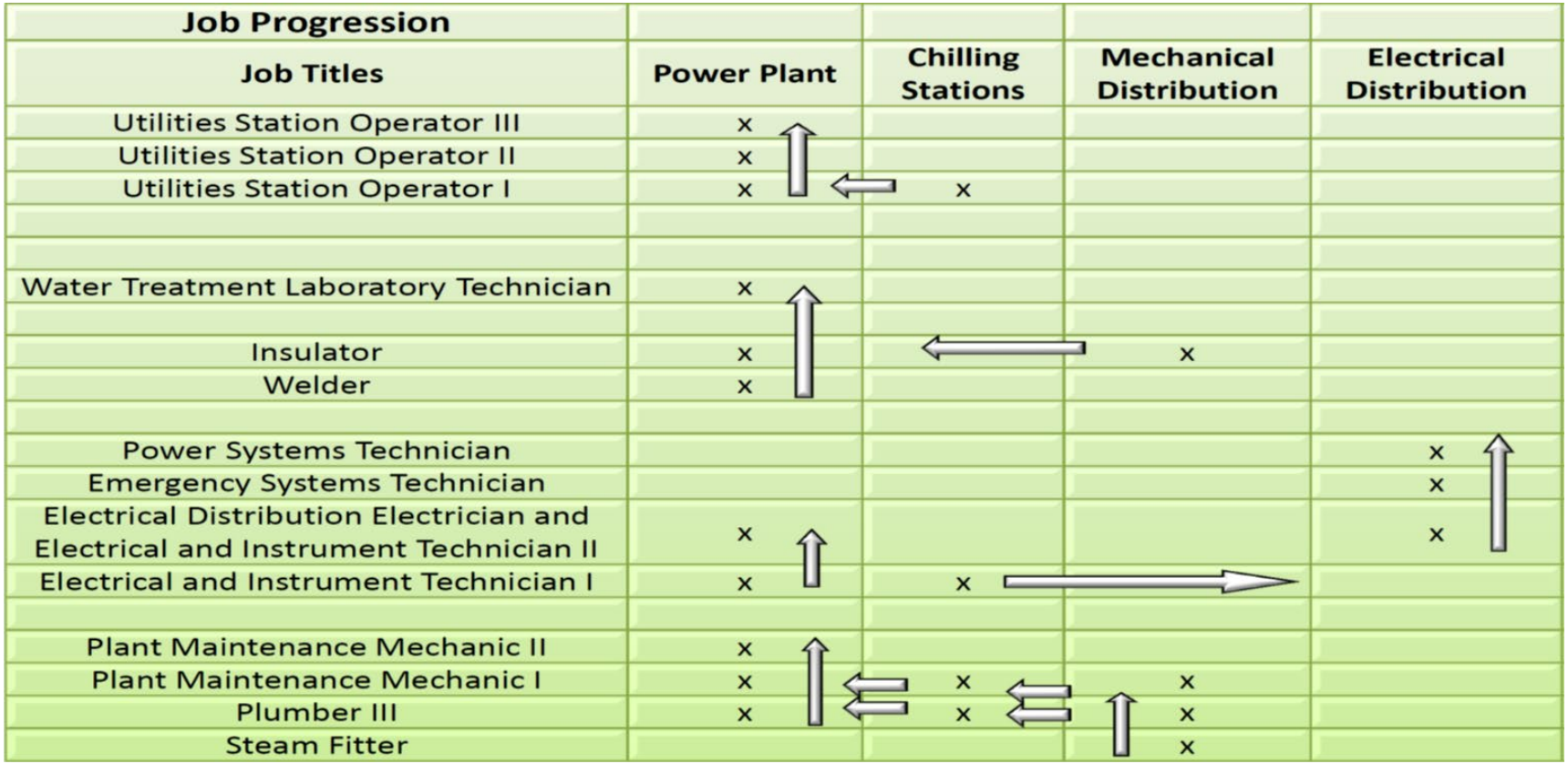
Equipment Assessment

- Identified Immediate Risks - Prioritized
  - Age
  - Condition
  - Operational Risk
  - Immediate Plant Dispatch Opportunities
  - Organizational Opportunities

Organizational Approach

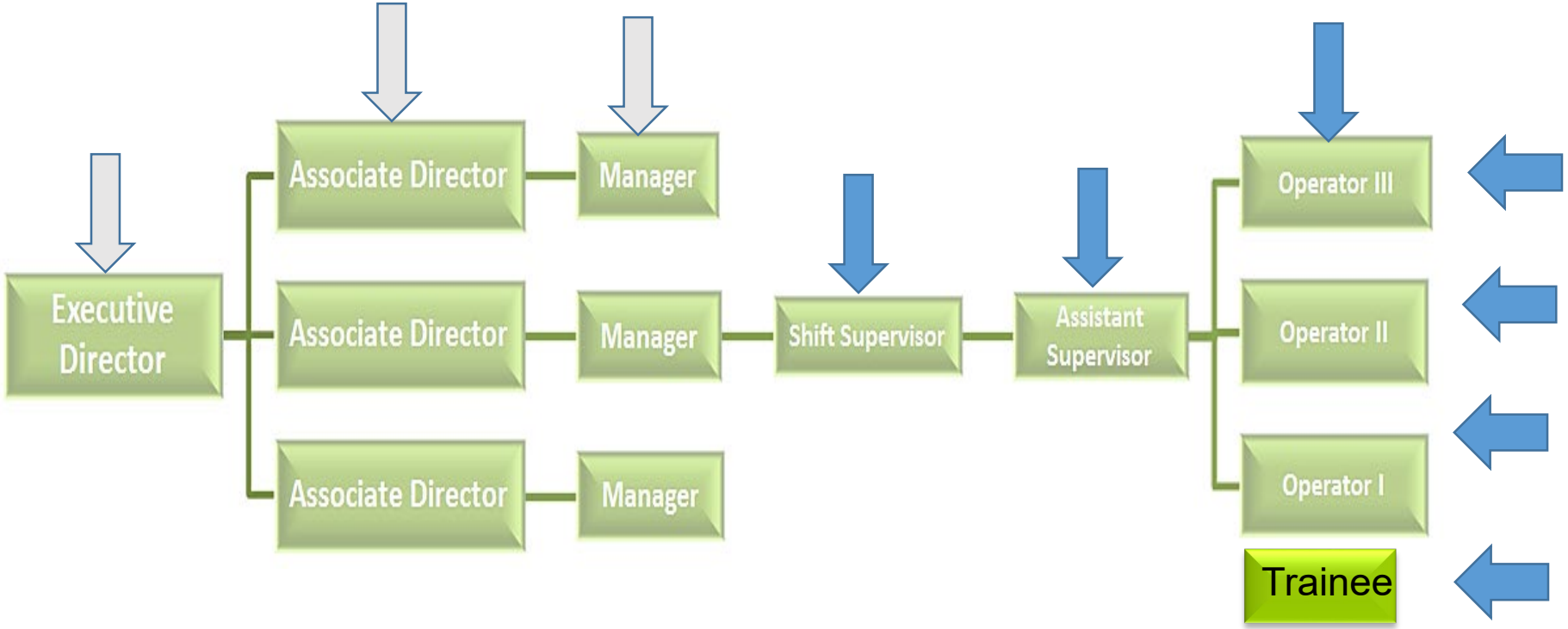
- **OVERARCHING OBJECTIVE - CREATE A SELF SUSTAINING PROCESS**
  - CREATE A LAYERED APPROACH TO THE ORGANIZATION
  - OPTIMIZE THE HIRING PROCESS
  - CREATE TRAINING PROGRAM TO TAKE ADVANTAGE OF THE LAYERS

Layered Organization



Job Progression				
Job Titles	**Power Plant**	**Chilling Stations**	**Mechanical Distribution**	**Electrical Distribution**
Utilities Station Operator III	x			
Utilities Station Operator II	x			
Utilities Station Operator I	x	x		
Water Treatment Laboratory Technician	x			
Insulator	x		x	
Welder	x			
Power Systems Technician				x
Emergency Systems Technician				x
Electrical Distribution Electrician and Electrical and Instrument Technician II	x			x
Electrical and Instrument Technician I	x	x		
Plant Maintenance Mechanic II	x			
Plant Maintenance Mechanic I	x	x	x	
Plumber III	x	x	x	
Steam Fitter			x	

Layered Organization



Hiring Policy

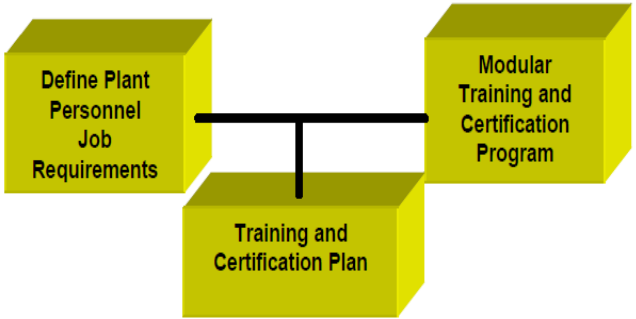
Main Objective

Try to keep employees within the department

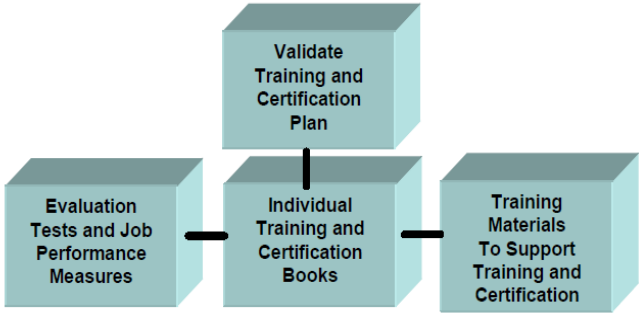
- Internal Positions only advertised in-house
  - Unless qualified candidates are not available
- Helps with morale and hopefully buys loyalty
- Filling jobs takes longer
- All Hiring Committees are Peer Committees

Training Program

- **Phase I – Design Program**



- **Phase II- Develop the Training Program and Training Materials**



Implementation Procedure

- **Craftsperson has 18 months to complete the Program**
- **Existing or new employee paid up to 6 hours of overtime per week to take the modules after hours**
  - **After 18 months:**
    - **Upon completion the employee performance evaluation form is modified to add a criteria that states “certified for the job” and receives an “exceed the job requirement” score**
    - **If not certified the employee receives a “does not meet the minimum job requirement” score**
    - **These scores are averaged in with the other essential job requirements for the position.**

Implementation Procedure

- Once certified for their current position they can pre-certify for any other position
  - No Pay
  - Pre-certification for another position is the employee's own personal investment
    - Gets preference for a job

Additional Incentive

Pins handed out by the Director with Photo Opportunity at each phase In front of Peers

Plus framed certificate indicating certification for the position signed by AVP

PP-MM-II Curriculum

Curriculum for Maintenance Mechanic II
Power Plant Mechanical Maintenance Training Program

DVD Course Name (52 Courses)	
AEDBL Diagrams/ Blueprint Reading	AOHIN Heat Exchangers / Introduction
AEEES Electrical Theory/ Electrical Safety	AOOTC Operator Responsibilities / Introduction
AMBIN Bearings/ Fundamentals	AOPBT Pumps/Basic Types & Operation
AMBRB Bearings Rolling Contact	AOPER Pumps / Performance & Inspection
AMBSB Bearings Sliding Surface	AOPFC Pumps / Fundamentals of Centrifugal Types
AMCAC Compressors Reciprocating	AORBC Refrigeration Systems/ Basic Concepts
AMCCC Compressors Centrifugal	AOTBO Power Plant Turbines / Bearings & Operation
AMFOO Forklift Operation	AOTSF Power Plant Turbines / Steam Flow
AMGG2 Gears/ Types and Characteristics	AOVB1 Valves/Basic Types & Operation 1
AMGGI Gears/ Overhauls	AOVB2 Valves/Basic Types & Operation 2
AMLBA Lubrication Basics	UTA-SR01 Safety Regulatory Training
AMMBA Math Basics	(29 elements x 45 min. each)
AMMES Seals/ Mechanical Seals	**Site-Specific Course Name (27 Courses)**
AMMFA Tools/ Mechanical Fasteners	
AMMSG Seals/ Gaskets and Packing	UTA-CS01 Cooling Tower Make-Up & Chemical Injection Systems
AMPC2 Pumps/ Centrifugal Pump Overhaul	UTA-CS02 Chiller No. 1 Chiller Station 2
AMPCT Pumps/ Centrifugal Pump and Trouble-shooting	UTA-CS03 Chillers Nos. 2 & 3 Chiller Station 2
AMPPP Pipes and Valves Pipes and Pipe Fittings	UTA-CS04 Chiller No. 1 Chiller Station 3
AMPST Pipes and Valves Steam Traps	UTA-CS05 Chillers Nos. 2 & 3 Chiller Station 3
AMPV1 Pipes and Valves Types and Operations	UTA-CS06 Chillers Nos. 1, 2 & 3 Chiller Station 4
AMPV2 Pipes and Valves Valve Maintenance	UTA-CS07 Chillers Nos. 1 & 2 Chiller Station 5
AMRHL Rigging/ Heavy Lifting	UTA-CS08 Chiller No. 3 Chiller Station 5
AMRLL Rigging/ Basic Lifting	UTA-CS09 Condenser Water System Chiller Station 2
AMRLS Rigging/ Ladders and Scaffolds	UTA-CS10 Condenser Water System Chiller Station 3
AMROV Rigging/ Basics	UTA-CS11 Condenser Water System Chiller Station 4
AMSAF Shaft Alignment/ Fundamentals	UTA-CS12 Condenser Water System Chiller Station 5
AMSBA Safety/ Industrial Safety Basics	UTA-CS13 Chilled Water System Chiller Station 2
AMSHS Safety/ Chemical Health Hazards	UTA-CS14 Chilled Water System Chiller Station 3
AMSRD Shaft Alignment/ Reverse Dial and Laser	UTA-CS15 Chilled Water System Chiller Station 4
AMSRF Shaft Alignment/ Rim and Face	UTA-CS16 Chilled Water Supply Chiller Station 5
AMTIH Tools/ Introduction to Hand Tools	UTA-MM01 Air Compressors
AMTIP Tools/ Introduction to Power Tools	UTA-MM07 Valves
AMTMI Tools/ Precision Measurement	UTA-MM08 Bearing And Seals
AOCIN Compressors / Introduction	UTA-MM09 Bench Grinder
AODB1 Diagrams/Basic Diagrams & Symbols 1	UTA-MM10 Band Saw
AODB2 Diagrams/Basic Diagrams & Symbols 2	UTA-MM11 Drill Press
AOEBP Equipment Drive Components / Couplings	UTA-MM12 Steam Traps
AOEGB Equipment Drive Components / Gear, Belt & Chain Drives	UTA-MM13 Portable Threader
AOELB Equipment Lubrication / Lubricants & Bearings	UTA-MM16 Coupling/Shaft Alignment
AOEUL Equipment Lubrication / Using Lubricants	UTA-MM19 Centrifugal Pumps
AOEWP Environmental Protection/ Water Pollution & Waste Disposal	UTA-MM20 Silver Solder

Initial Estimates of Times Required to Complete Primedia and IRI Training Programs Calculated for Hours/Month and Number of Weeks At 6 Hours/Week

Job Title by Section	Total Hrs Primedia Only	Hrs/Mo 18-Mos Primedia	Weeks at 6 Hrs/Wk Primedia	Total Hrs IRI Only	Total Hrs Primedia & IRI	Weeks at 6 Hrs/Wk For Both
Chiller Station Maintenance Training Program						
Maintenance Mechanic I	95	5	16	28	123	21
Maintenance Mechanic II	137	8	23	108	245	41
Electrical & Instrument technician I	117	7	20	28	145	24
Electrical & Instrument technician II	145	8	24	72	217	36
Chiller Station Operations Training Program						
Chiller Station Operator	123	7	21	80	203	34
Water Treatment Laboratory Technician	97	5	16	36	133	22
Electrical Distribution Training Program						
Electrician	86	5	14	108	194	32
Power Systems Technician	99	6	17	56	155	26
Emergency Systems Technician	99	6	17	52	151	25
Mechanical Distribution Training Program						
Maintenance Mechanic I	63	4	11	20	83	14
Maintenance Mechanic II	101	6	17	68	169	28
Steam Fitter	83	5	14	52	135	23
Utilities Insulator	75	4	13	36	111	19
Utilities Plumber	69	4	12	56	125	21
Power Plant Electrical Maintenance Training Program						
Electrical & Instrument Technician I	115	6	19	28	143	24
Electrical & Instrument Technician II	147	8	25	56	203	34
Power Plant Machine Shop Training Program						
Power Plant Machinist	99	6	17	31	130	22
Power Plant Mechanical Maintenance Program						
Maintenance Worker I	44	2	7	28	72	12
Maintenance Mechanic II	119	7	20	28	147	25
Maintenance Mechanic III	177	10	30	140	317	53
Utilities Welder	85	5	14	28	113	19
Utilities Insulator	55	3	9	16	71	12
Power Plant Operations Training Program						
Utilities Station Operator I	140	8	23	0	140	23
Utilities Station Operator II	140	8	23	66	206	34
Utilities Station Operator III * *(see note)*	191	11	32	66	257	43
Water Treatment Laboratory Technician	97	5	16	64	161	27

** Note: PP US-OP-III Primedia training includes 51 hours of video cassettes*

These are liberal assumptions; they assume the maximum of two tests per module for all of Primedia's and IRI's courses. Actual hours spent will usually be less. Total period allowed is 18 months. All numbers are rounded to whole numbers.

Conclusion

- Take a holistic look at the effort
- Master Plan the effort
- Involve all of the players that may be affected
- Changing systems- improving systems involves smart risk taking
- Be methodical
- Be determined

Questions?

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