What do we want to accomplish:

• Define Centralized and Decentralization
• Identify Key Issues
• Identify Potential Opportunities
Centralized Utilities

DFW Airport
Centralized Utilities – District Plants

University of Texas at Austin
Decentralized Utilities

Tarrant County, Fort Worth TX
Systematic Method to Identify and Plan Utility Infrastructure Needs

– Establish **Critical Issues**; Define Success
  • Reliability, resiliency, energy & sustainability, maintenance, financial constraints, etc.

– Identify Current/Future Conditions
  • Load density, load growth, equipment/system condition, utility rates, etc.

– Identify **Opportunities** to Support Existing and Future Growth

– Analysis and Recommendations
  • life cycle cost analysis

– Implementation Plan
So what is the right approach?

Centralization?
Decentralization?
Something in between?

Here are 16 factors to consider . . .
1. Life Cycle Cost

Advantage

- Centralization
- Decentralization

Reasons

- Economies of scale
- Load diversity
- Reduction in redundant equipment
- Consolidation of auxiliary systems
- Energy and efficiency opportunities
- Strategic planning

REQUIRES DETAILED STUDY
2. Energy & Efficiency

Advantage

✓ Centralization

Reasons

- Consolidated loads = increased opportunities
  - Efficiency improvements with larger equipment
  - Variable flow applications
  - Thermal energy storage
  - Heat recovery options
  - Combined heat and power (CHP)
  - Water reclaim/reuse

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Planning: Key Issues and Opportunities
3. Maintenance

Advantage

✓ Centralization

Decentralization

Reasons

– Consolidated location
– Reduced equipment quantities

Caution

– Be sure to capture maintenance impact of E&E opportunities
4. Equipment Life

Advantage

✓ Centralization

☐ Decentralization

Reasons

– Industrial vs commercial equipment
– 20-30 year life vs 10-15 year life

Caution

– Capture equipment replacement costs in LCCA
– Consider environmental impacts to equipment life
5. Redundancy

Advantage

☑ Centralization
☐ Decentralization

Reasons

– Shared redundancy across campus

Caution

– Establish requirements up front (N; N+1; N+2; 2N; etc)
– Any mission critical facilities?
6. Chemical Storage & Refrigerant Use

Advantage

✓ Centralization

☐ Decentralization

Reasons

– Reduced point of delivery and storage
– Consolidation of chemicals/refrigerants
  = reduced risk of exposure to public

Caution

– Chemical storage limitations
– ASHRAE 15 – refrigeration systems
Planning: Key Issues and Opportunities

7. Noise/Vibration

Advantage

✓ Centralization

☐ Decentralization

Reasons

– Eliminate concerns & cost local to each building

Caution

– Day/night noise limits
– Siting/proximity of plant to sensitive people or process
8. Ease of Equipment Replacement

Advantage

✓ Centralization

☑ Decentralization

Reasons

– Less impact to building occupant or facility operations
– Facility designs are driven by primary function
  • Buildings designed around people/process
  • Plants designed around equipment/systems

Consideration

– Be sure to capture special costs for removal of equipment in LCCA (roof or basement locations)
9. Building Security

Advantage

✓ Centralization

☐ Decentralization

Reasons

- Fewer maintenance calls, contractors needing access to buildings
10. Spare Parts Inventory

Advantage

✓ Centralization

☐ Decentralization

Reasons

– Less equipment
– Standardization
  • Size
  • Make
  • Model

Consideration

– Adopt design standards
11. Single Points of Failure

Advantage

- Centralization
- Decentralization

Caution

- Check requirements of mission critical buildings/functions on campus
- Mission/Goals for resiliency may require a hybrid solution.
- Consider 2 or 3 “district” plants and dual path distribution
12. Space Utilization

Advantage

✓ Centralization

☐ Decentralization

Reasons

– Simplifies building infrastructure requirements
– Freeing up space within building
– More space for profitable or beneficial use

Caution

– For existing buildings, check limitation of space to expand infrastructure.
13. Health, Safety & Comfort

Advantage

✓ Centralization

☐ Decentralization

Reasons

– See Chemical Storage and Refrigerant Use
– See Building Security
– See Noise/Vibration
– Consolidation of Plume,
– Engine Exhaust, Boiler Exhaust

Caution

– Consider CFD analysis
14. Aesthetics

Advantage
✓ Centralization
☐ Decentralization

Reasons
– Removal of equipment from public view
– Variety of options

Caution
– For LCCA, be sure to capture cost allowance for treatment with both options

Advantage
- Centralization
- Decentralization

Reasons
- Potential problems for remote locations
- Labor force
- Experienced maintenance staff
- Available goods/impacts to shipping
- Impacts to utility rates
- Environmental impacts to equipment
16. Lowest Initial Installed Cost

Advantage

- Centralization
- ✓ Decentralization

Reasons

- Funding limitations
- Uncertainty
- Prepositioning requirements for future phases
- Load density & utility distribution
## Summary Table

<table>
<thead>
<tr>
<th>Key Issue / Opportunity</th>
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<tbody>
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<tr>
<td>Total Implementation Cost</td>
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<tr>
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Decentralization

- Lower initial installed cost
- Flexibility in handling uncertainty with funding or planning
- Flexibility in handling isolated buildings due to distance or critical function
Centralization

• Typically lowest life cycle cost
• Improved energy efficiency opportunities
• Longer equipment life and improved durability
• Standardized and consolidated maintenance
Utility Master Planning

- Plan for success - Define vision and goals
- Understand issues and opportunities
- Leverage opportunities to maximize success
Questions/Comments?

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