ASHRAE Will Give You the World

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Give Back to ASHRAE

NETWORK

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This ASHRAE Distinguished Lecturer is brought to you by the Society Chapter Technology Transfer Committee

1

Automation Master Planning

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2

VOLUNTEER!

Become A Future Leader in ASHRAE – Write the Next Chapter In Your Career

ASHRAE Members who are active at their chapter and society become leaders and bring information and technology back to their job.

You are needed for:

- Society Technical Committees
- Society Standard Committees
- Chapter Membership Promotion
- Chapter Research Promotion
- Chapter Student Activities
- Chapter Technology Transfer

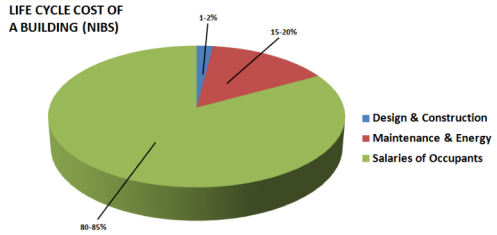
Find your Place in ASHRAE and volunteer

3

The History and Why we have a Problem – or Opportunity

4

Why Look at Operations Automation for Your Building



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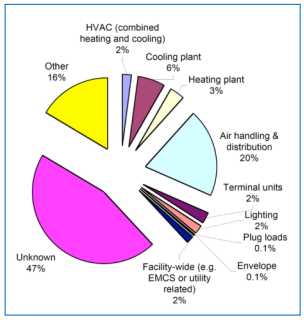
Where Opportunities Are Found

- Based on data from LBNL PECI and Texas A&M 2004 study the following summary was provided.
- Significant opportunities Systems Controlled by Automation



6

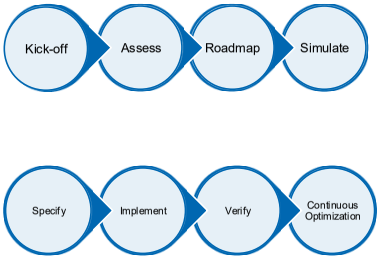
Master Planning ➡ Change

- Top Reason Why People Resist Change
  - Loss of Control
- Top Reason Why BAS Master Planning is Needed
  - Trying to regain control!

Harvard Business Review

7

Master Planning Process



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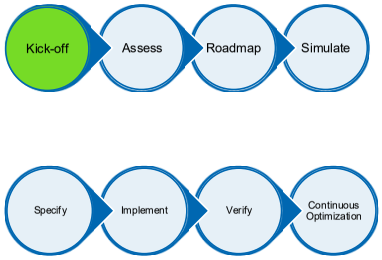
Master Planning Process



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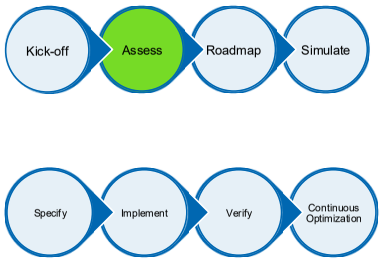
Project / Program Kick-off

- Identify Stakeholders
- Establish Project Goals
- Prioritize Goals
- Concept of Roadmap
- Define Program

10

Master Planning Process



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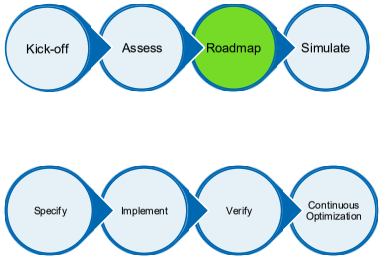
11

Assess Project and Program Feasibility

- Review Existing System(s)
- Review Active Standards
- Document Baseline
- Identify Deficiencies
- Identify Enhancements
- Begin What If? Thinking

12

Master Planning Process



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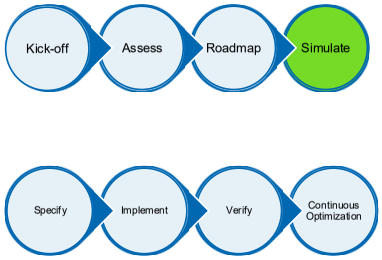
13

Roadmap

- Review the What If? List with Tech Team
- Stage II Goals and Ranking of Goals
- Define End Game
- Put in Writing Stakeholder Data
- Stage II Program Document

14

Master Planning Process



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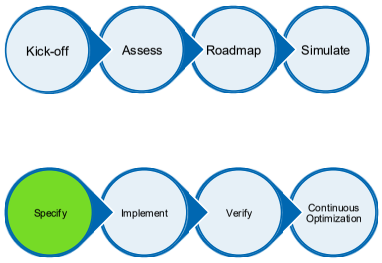
15

Simulate the Future State

- Define Stages and Milestones
- Compare to Current Market
- Identify Peer Projects
- Define Benefits
- Define Hard and Soft Returns Potentials
- ROM Cost Benefit Analysis
- Classify What If? Items into 3 Tiers

16

Master Planning Process



17

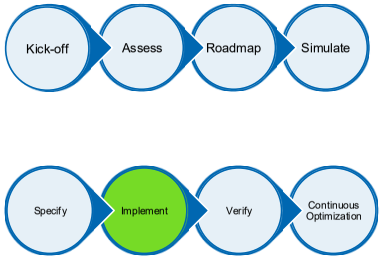
17

Specify / What IF? to What Now!

- Define Selection Criteria
- Review Stakeholder Recommendations
- Finalize Goals
- Define Success Criteria
- Identify Potential Benefits
- Identify Day 2 Opportunities

18

Master Planning Process

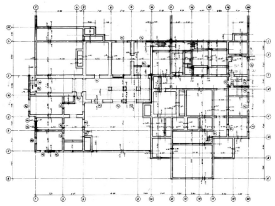


19

19

Implement the Vision

- Produce Biddable Specification
- Identify Suppliers
- Implementation Schedule
- "Interruptions" & "Migrations"
- Verify Bids



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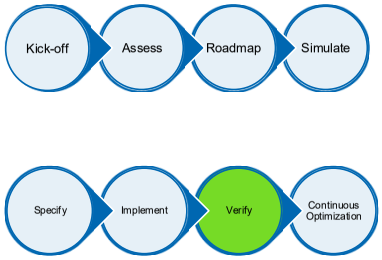
Master Planning Process



21

21

Verify the Vision to Reality

- Realtime Validation at Milestones
- Staged Turnover
- Constant Goals Review
- Stakeholder Updates
- Commissioning, Demonstration and Training

22

Automation Role in Todays Cx Process

23

Most Common Phases of Cx

- Level 1 – Factory Acceptance Testing
- Level 2 – Component Start-Up
- Level 3 – Equipment Start-up & Testing
- Level 4 – System Level Testing
- Level 5 – Integrated System Testing

24

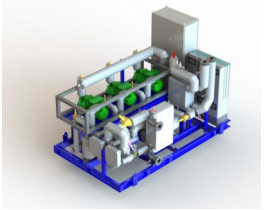
Level 1- Factory Witness Testing

- Level 1 testing is often referred to as the testing level with the greatest return on investment.
- Level 1 testing now includes Level 2 and 3 items for pre-fabricated systems.

25

Level 1- Factory Witness Testing

- Increased pre-wiring and installation of Automation components
- Skids are becoming self-contained mini-systems.



26

Level 2 -Component Start Up

- Level 2 starts with an inspection of the materials when they arrive at the project site.
- Upon arrival onsite the components and systems must be staged in an appropriate manner

27

Level 2 -Component Start Up

- Automation components are very sensitive and require re-verification
- Don't be fooled by it "worked before"!
- Automation interactions and communication between skids

28

Level 3 – Equipment Start-up & Testing

- Level 3 Start-up Testing must follow manufacturers recommended start-up procedures.
- Load testing and thermal scanning may be performed during equipment start-ups.

29

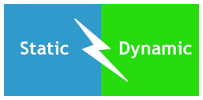
Level 3 – Equipment Start-up & Testing

- Validates manufacturing, fabrication, assembly and start-up.
- Automation systems prove out the logic
- In a safe manner test systems before loads are applied.

30

Level 4 –System Level Testing

- Level 4 testing is often called the dynamic testing phase.
- This phase confirms the operations of systems under normal and anticipated modes of operations.



31

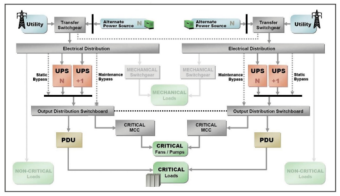
Level 4 –System Level Testing

- Simulate actions and reactions of the system.
- Sequence of operations is verified – often tweaked and enhanced in this stage
- The first chance to see the system effects and implementation of designer's vision.

32

Level 5 -Integrated System Testing

- Level 5/IST testing is the culmination of the testing phases.
- The Integrated Tests demonstrates that the combination of all systems has met the overall performance and specifications for the project.



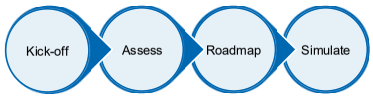
33

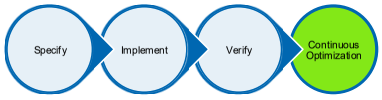
Level 5 -Integrated System Testing

- Identifies system to system communication gaps.
- Simulates common modes of operations.
- Records performance and response.
- Validates shut-down and re-start operations.

34

Master Planning Process





35

35

Continuous Improvement

- Accept:
  - Technology Changes.
  - Mission Changes
  - Space Use Changes
- Review Stakeholders 5 Year Vision
- Review Day 2 Projects
- MBCx / EBCx
- Establish New Benchmark

36

Controls Master Planning A Deeper Dive into the Why and What

- In the not-so-distant past controls were applied after the MEP systems were designed
- Controls were device and single system centric
- Communication between systems were limited
- This generation is often the decision maker.

37

What does this history mean

- Similar to the workplace there are multiple generations
- Buyers may be more comfortable with previous generations of Automation
- The old model that Controls follows the design does not work!
- Communication Gap!

38

Automation & Monitoring to Run Your Building

- Automation is needed to run your building – step one
- Focus on system operations at turn-over
- What does the operator see?
  - Macro system graphics
  - Detailed components
  - Trend data
  - Prioritized alarms
- These are all needed to run a building

39

Automation & Monitoring to Maintain the Edge

- Step two
  - Ongoing data gathering
  - Identify drift and changes
  - Log energy performance
  - Repeat Functional Performance Tests
  - Log all changes
  - The fix that broke the camels back
  - Observe how expansions impact existing spaces

40

Controls Master Planning

- Most, if not all, organizations are currently facing issues associated with existing control systems:
  - Obsolete hardware and software
  - Multiple generations of software
  - Multiple manufacturers
  - Stand alone and central automation hybrids

41

Controls Master Planning

Other issues beyond the technology like:

- Dissatisfaction with service and support from current control system provider(s)
- Limited, or no, competition on renovation or new construction projects.
- Perception of management that a change is needed
- ASHRAE engineers saving the world with energy efficiency

42

Controls Master Planning

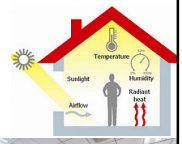
- Desire for Facility/Building Automation Systems to aid in making decisions
  - related to reducing utility and energy costs
  - Occupant comfort
  - Space utilization
  - Metrics for performance

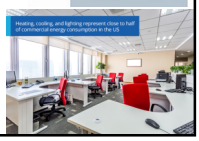
43

Automation Master Planning

There are a lot of factors to consider and balance

- Occupant comfort
- Capital expenditure
- Operational costs





44

Existing Spaces Master Planning

- Identify
  - Obsolete parts
  - Critical systems
  - Missing systems
  - Potential expansion
  - Trouble areas

45

How to find the missing link

- The number one challenge with an existing system is where to find the truth.
  - As built drawings
  - Operator interviews
  - Search and find
  - Assume??
  - All of the above + some contingency

46

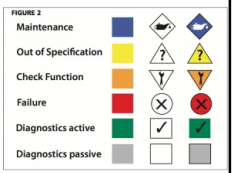
Existing System Assessment

- Discover
  - What is system currently controlling and monitoring?
- Assess
  - Does current system have necessary capacity and capability for optimum operation?
  - Compare to capabilities and features of modern BAS
- Execute
  - Develop implementation plan
  - Add/remove points as required to improve sequence of operations for building to reach peak performance.

47

All of these new features!

- What new features should be incorporated.
- What about alarms?
  - Prioritization
    - Learn from the auto industry
  - External communication



48

All of these new features!

- Cross platform data sharing
  - Avoid duplicate data display
  - Ensure the new system splits display from control
  - Incredible volume of data
    - Over 100 points from a UPS “available”

49

All of these new features!

- Culture change for operations!
  - Ability to show less in graphics but get more. For example fan status.
    - Show fan as moving based on status
    - Add an error if status does not match command
      - » Do not show status and command - clutter

50

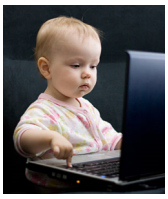
Operational Changes

- Site staffing
  - Full time
  - Days
  - Regional support
  - Unstaffed
- Skill level of staffing

51

New Operational Options

- Alarm philosophy
  - Site must stay up 99.999%
  - Can handle short term interruptions
- User input
  - Do you want users to be able to change
  - Public spaces
  - Yes to both



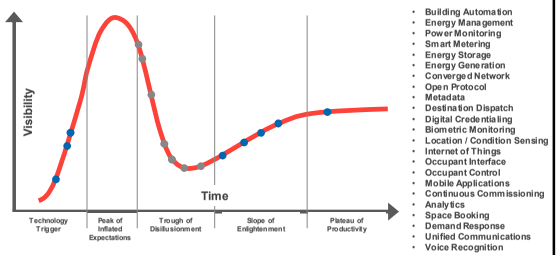
52

Retrofit vs New Construction

- Same principles
- Same process
- New is a single phase
- Retrofit much more complex
  - Keep existing running
  - Run in a hybrid mode

53

Where Are You On Your Journey



54

The Future is Today

55

Intelligent Buildings

- Dynamically Connected Smart Systems
- Advanced Diagnostics / Analytics
- Enhanced Visualization & User Portals

56

Questions.

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57