

**“Finding the ‘Right Fit’;  
Sustainable Healthcare Facility  
Design, given competing  
initiatives;  
Fiscal Viability and  
Emergency Preparedness”**

*–Ted W. Mallin AIA, ASHE, FHEA;  
Managing Principal, ENVISION Architects PA*

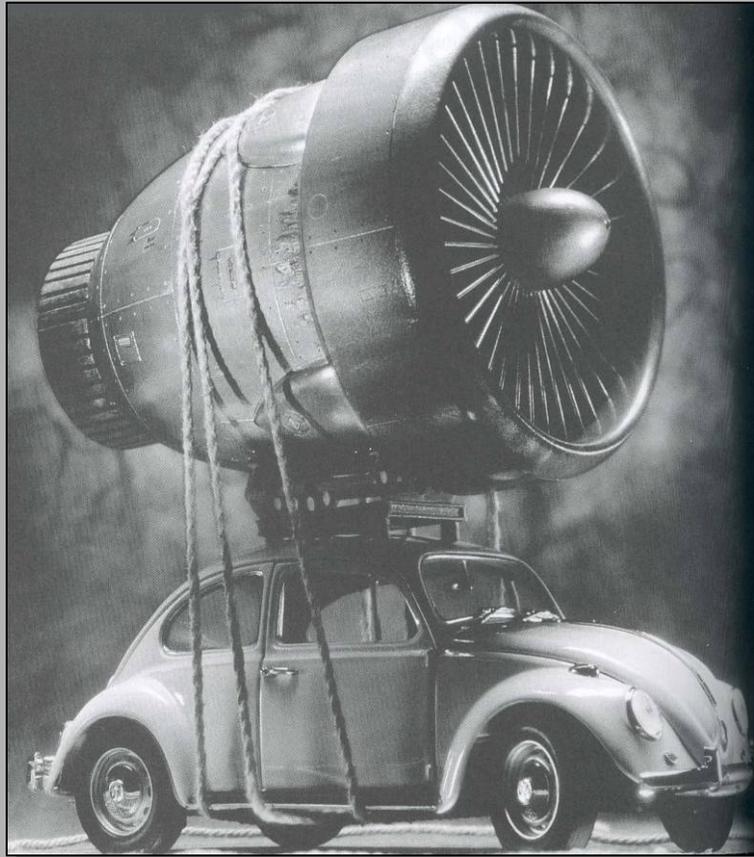
*–Damon Greeley PE, CEM, HFDP, CBCP;  
Principal, Director Engineering, FreemanWhite*

*October 29, 2008*

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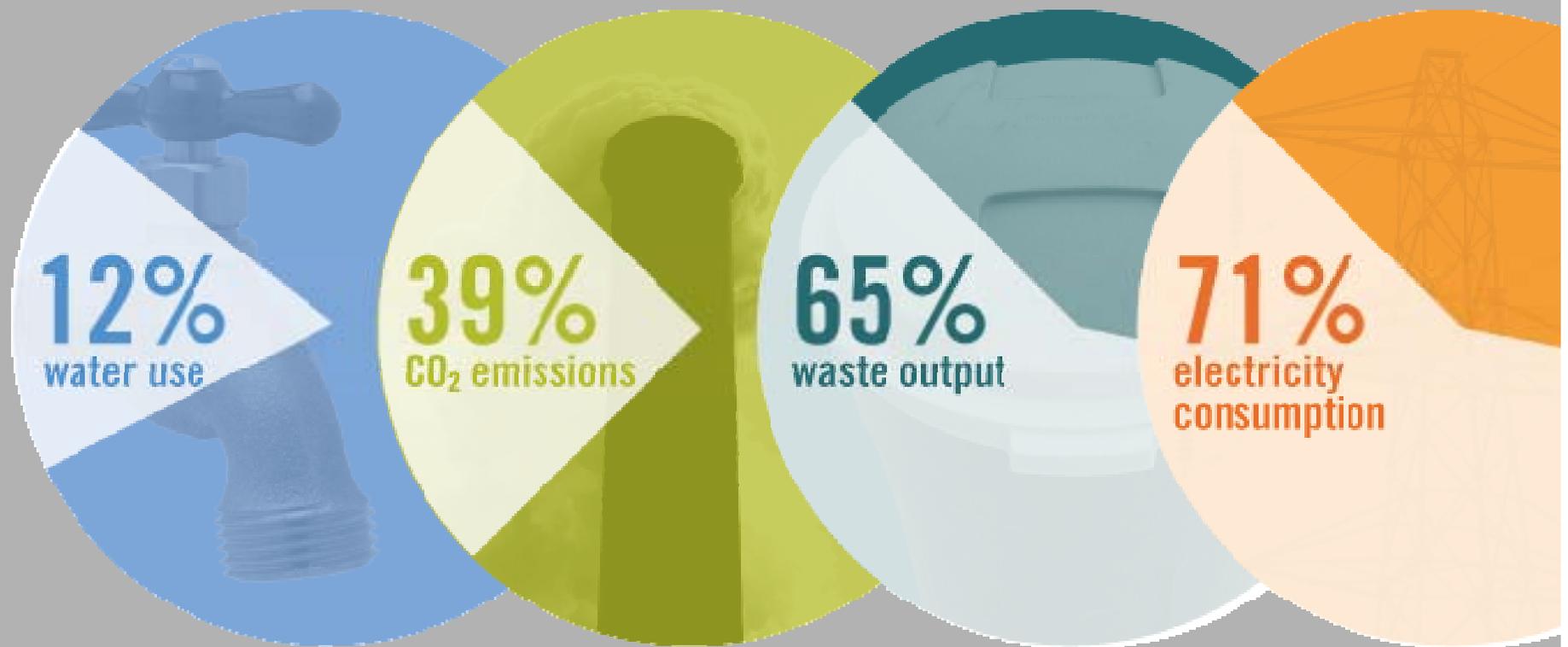
# Eureka!



A major determining factor for success is whether or not the solution is **applied** or **integrated**.

**We need an integrated solution for “Green” Healthcare!**

# U.S. Building Impacts:



# What Is Green Building?



Design and construction practices that significantly reduce or eliminate negative impact of buildings on the environment and occupants in five broad areas:

# Benefits of Sustainable Design

## Environmental Benefits

- Reduce the impacts of natural resource consumption

## Economic Benefits

- Improve the bottom line

## Health and Safety Benefits

- Enhance occupant comfort and health

## Community Benefits

- Minimize strain on Campus and local infrastructures

# LEED Planning Checklist Summary

<b>Sustainable Sites</b>	<b>14 Points</b>
<b>Water Efficiency</b>	<b>5 Points</b>
<b>Energy &amp; Atmosphere</b>	<b>17 Points</b>
<b>Materials &amp; Resources</b>	<b>13 Points</b>
<b>Indoor Environmental Quality</b>	<b>15 Points</b>
<b>Innovation &amp; Design Process</b>	<b>5 Points</b>
<b>Project Totals (pre-certification estimates)</b>	<b>69 Points</b>

# LEED Planning Checklist Sample

## LEED Planning Tool

Derived from:

LEED for New Construction v2.2

Registered Project Checklist

Project Name:

Project Address:

Yes	?	No				
0	0	0	<b>Sustainable Sites</b>		14 Points	<b>Sustainable Strategy</b>
Y			Prereq 1	<b>Construction Activity Pollution Prevention</b>	Required	
0		0	Credit 1	<b>Site Selection</b>	1	
	0		Credit 2	<b>Development Density &amp; Community Connectivity</b>	1	
		0	Credit 3	<b>Brownfield Redevelopment</b>	1	
	0		Credit 4.1	<b>Alternative Transportation, Public Transportation Access</b>	1	
0			Credit 4.2	<b>Alternative Transportation, Bicycle Storage &amp; Changing Rooms</b>	1	
0			Credit 4.3	<b>Alternative Transportation, Low-Emitting &amp; Fuel-Efficient Vehicles</b>	1	
		0	Credit 4.4	<b>Alternative Transportation, Parking Capacity</b>	1	
0			Credit 5.1	<b>Site Development, Protect or Restore Habitat</b>	1	
0			Credit 5.2	<b>Site Development, Maximize Open Space</b>	1	
0			Credit 6.1	<b>Stormwater Design, Quantity Control</b>	1	
		0	Credit 6.2	<b>Stormwater Design, Quality Control</b>	1	
		0	Credit 7.1	<b>Heat Island Effect, Non-Roof</b>	1	
	0		Credit 7.2	<b>Heat Island Effect, Roof</b>	1	
	0		Credit 8	<b>Light Pollution Reduction</b>	1	
Yes	?	No				
0	0	0	<b>Water Efficiency</b>		5 Points	<b>Sustainable Strategy</b>
0	0		Credit 1.1	<b>Water Efficient Landscaping, Reduce by 50%</b>	1	
		0	Credit 1.2	<b>Water Efficient Landscaping, No Potable Use or No Irrigation</b>	1	
	0		Credit 2	<b>Innovative Wastewater Technologies</b>	1	
0			Credit 3.1	<b>Water Use Reduction, 20% Reduction</b>	1	
0			Credit 3.2	<b>Water Use Reduction, 30% Reduction</b>	1	

# Hospital Sustainability Workshop

## ELLIS HOSPITAL EXPANSION SUSTAINABILITY WORKSHOP

LOT DESIGN, PREPARATION & CONSTRUCTION		ROI	KEY NOTES
1	Reuse an existing building	High	Minimal impact for project scope
2	Recycle demolition debris	None	
3	Implement erosion control measures during construction	Low	Required by NYS
4	Swales to divert surface water		N/A
5	Erosion control blankets (for sloped areas of landscape)		N/A
SITE PLANNING & LAND DEVELOPMENT			
6	Reduce impervious paved surfaces		Not possible
7	Reduce parking demand through public transportation connections, encourage bicycle use and provide preferred parking for high occupancy and alternative fuel vehicles	Low	
8	Trees and shrubs shade driveways, patios and walkways to reduce heat island effects	Low	Determined in Evidence Based design workshops
9	Plant trees or shrubs in disturbed construction area as a permanent erosion control measure		N/A
10	Program existing building to take advantage of solar orientation and environmental factors	Low	Constrained by site
RESOURCE EFFICIENCY			
11	Specify materials with recycled content, renewable content, and with low embodied energy	None	
12	Specify material with low or zero VOC's	Medium	Regulation driven
13	Specify wood that has been sustainably harvested	None	
14	Salvage, reuse, or donate demolished materials and equipment	Low	
15	Recycle construction waste	None	

# Hospital Sustainability Workshop

<b>ENERGY EFFICIENCY</b>			
16	Green power	<b>None</b>	If utility offers it, typically 10-15% is purchased
17	Provide occupancy sensors	<b>Medium</b>	Public spaces, conference rooms, mechanical/electrical rooms
19	Reject condenser heat to domestic water	<b>High</b>	Modular heat recovery chillers work best for this, also code by NYS Energy
20	Increased indoor design temperature-Use wider indoor temperature range with control band of 5deg F	<b>Medium</b>	Purely operational, requires energy conservation education of staff
23	High efficiency lighting fluorescent and LED	<b>Medium</b>	T8 is standard, T5 in certain areas
24	Renewable energy (solar water heating)	<b>Low</b>	Based on sunlight days in NYS
25	Balance HVAC system	<b>Medium</b>	Requires ongoing measurement & verification devices for long term savings
27	Task lighting, dimming, and multiple switching	<b>Medium</b>	
28	Premium efficiency motors with either VFD's or soft start	<b>High</b>	
29	Automated lighting controls	<b>High</b>	Public areas preferably, can be minimal in acute care and D&T areas
32	Photo sensors on exterior lighting	<b>High</b>	
34	Daylight sensors for lighting to control on/off or dimmable ballasts	<b>Medium</b>	Public areas only
38	Windows that meet or exceed the requirements for Energy Star labeled windows	<b>High</b>	Should not be value engineered due to potential impact to HVAC
39	Extra insulation	<b>Medium</b>	Should not be value engineered due to potential impact to HVAC
40	Use of cellular foam insulation for chilled water piping	<b>Medium</b>	Prevents vapor seal loss issue with fiberglass
41	Use at least R-3 insulation in pipes running through non-conditioned spaces	<b>High</b>	3.7 minimum by NYS Energy Code
42	R-4 insulation on hot water piping	<b>High</b>	3.7 minimum by NYS Energy Code
44	Photovoltaic sensors controlling retractable shades over windows	<b>Low</b>	
45	No ducts in exterior walls	<b>Low</b>	
46	Medical process equipment efficiency	<b>High</b>	Tie cooling into house chilled water system with domestic water as back-up
48	AHU zones based on operations & occupancy cycles	<b>Medium</b>	

# Hospital Sustainability Workshop

<b>ENERGY EFFICIENCY (cont'd)</b>		
50	5% Duct leakage	High Should be in specification
51	Demand based ventilation (carbon dioxide detectors)	Medium Works well for single zone systems
52	Heat recovery ventilation	Low Maintenance intensive for performance
53	HVAC system with non-HCFC refrigerants	None R-134A or non-HCFC blend
55	Air side energy recovery heat/enthalp wheel	Medium Where leakage is acceptable, maintenance is usually problematic
58	Building Automation System with control points for monitoring building energy performance	High
59	Semi or fully instantaneous domestic water heating	High Existing systems can be retrofitted
60	High intensity discharge (HID) bulbs for exterior lighting	Medium
62	Indirect lighting options	Low Standard practice except for clinical task lighting requirements
63	Skylights and/or solar tubes with lighting controls	Low Challenging in healthcare for staff satisfaction
66	Utilize HVAC equipment with high EER and COP ratios as mandated by ASHRAE 90.1	Medium Standard practice
67	Use high efficiency electric fixture ballasts and compact fluorescent bulbs	High Standard practice
69	Provide economizer with enthalpy control for HVAC systems	Medium Exception would be with water side economize for low humidity conditions
70	Optimize Start/Stop operation schedules for HVAC	Medium Standard practice
73	AHU design velocity of 350-450 FPS	Medium
75	Commissioning & Enhanced Commissioning	High More rigorous process for systems check-out and start-up and acceptance

# Hospital Sustainability Workshop

<b>WATER EFFICIENCY</b>			
76	Storm water recovery for use in gray water systems	Low	Can be used for non-potable emergency water reserve
77	Low flow plumbing fixtures (1.6 gpf.)	High	
78	Low flow plumbing fixtures (1.28 gpf.)	High	
80	Sensor lavatory faucets	High	
82	Capture condensate from cooling coils and use for landscape irrigation or cooling tower make-up	High	
83	Waterless urinals	Low	Recommend blend with standard for customer choice
84	Install landscaping which does not require irrigation		
85	Use drip water irrigation system		Use for "Green Roof"
<b>INDOOR ENVIRONMENTAL QUALITY</b>			
86	Natural ventilation	Medium	Enthalpy controlled economizer
87	Enhanced refrigerant monitoring	None	Recommended by ASHRAE 15
88	Direct makeup air to furnace/boiler	Medium	High efficiency boiler recommended venting
89	Community contaminant prevention	Medium	Heat recovery reduces boiler emissions
90	Greenguard certified fiberglass	None	
91	Low-emitting furniture	None	
92	Install air filters MERV 8-13 or higher	None	Determined by healthcare codes & guidelines
94	Preoccupancy outdoor air flush		N/A
96	Install outside air measuring in central HVAC system and monitoring stations with ability for "ventilation reset"	Medium	Smart building controls protocol
<b>OWNER EDUCATION</b>			
97	Use of green cleaning products	Low	
98	Recycling	Low	
99	Efficient Management of HVAC System operations	Medium	
<b>GLOBAL IMPACT</b>			
100	Purchase building materials manufactured within 500-miles of building site	None	

# LEED/Sustainable Survey

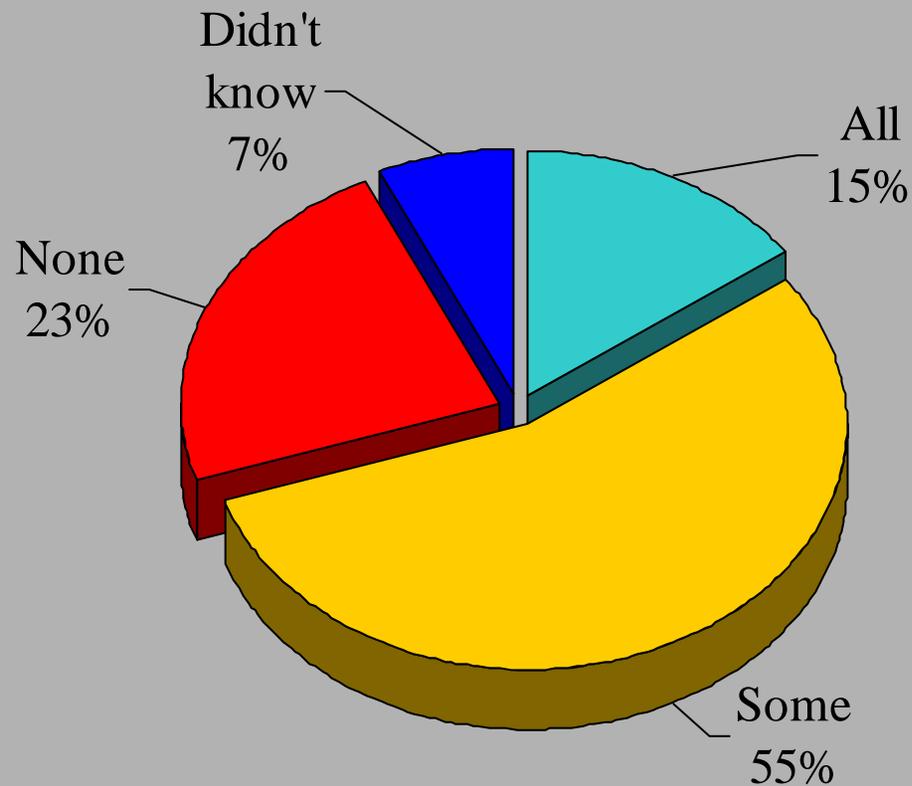
*Source:*

*“Greening Up Hospitals getting savvier on sustainability”*

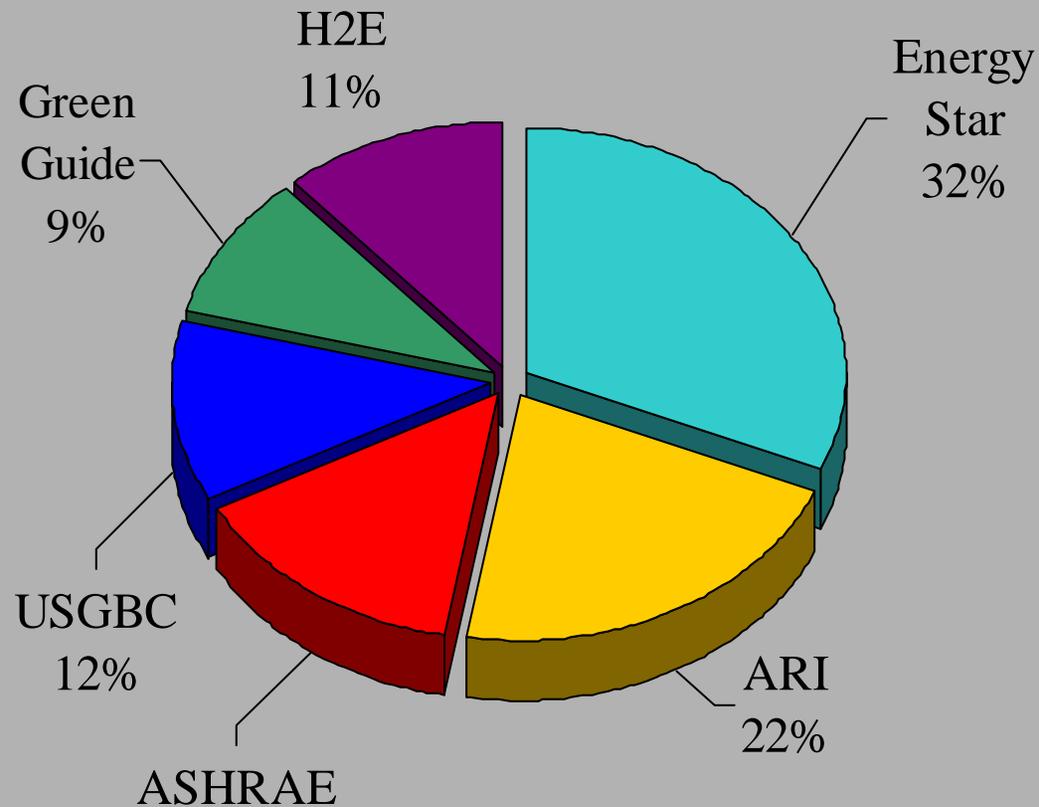
*by Dave Carpenter*

*Health Facilities Management Magazine*

# Survey: Hospital reports specifying green/environmentally friendly construction materials in **current construction and renovation projects.**



# Survey: Hospital use of energy efficiency, green or sustainable, **programs/services** *italics underline [Envision/FreemanWhite]*



## **The Best Intentions:**

“Everyone has good intentions, but in the healthcare area, cost containment is a [particularly] huge issue.”

*- Dawn LeBaron, CHFM  
Member of ASHE's Sustainability Task Force*

## **Cost Containment:**

Engineering infrastructure costs,  
**especially central plants,** have  
become the biggest challenges for our  
hospitals to 'fit' within their budgets.

*- James R. (Skip) Gregory. NCARB  
ACHA Bureau Chief*

## **The Challenge:**

**We need an integrated approach  
to deliver “Green” projects within a  
budget and without compromise  
of other key components.**

**FreemanWhite Survey** (5% of US Hospitals):  
**Keys to a Successful Project**

**Nimble**

**Optimal**

**Viable**

**Environmental**

# “Value Engineering”

has become a method  
of removing the “value”  
from a project.

- *Doug Erickson, FASHE, CHFPM, HFDP*  
*Deputy Director of ASHE*

# Considerations for Emergencies

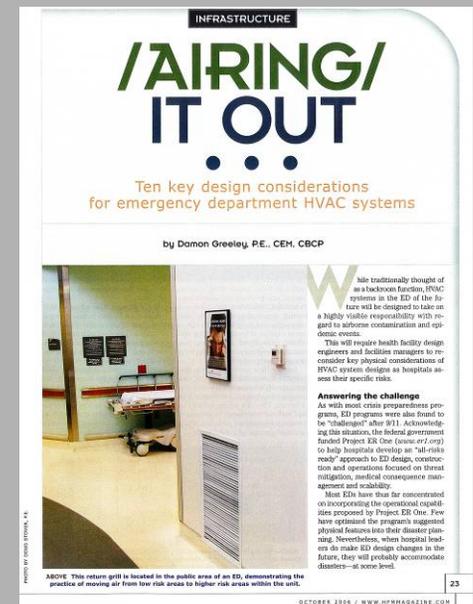
- “Critical Axis” utilities
  - Defined by your HVA
- Mass contagion
- Loss of communications
- Loss of water or electrical utility
- Flood or surge
- Emergency power;  
“Fragile Grid”
  - 100% operations & cooling



Source: Inside ASHE,  
Sep/Oct 2008, Volume 16,  
No. 5

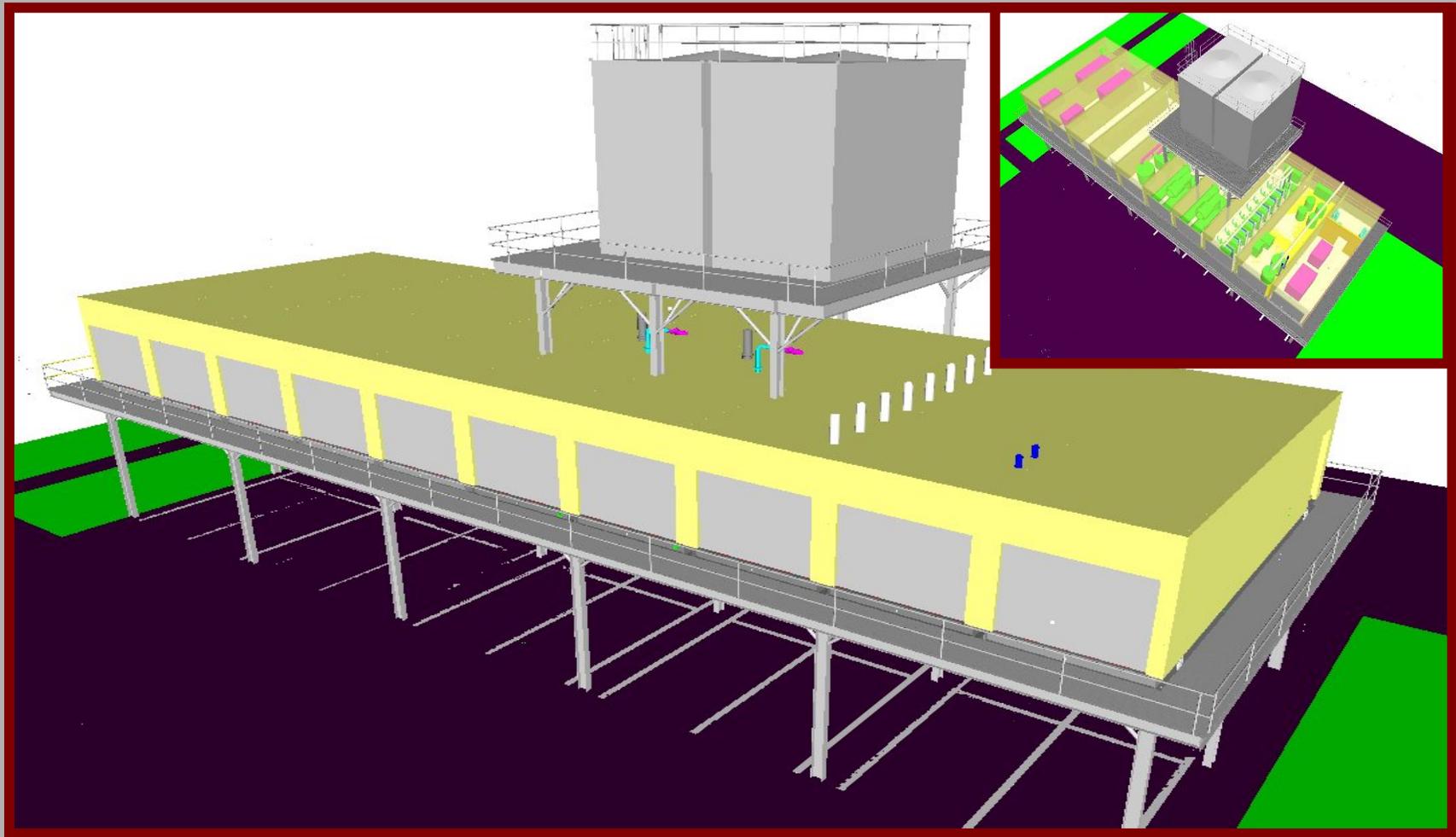
# Considerations for Safety

- Mitigate airborne contagion
  - Florida; nearly 7M undiagnosed enter your ED's annually
  - Filtration, UVGI
  - Venting location
- Redundant Systems
- “Big Plugs”
- Hierarchal pressurization
  - Clean to dirty movement
- Minimal complexity
  - Controls



Source: Health Facilities Management, Oct. 2006, Volume 16, No. 5

# Emergency Responsive, Scalable, Component Constructed Utilities



Courtesy of Stellar Energy, Jacksonville, FL

# “Evidence-Based” Operations Planning

- Self-Assessment
- Needs Scorecard
  - Equipment & Systems
- Risk Analysis
- “*Smart Growth*” Tools
- Focused Condition Assessments
  - Building Envelope Study
  - Seismic Evaluation
  - Energy Optimization
  - SOC & Life Safety

# “Re-Engineering” for Optimization

- “Smart Growth” Tools identified chilled water optimization opportunity
- Campus Growth of 200,000 SF could still be served by current plant with optimization vs. plant expansion
- 1 year payback through energy savings
- Look for opportunities for efficiency improvements that have immediate ROI
- Featured in March 2008, Health Facilities Management Magazine, titled, “Chilled Out.”

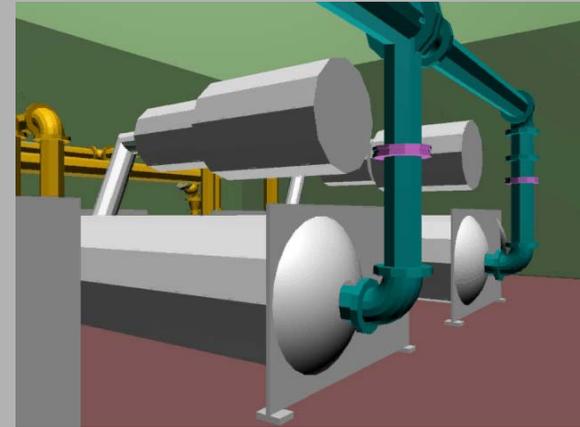


# Financial “Checks & Balances”

- Integrated with Strategic Plan
  - Including strategy for growth, e.g. phasing
  - Protect profitable service lines, e.g. continuity of service
    - Surgery, Radiology, Oncology, OB, etc...
- Reduce energy costs
  - Top 5 budget line item
- Capital outlay schedule
  - 30% +/- of annual depreciation
- Review FASB 13
  - Other factors that affect bond rating, e.g. “off balance” sheet projects
- Reduce O&M budget initiatives
- Vector analysis of FCI & AAP

# Sustainable/Renewable Innovation & Factory-Built Standardization

- Cost savings
- Single source
  - Standardized Equip
- Expedited construction
  - Controlled environment
- LEED & commissioned
- On going Process Improvement
- Scalable to the immediate/future needs
- Integrated BIM



Courtesy of Stellar Energy  
Jacksonville, FL

**Your future** **SUCCESS**

**is only limited**

**by your** **VISION.**

*- Lt. Colonel Richard Cutts*

*CEO & Founder*

*Foundation Pegasus*

**Sustainability should no longer be a *buzz* word.**

**It should be a process of optimizing outcomes in planning and design.**

**Thank You**

*Questions?*