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Duke Energy Convention Center

Cincinnati, Ohio

August 7–10, 2011

US Army Corps of Engineers®

FORT BLISS REPLACEMENT HOSPITAL

EL PASO, TEXAS

SESSION TITLE: Hospitals: Cures for Hospital Energy Ills
TRACK: Specialty Buildings

9 August 2011

Department of Defense – Military Healthcare System

Overview of MHS Inventory

Facility Types	*Number*
Military Inpatient Facilities	59
Medical Clinics	365
Dental Clinics	281
Veterinary Clinics	255
Medical R&D	24
Medical Training	19

- Approx. $33B plant replacement value (PRV) globally
- Approx. $9B currently in design or construction
- Approx. $1B annual capital investment

It is about the delivery of healthcare…

MEDCOM Sustainability Strategy Map

May 2011

MEDCOM GREEN
IMPROVE THE PRESENT, RESPECT THE FUTURE

Mission	To accomplish our mission through due consideration of health, value, environment, and communities while enhancing the ability of future generations to accomplish their missions.
Vision	Sustainable healthcare for today and tomorrow. Improve the present; respect the future.

Strategic Themes & Results	Enhance Health	Enhance the Environment	Enhance our Communities

ENDS — Patient/Customer/Stakeholder

- CS 1.0 Improved Facility Environment
- CS 2.0 Reduced Environmental Impact
- CS 3.0 Improved Community Relations
- CS 4.0 Sustainable Facilities

WAYS — Internal Process

- IP 1.0 Improve Energy Conservation
- IP 2.0 Improve Water Conservation
- IP 3.0 Improve Responsible Purchasing
- IP 4.0 Decrease Waste Streams
- IP 5.0 Improve Sustainability Awareness
- IP 6.0 Improve Sustainability Best Practice Transfer
- IP 7.0 Reduce MEDCOM Carbon Footprint
- IP 8.0 Design, Build, and Operate Sustainable Facilities

MEANS — Learning and Growth

- LG 1.0 Improve Knowledge Management
- LG 2.0 Enhance Staff Training and Development
- LG 3.0 Promote a Culture of Sustainability

MEANS — Resource

- R 1.0 Optimize Resource Stewardship

Introduction – Many Locations

Pick a location…DoD's MHS has likely provided care there

Overview of MHS

- Direct Patient Care of Service Members & Families
- Veterans
- Humanitarian Aid
- Disaster Relief
- Infectious Disease Response
- War Zone Casualty Care
- Etc.

Introduction – Many Delivery Platforms

DoD Strategic Sustainability Performance Plan (SSPP)

"Sustainability" and "sustainable" mean to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations of Americans.
— *Executive Orders 13423 & 13514*

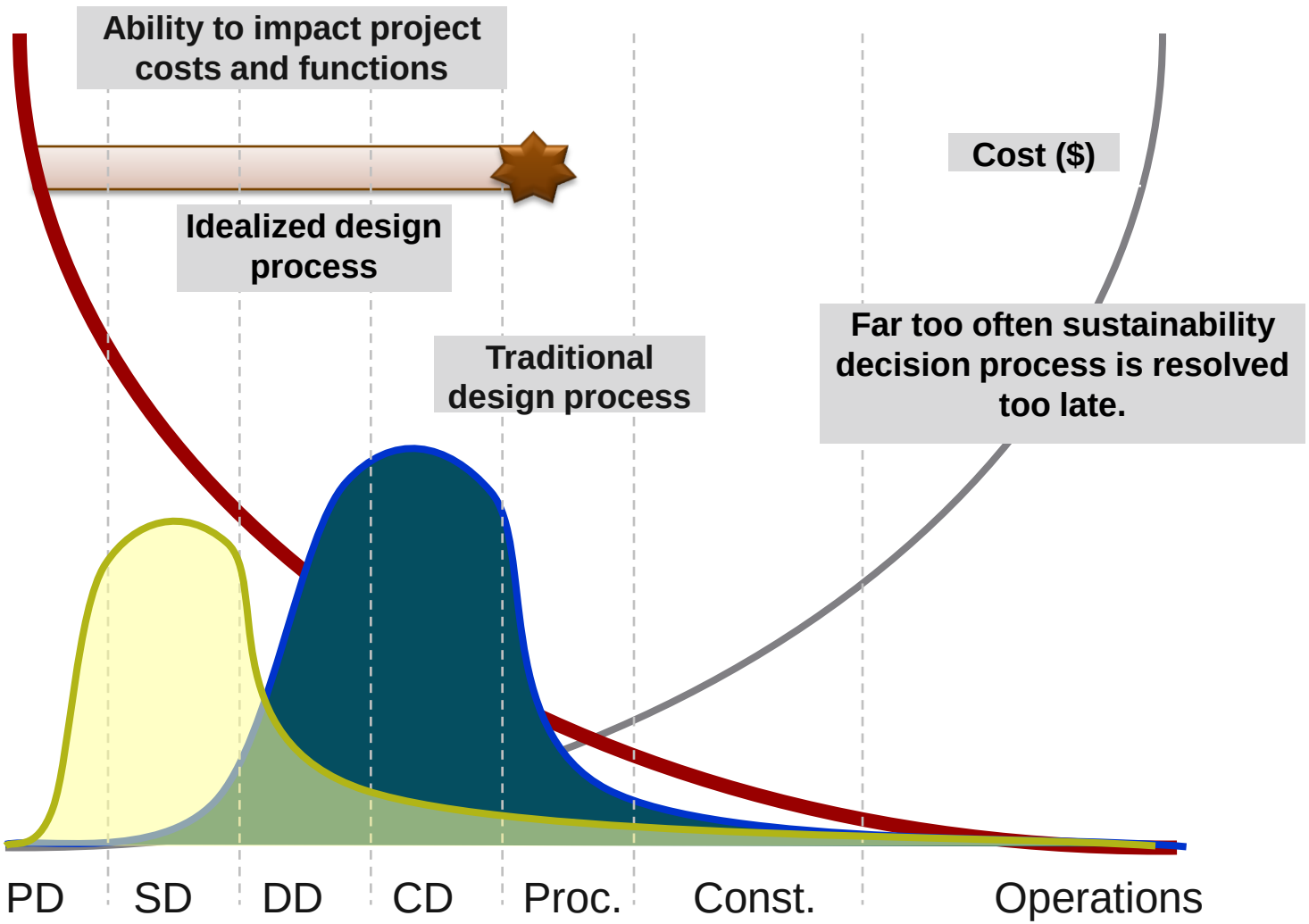
DoD Priorities:

1. **Energy and Reliance on Fossil Fuels**
2. **Chemicals of Environmental Concern**
3. **Water Resources Management**
4. **Maintaining Readiness in the Face of Climate Change**

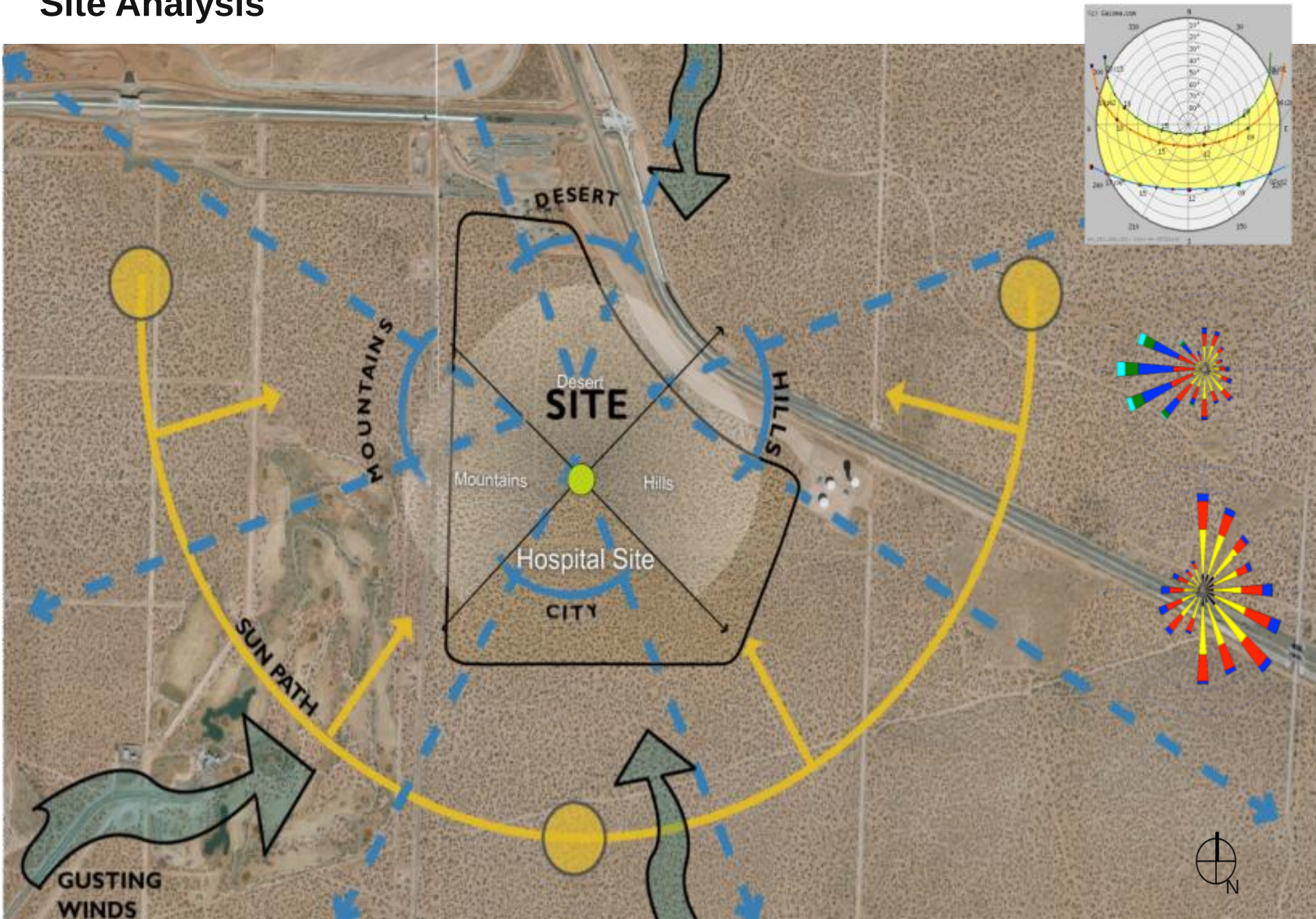
DoD Energy Security

"Energy security for the Department means having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet operational needs. Energy efficiency can serve as a force multiplier, because it increases the range and endurance of forces in the field and can reduce the number of combat forces diverted to protect energy supply lines, which are vulnerable to both asymmetric and conventional attacks and disruptions."
— *DoD Quadrennial Defense Review, 2010*

Making decisions sooner = higher probability of good implementation



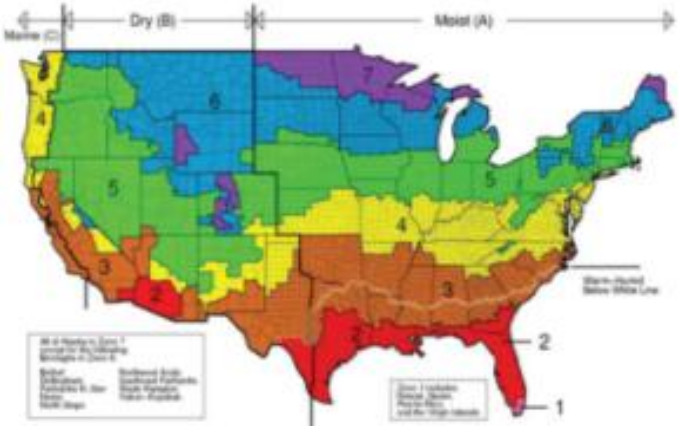
Site Analysis



MHS's World-Class and EBD Strategies

- Evidence-Based Design (EBD) Checklist
- Requirements for achieving the World-Class designation
- Sustainably Return on Investment (SROI) was used in a decision-making process to help inform EBD and World-Class strategies.

Criteria & Metrics



- **Climate responsive**
- **Healthcare specific**
- **Investing $$ for maximum value**
- **Optimize sustainable outcomes**
  - Driven to achieve natural resource intensity reductions

- **Natural Resource Use Intensities**
  - Measured per SF per year
    - Solid Waste
    - Water
    - Wastewater
    - Energy
  - Earn LEED® ratings
  - Greenhouse gas emission reporting

Optimize
Net Present
Value

Process

DRIVERS

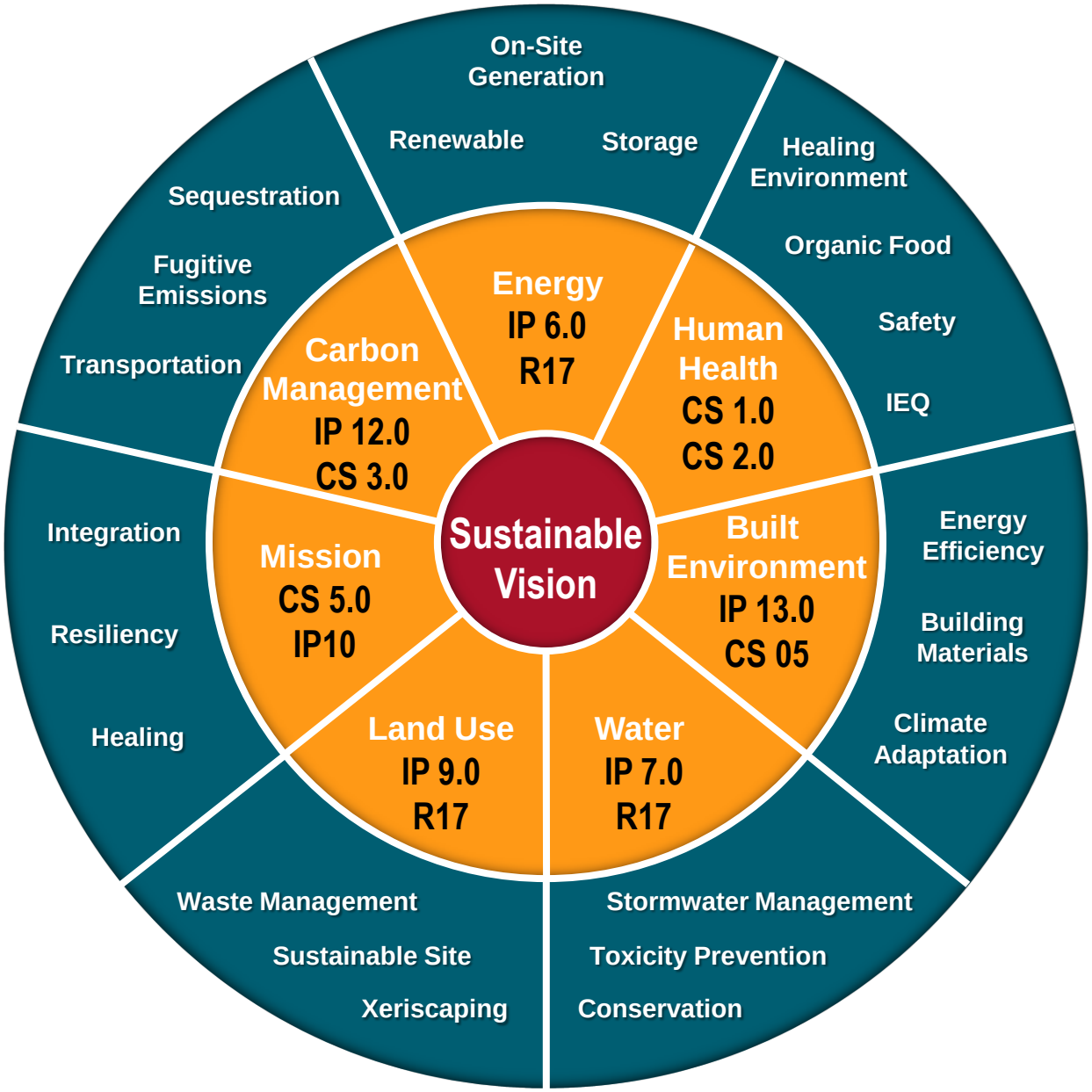
- MEDCOM Sustainability Guide
- EO13514
- EO13423
- EISA
- National Defense Authorization Act
- MOU – HPSB
- EPAct 2005
- Climate Change
- Carbon Reduction
- LEED
- Evidence-based Design

QUALIFIED GOALS

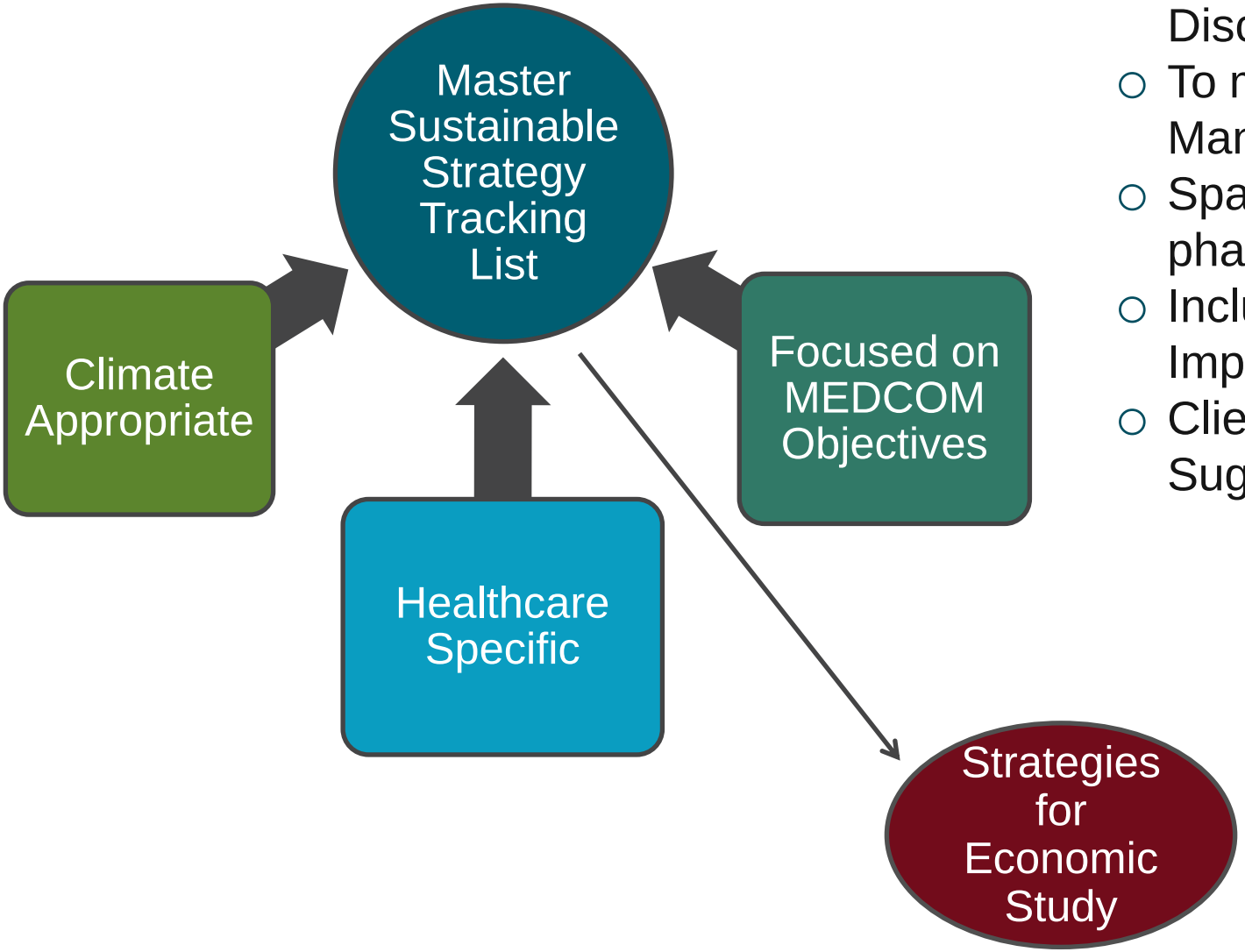
- Reduce GHG Emissions
- Reduce Operational Cost
- Reduce Air Contaminant Emissions
- Conserve Fresh Potable Water
- Improve Healing Environment
- Reduce Hospital Acquired Infections
- Improve Productivity
- Improve Energy and Water Resiliency

SUSTAINABLE VISION

Vision = MEDCOM Sustainability Guide



Sustainable Strategies



- 75+ Strategies
- Assigned to A/E Disciplines
- To meet Federal Mandates & LEED
- Spanning all design phases (S2-S6)
- Includes Options to Improve O&M
- Client Action Items Suggested

Sustainable Strategies based on SROI & LCCA Analysis May 2011		SROI + LCCA	
		Analysis	Status
Energy Path 1	**Geothermal Direct Heating**		Implementing
	Thermal Storage		
	Ground Source Heat Pump		
	Energy Recovery Ventilator		
Energy Path 2	Condensing Boilers		Closed
	Thermal Storage		
	Heat Recovery Chiller		
	Ground Source Heat Pump		
	Energy Recovery Ventilator		
	Solar Hot Water		
	Solar Photovoltaics		
	Co-Generation #1 Full Load		Closed
	Co-Generation #2 Partial Load		Closed
Water	**On-Site Greywater and Wastewater Reclamation, Treatment, and Re-Use**		Report @ S4
Waste	**Recycling Station & In-vessel Composting**		Report @ S4
EBD	**HEPA/MERV 16 and Ultraviolet**		Implementing
	Hydrogen Peroxide Vapor Cleaning		Portable Unit Eval.

SROI = Calculating The Triple Bottom Line

Traditional models such as Life-Cycle Cost Analysis (LCCA) often fall short:

- Only considering cash impacts
- Lacking transparency
- Not accounting for uncertainty

Adopted from the 2002 University of Michigan Sustainability Assessment

DOD Examples of Recent SROI Projects

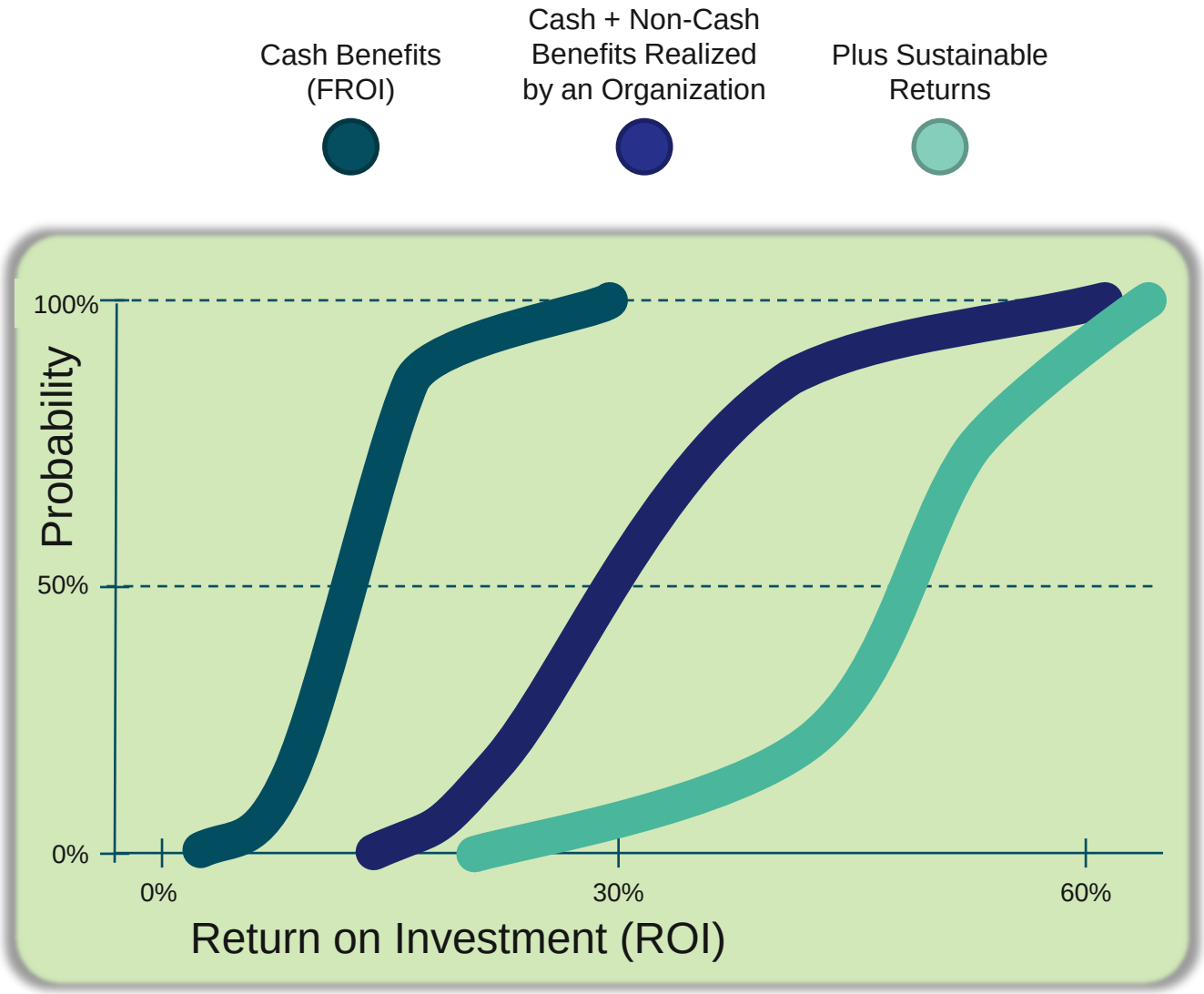
- Fort Belvoir Community Hospital
- USAG Humphreys in Korea
- Fort Bliss Replacement Hospital
- MCAS, Iwakuni, Japan
- NAVFAC Pacific, Pearl Harbor HI
- AFCEE Sustainable Communities

Fort Bliss Replacement Hospital

USAG Humphreys Korea

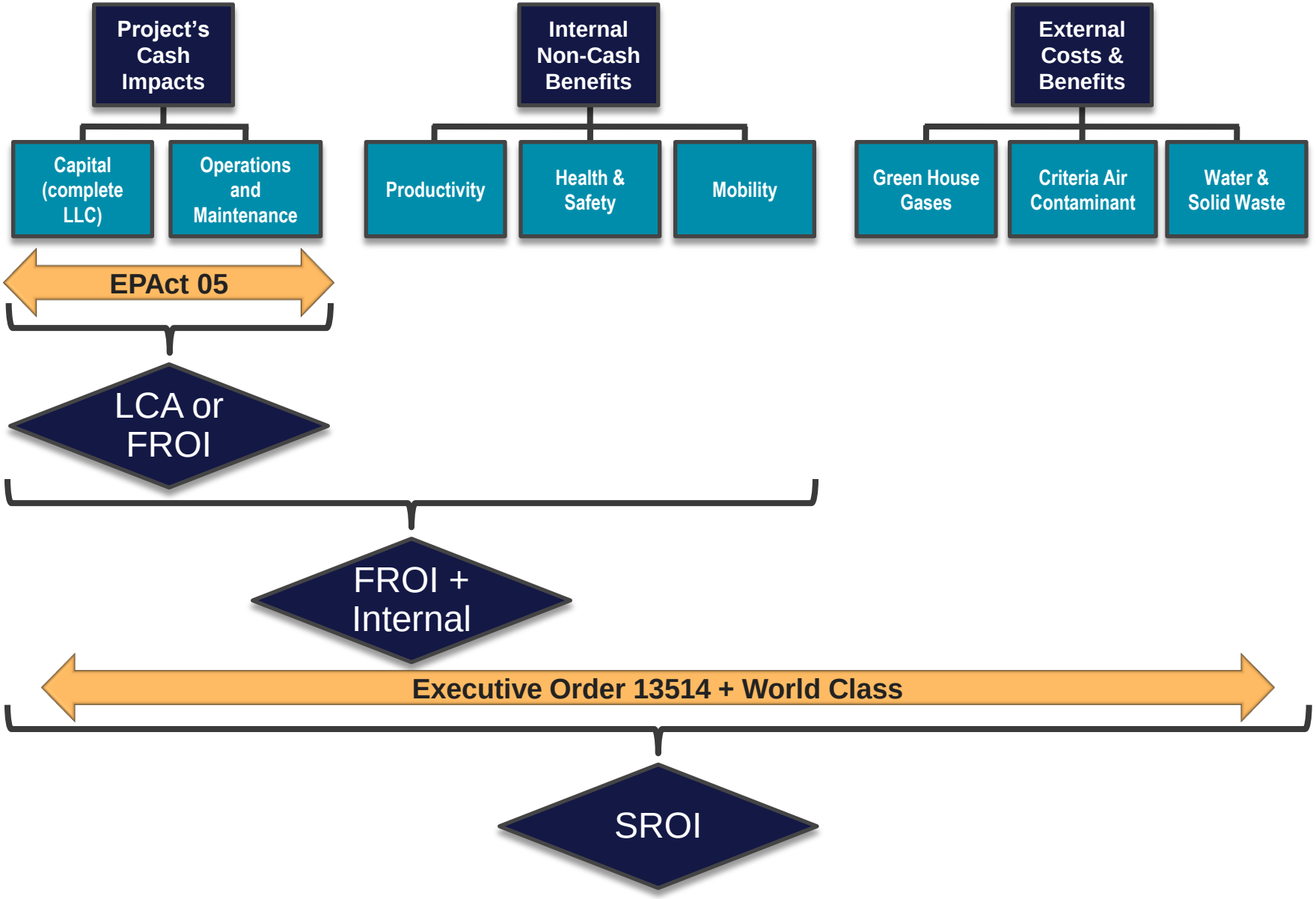
Fort Belvoir Community Hospital

Analysis Results



- ✓ Monetizing the variables provides ROI for the three perspectives
- ✓ Analyzing the potential variability of the input variables yields probability to address risk and identify sensitivity of your results to changes in key variables

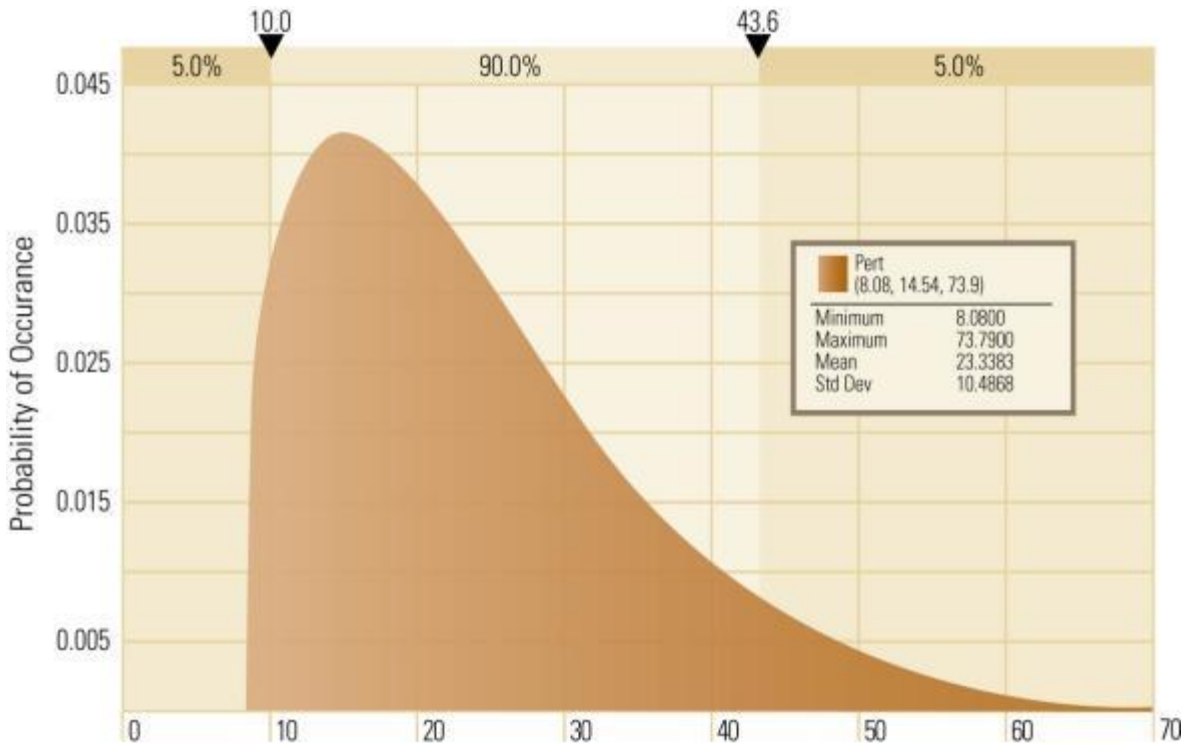
SROI Methodology



Quantify Input Data Assumptions

Example: Cost of CO_2 per Incremental Ton ($2011)

Quantify Input Data Distributions	Median	Lower Limit	Upper Limit
	$20.87	$7.51	$86.50

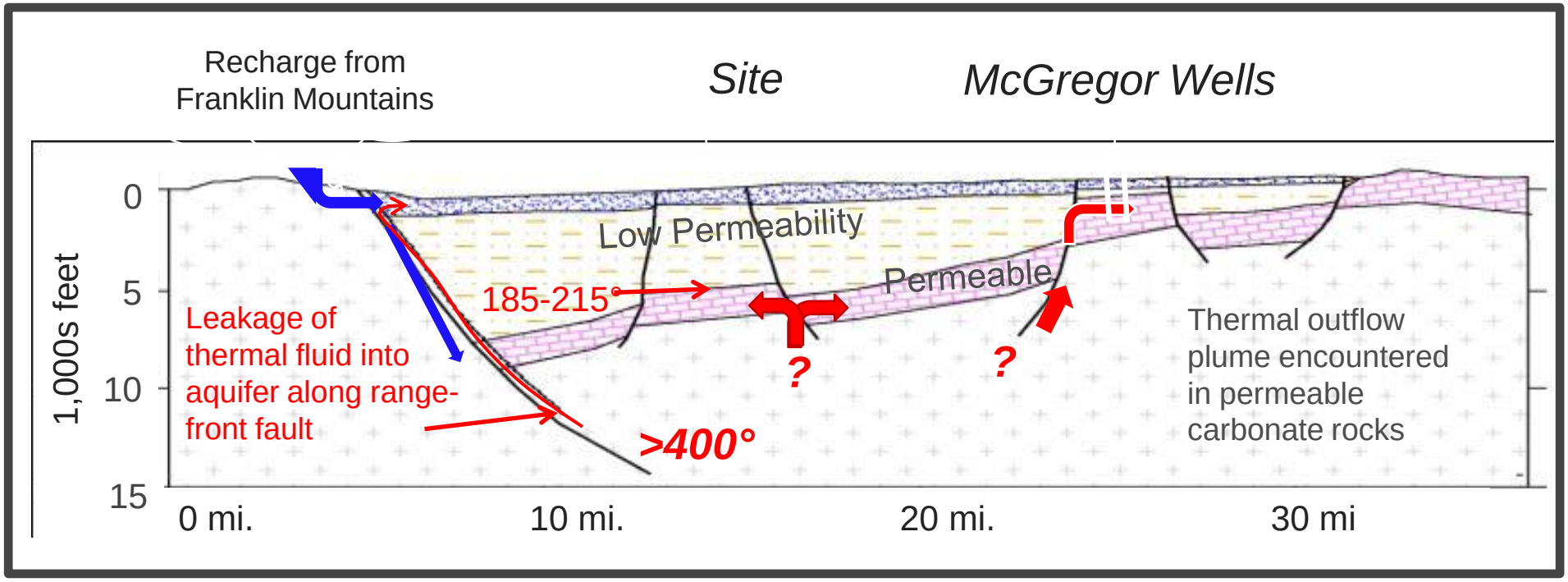


Quantify Input Data Assumptions

	ENERGY 1: GEOTHERMAL (EPACT Compliant)	ENERGY 2: NON-GEOTHERMAL (EPACT Complaint)
FROI		
Metrics	**Values**	**Values**
Avg Annual Value of Benefits	$1,498,146	$1,499,092
Avg Annual Value of Costs	$257,601	$1,458,050
Net Present Value	$10,998,620	($32,584,077)
Return on Investment	13.3%	1.9%
Discounted Payback Period	12 y 5 m	Beyond Study Period
Internal Rate of Return (%)	11.3%	0.1%
Benefit to Cost Ratio	2.3	0.4
SROI		
Metrics	**Values**	**Values**
Avg Annual Value of Benefits	$1,743,070	$2,732,820
Avg Annual Value of Costs	$262,311	$1,465,918
Net Present Value	$13,907,626	($17,394,807)
Return on Investment	14.9%	3.5%
Discounted Payback Period	11 y 12 m	Beyond Study Period
Internal Rate of Return (%)	12.5%	3.0%
Benefit to Cost Ratio	2.6	0.7

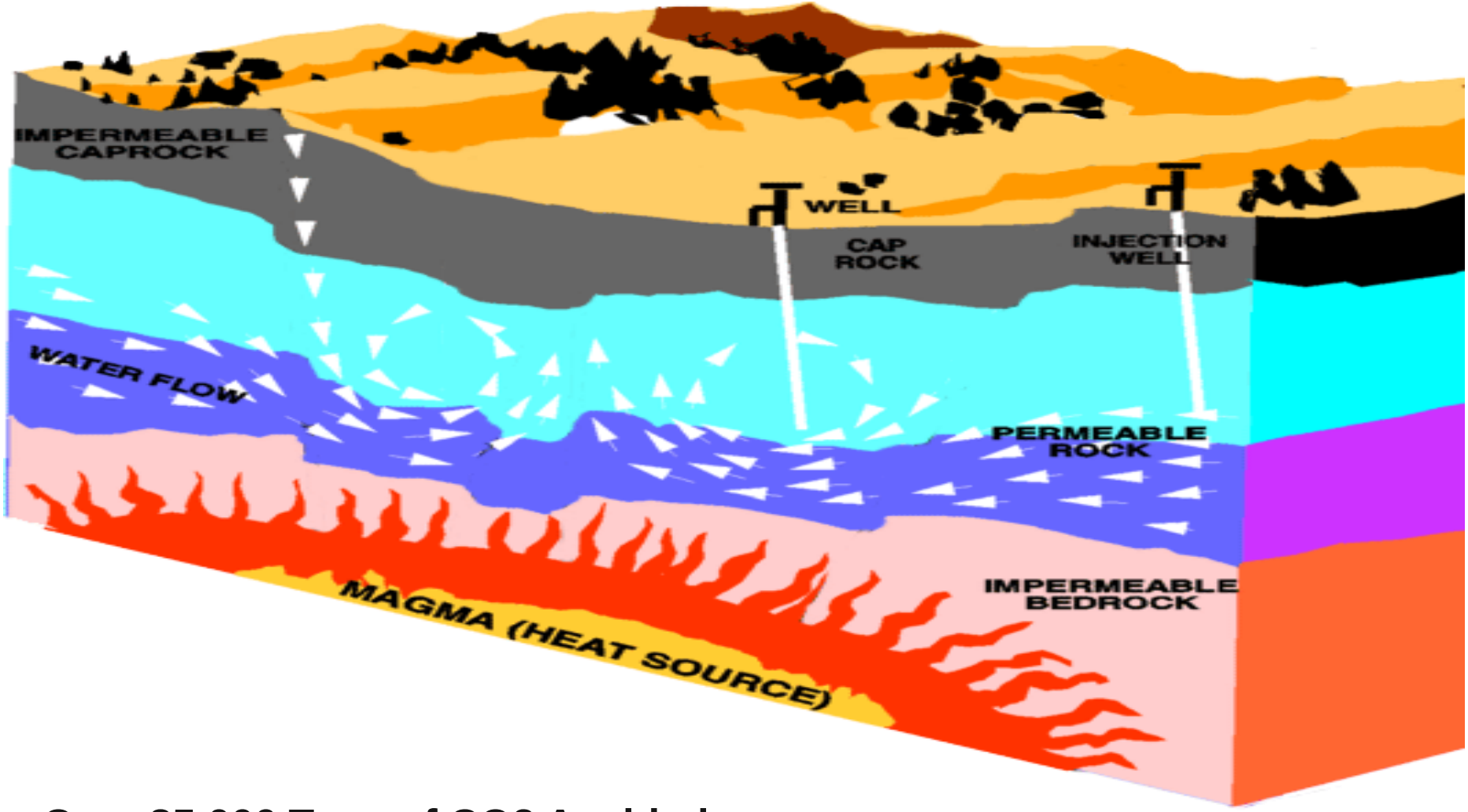
Compared to using electricity off the grid, without any initiatives

Geothermal Potential



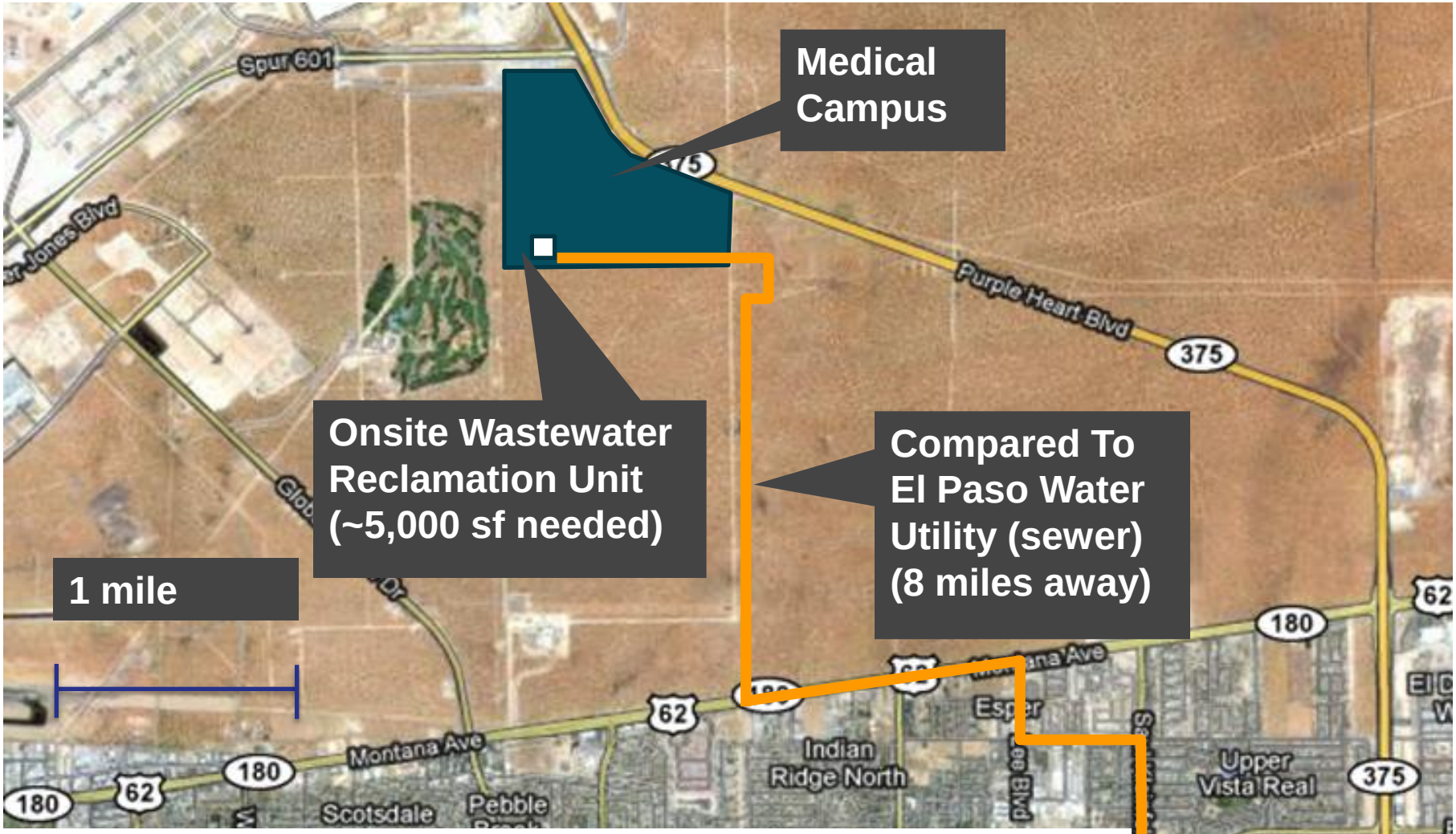
- **Geologic Indicators**
  - McGregor Wells (temperature greater than 195°F)
  - Chemical Markers found in surrounding water wells
- **High Probability both Temperature and Permeability**
  - Expectation of greater than 185°F / greater than 1000 GPM

Geothermal Process



- Over 85,000 Tons of CO_2 Avoided

Wastewater Reclamation– Aerial View



- Over 2.5 Billion Gallons of Water Proposed to be Reclaimed
- 13,243 Tons of CO2 Proposed to be Avoided

Valuation

Energy

- Deep Geothermal Drilling
  $9 million investment*
  - 12.5-year discounted financial payback
  - 12-year discounted sustainable payback
- **60% energy use intensity reduction**
  - ✓**LEED**
  - ✓**EPACT**
  - ✓**EISA ?**

Water

- Onsite Wastewater Reclamation and Reuse
- $12 million investment*****
- **21-year discounted financial payback**
- **9.5-year discounted sustainable payback**
- **40% water use intensity reduction**
  - ✓**LEED**
  - ✓**EO 13423**

*** Costs included in current PA**

SROI Attributes

- Creates objective discussions
- Addresses variability (sensitivity analysis)
- Is transparent
- Is scalable

Adopted from the 2002 University of Michigan Sustainability Assessment

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The GovEnergy workshop and trade show provides effective training for meeting federal energy management goals.

GovEnergy is of Special Interest to:

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- Federal Energy Coordinators
- Federal Facility Managers
- Federal Procurement Officials
- Federal Contracting Officers
- Federal Lawyers
- State and Local Government Officials
- Utility and Energy Service Companies
- Equipment Manufacturers
- Energy Management Service Providers
- Private Sector Facility and Energy Professionals

Event Features:

- Strategy-focused sessions; with beginner, intermediate, and advanced topics
- Subject matter experts with firsthand knowledge of policy and operations
- Professional development and education credits
- Networking opportunities
- A trade show offering a range of equipment and service solutions
- Local facility tours[1]

[1]Tours are scheduled for Sunday, August 7 and are not included with registration. Separate fees apply.

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