

Addressing Challenges in Federal Facilities from Cyber Risk to Operational Performance

Presented by **Ryan M. Colker, J.D.**
Director, Consultative Council/Presidential Advisor
National Institute of Building Sciences

Addressing Challenges in Federal Facilities from Cyber Risk to Operational Performance

OSIsoft Intelligence and National Security Forum
April 20, 2017



National Institute of
BUILDING SCIENCES

*An Authoritative Source of Innovative Solutions
for the Built Environment*

Ryan M. Colker, J.D.
Director, Consultative Council/Presidential Advisor
National Institute of Building Sciences
1090 Vermont Ave., NW #700
Washington, DC 20005
202-289-7800 x133
rcolker@nibs.org
@rmcolker

Public Law 93-383, Sect. 809

Congress directed the Institute to “exercise its functions and responsibilities in four general areas.....”

- **Develop and maintain** performance criteria for maintenance of life, safety, health, and public welfare for the built environment
- **Evaluate and prequalify** building technology and products
- **Conduct** related and needed investigations
- **Assemble, store, and disseminate** technical data and related information



National Institute of
BUILDING SCIENCES



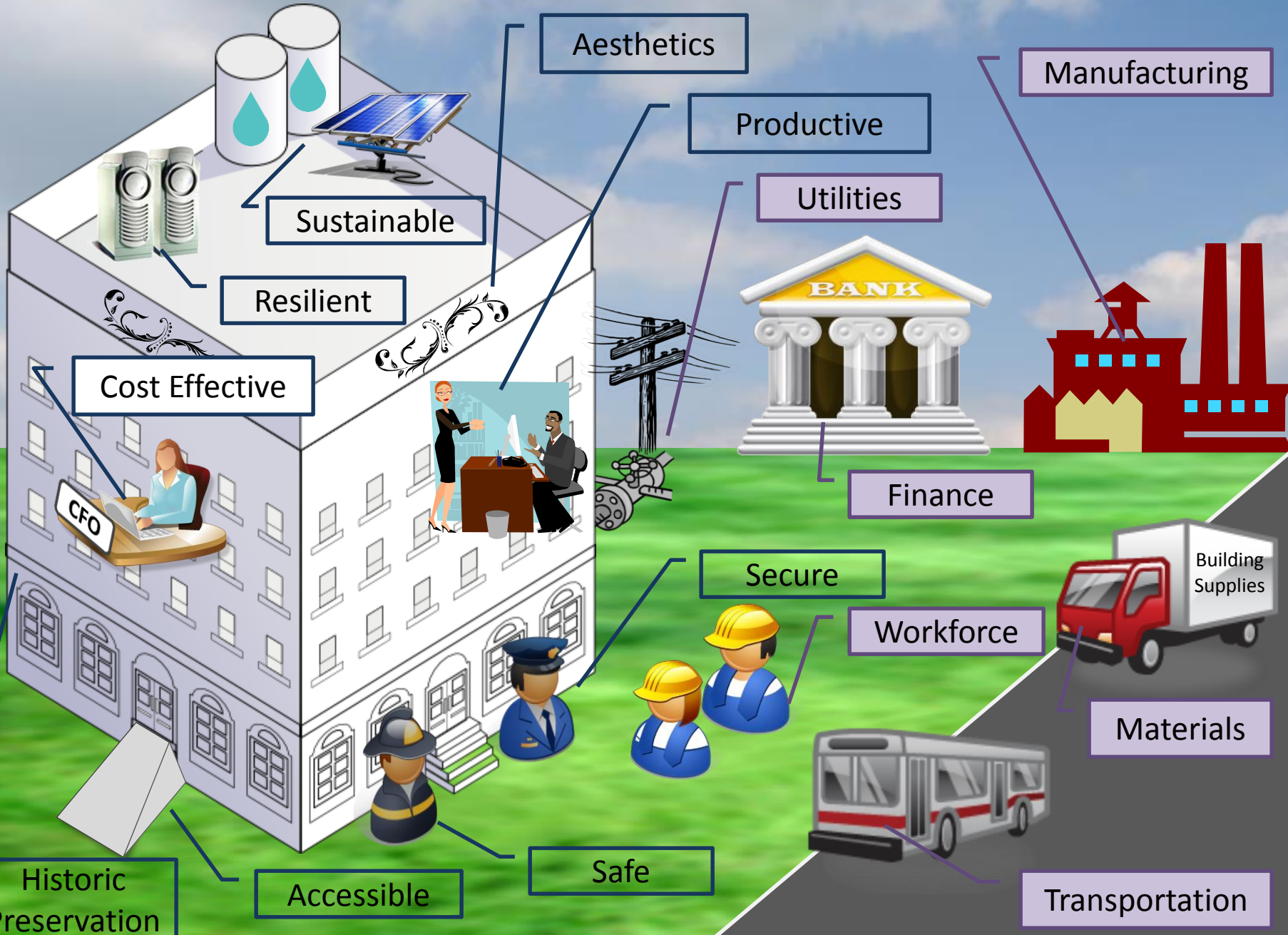


High-Performance Buildings Defined

High-Performance building means a building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy [and water] conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

-Energy Independence and Security Act of 2007 §401 (PL 110-140)

Buildings are a Key Aspect of the Economy!



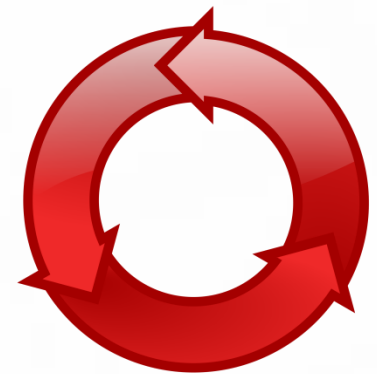
Integrate



Optimize

















Life-Cycle































Identifying and Meeting Performance Goals

Environmental Protection Agency

January 2016 OMB Scorecard on Sustainability/Energy

 <p>Scope 1&2 GHG Emission Reduction Target For Scope 1&2 GHG Reduction Target of 25% by 2020: 63% reduction in 2015 and on track</p>	 <p>Score: GREEN</p>
 <p>Scope 3 GHG Emission Reduction Target For Scope 3 GHG Reduction Target of 8% by 2020: 57% reduction in 2015 and on track</p>	 <p>Score: GREEN</p>
 <p>Reduction in Energy Intensity Reduction in energy intensity in goal-subject facilities compared with 2003: 33% and on track</p>	 <p>Score: GREEN</p>
 <p>Use of Renewable Energy Use of renewable energy as a percent of facility electricity use: Total of 121.3% from renewable electricity sources including at least 3.75% from new sources (thermal, mechanical, or electric)</p>	 <p>Score: GREEN</p>
 <p>Reduction in Potable Water Intensity Reduction in potable water intensity compared with 2007: 42% and on track for 26% in 2020</p>	 <p>Score: GREEN</p>
 <p>Reduction in Fleet Petroleum Use Reduction in fleet petroleum use compared to 2005: 39% and on track for 20% in 2015</p>	 <p>Score: GREEN</p>
 <p>Sustainable green buildings: 15.7% of buildings sustainable</p>	 <p>Score: GREEN</p>

Standards for Success — Red Standard, Yellow Standard, Green Standard

 <p>Scope 1&2 GHG Emission Reduction Target</p>	 GREEN: On track to achieve agency's proposed 2020 GHG Scopes 1&2 emissions reduction target.  YELLOW: Less than a year behind glide path to achieve agency's 2020 target for GHG Scopes 1&2.  RED: More than a year behind glide path to achieve agency's 2020 target for GHG Scopes 1&2.
 <p>Scope 3 GHG Emission Reduction Target</p>	 GREEN: On track to achieve agency's proposed 2020 GHG Scope 3 emissions reduction target.  YELLOW: Less than a year behind glide path to achieve agency's 2020 target for GHG Scope 3.  RED: More than a year behind glide path to achieve agency's 2020 target for GHG Scope 3.
 <p>Reduction in Energy Intensity</p>	 GREEN: Reduced energy intensity (Btu/GSF*) in EISA goal-subject facilities by at least 30 percent compared with 2003.  YELLOW: Reduced energy intensity (Btu/GSF) in EISA goal-subject facilities by at least 27 percent compared with 2003.  RED: Did not reduce energy intensity (Btu/GSF) in EISA goal-subject facilities by at least 27 percent compared with 2003.
 <p>Use of Renewable Energy</p>	 GREEN: Uses at least 75 percent electricity from renewable sources as a percentage of facility electricity use & at least 3.75 percent of facility electricity use comes from new sources (post-1999). (Thermal and mechanical renewable can be included in the 3.75 percent new requirement, but not the 75 percent goal; i.e., an agency meets all new sources requirement with thermal or mechanical energy (3.75 percent) but would still need an additional 75 percent from renewable electricity sources.)  YELLOW: Uses at least 75 percent renewable energy from electric, thermal or mechanical sources to power facilities and equipment; but less than half was obtained from new sources (post-1999) or part of the requirement was met with thermal and mechanical renewable energy.  RED: Did not use at least 75 percent renewable energy from electric, thermal or mechanical sources to power facilities and equipment.
 <p>Reduction in Potable Water Intensity</p>	 GREEN: Reduced water intensity by at least 16 percent from final approved 2007 baseline and is on track for 26 percent reduction by 2020.  YELLOW: Reduced water intensity by at least 14 percent from final approved 2007 baseline.  RED: Did not reduce water intensity by at least 14 percent from final approved 2007 baseline.
 <p>Reduction in Fleet Petroleum Use</p>	 GREEN: Achieved a 20 percent reduction in petroleum use in its entire vehicle fleet compared to 2005.  YELLOW: Achieved at least 18 percent reduction in petroleum use in the entire vehicle fleet compared to 2005.  RED: Did not achieve at least 18 percent reduction in petroleum use in its entire vehicle fleet since 2005.
 <p>Green Buildings</p>	 GREEN: Demonstrates implementation of Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (GP) for new, existing and leased buildings; and reported that at least 15% of buildings >5,000 GSF meet GP as reported in the Federal Real Property Profile (FRPP).  YELLOW: Incorporates Guiding Principles into all new design contracts for construction, major renovations and leases and at least 15 percent of GSF of its building inventory over 5,000 GSF meets GP as reported in FRPP.  RED: Cannot demonstrate compliance with GP on new construction, major renovations, or leases; and/or less than 15 percent of building inventory, either by number of buildings or GSF, over 5,000 GSF meets GP as reported in FRPP.

*GSF = Gross Square Footage

Army Net Zero Initiative

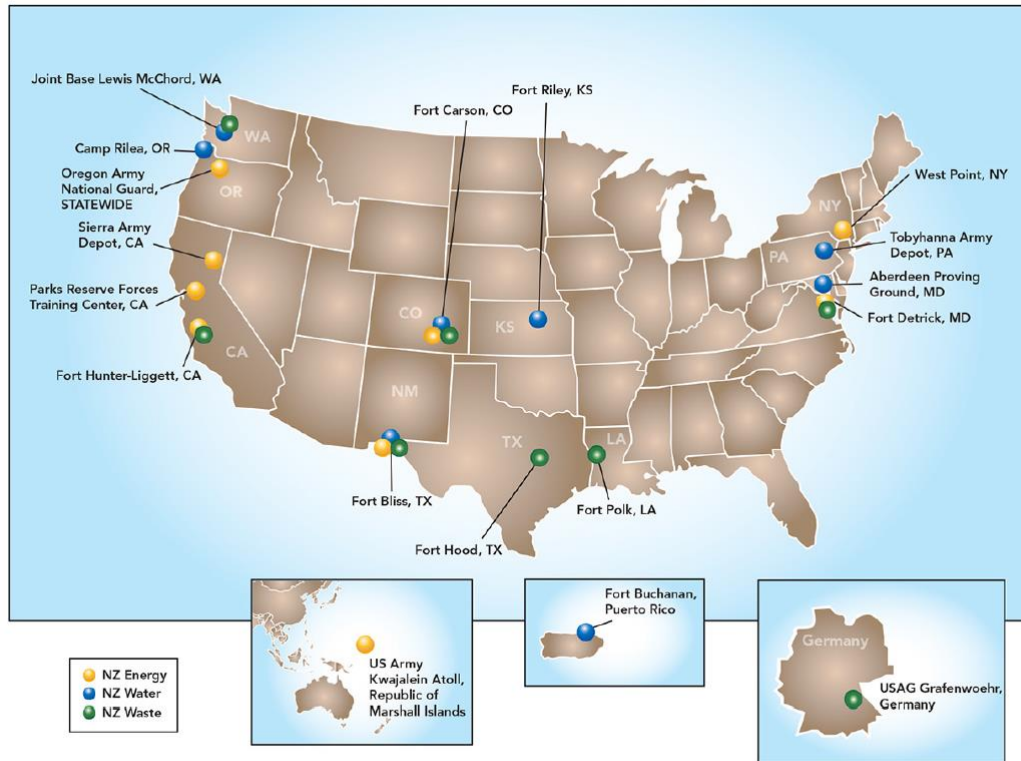


Figure ES.1. Net Zero Pilot Installations

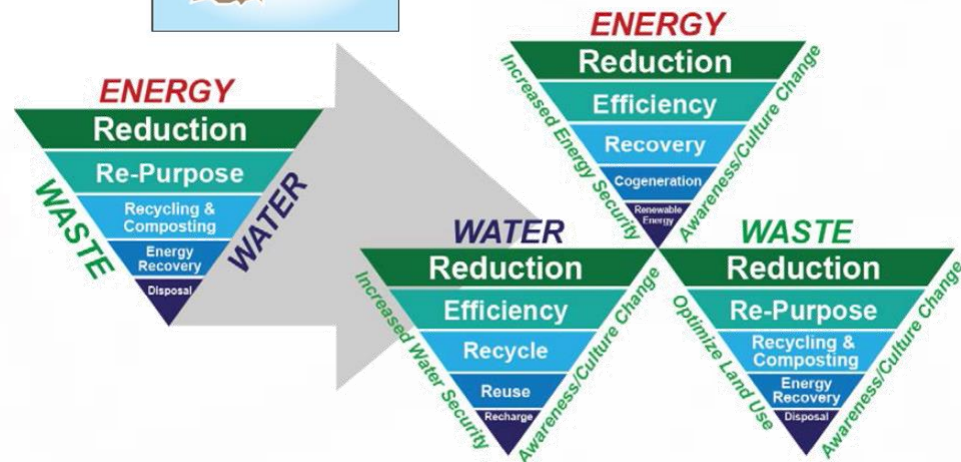
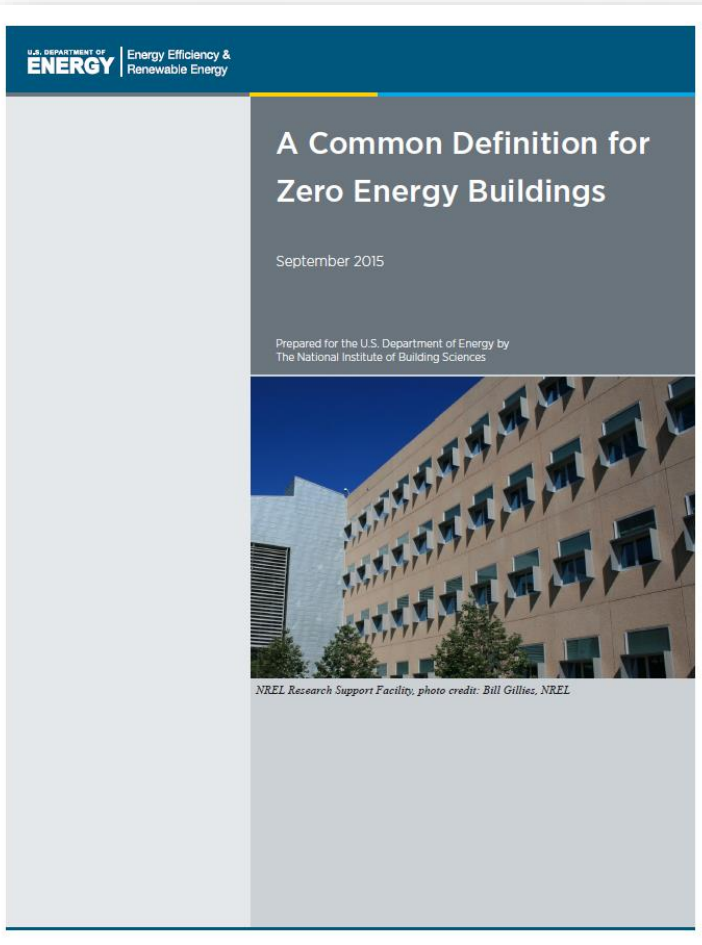


Figure 2. Net Zero Hierarchy

Common Definition for ZEB



<http://energy.gov/eere/buildings/downloads/common-definition-zero-energy-buildings>

- Zero Energy Building (ZEB):
 - An energy-efficient **building** where, on a **source energy** basis, the **actual annual delivered energy** is less than or equal to the on-site renewable **exported energy**.
- The designation *Zero Energy Building (ZEB)* should be used only for *buildings* that have demonstrated through **actual annual measurements** that the *delivered energy* is less than or equal to the *on-site renewable exported energy*.
- Also similar definitions for **campus**, community, **portfolio**



Achieving Energy Performance Goals

- Establishing targets based on Actual, Measured Results
 - Performance Standards
 - Outcome-Based Codes
 - ESPCs/USPCs
 - Performance-Based Contracting
 - Design-Build-Operate-Maintain/P3

Performance-Focused GSA P100

Performance Based P100

INTRO

TABLE OF CONTENTS

CHAPTERS 1-5 ▾

CHAPTERS 6-8 ▾

Q

SUSTAINABLE LOCATIONS

SITE SUPPORTS NEIGHBORHOOD CONNECTIVITY, WALKABILITY, AND BIKEABILITY

BASELINE	★ TIER 1 HIGH PERFORMANCE	★★ TIER 2 HIGH PERFORMANCE	★★★ TIER 3 HIGH PERFORMANCE
<ul style="list-style-type: none"> Site selection process addressed EOs 12072, 13006, 13514, and Implementing Instructions for Sustainable Federal Locations (CEQ 09/2011) Principal functional entry on front façade faces public space Connectivity of site and adjacent land is at least 90 intersections/sq. mi. as measured w/in a 1/2-mile distance from center of the facility Primary functional entrance is (a) w/in 1/4-mile walk distance of at least 5 diverse uses or (b) w/in 1/2-mile walk distance of at least 7 diverse uses. 	<ul style="list-style-type: none"> The site meets the Baseline requirements, AND: Connectivity of site and adjacent land is between 90-250 intersections/sq. mi. as measured w/in a 1/2-mile distance from center of the facility, AND Primary functional entrance is (a) w/in 1/4-mile walk distance of at least 7 diverse uses or (b) w/in 1/2-mile walk distance of at least 10 diverse uses." 	<ul style="list-style-type: none"> The site meets the Baseline requirements, AND: Connectivity of site and adjacent land is between 251-290 intersections/sq. mi. as measured w/in a 1/2-mile distance from center of the facility, AND Primary functional entrance is (a) w/in 1/4-mile walk distance of at least 10 diverse uses or (b) w/in 1/2-mile walk distance of at least 12 diverse uses." 	<ul style="list-style-type: none"> The site meets the Baseline requirements, AND: Connectivity of site and adjacent land is greater than 291 intersections/sq. mi. as measured w/in a 1/2-mile distance from center of the facility Primary functional entrance is (a) w/in 1/4-mile walk distance of at least 12 diverse uses or (b) w/in 1/2-mile walk distance of at least 15 diverse uses."

VERIFICATION

Measurements & Verification

ODC Review of Site Acquisition Package and presentation at relevant reviews

Plans & Specifications

Site Acquisition and Design Concept materials

Calculations & Analysis

N/A

Design Basis of Design

EOs 12072, 13006, 13514, and Implementing Instructions for Sustainable Federal Locations (CEQ 09/2011); LEED ND, v2009

Construction Verification

Verify relevant design elements from approved Concept presentation.

GSA Federal Center South

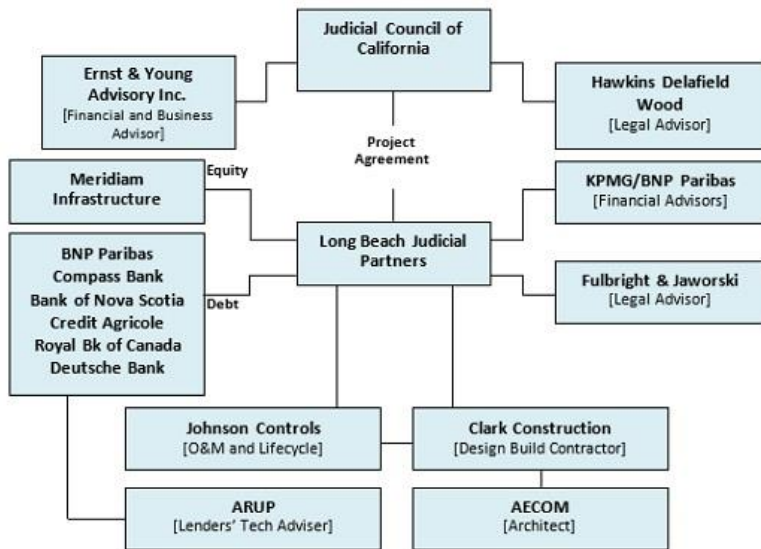
7. CLIN 0005 – M&V and Warranty Period Verification. The Government will **retain a pre-determined amount of dollars** from the overall contract award during performance evaluation. Release of **payment** for this withheld amount **will be contingent upon final confirmation that the energy performance standards for the facility (i.e. actual BTU/GSF saved) have been achieved** as verified by the M&V and Warranty Period testing to be conducted within 365 days from final completion. The basis for the pre-determined amount shall be equal to **.5%** of the proposed construction price.



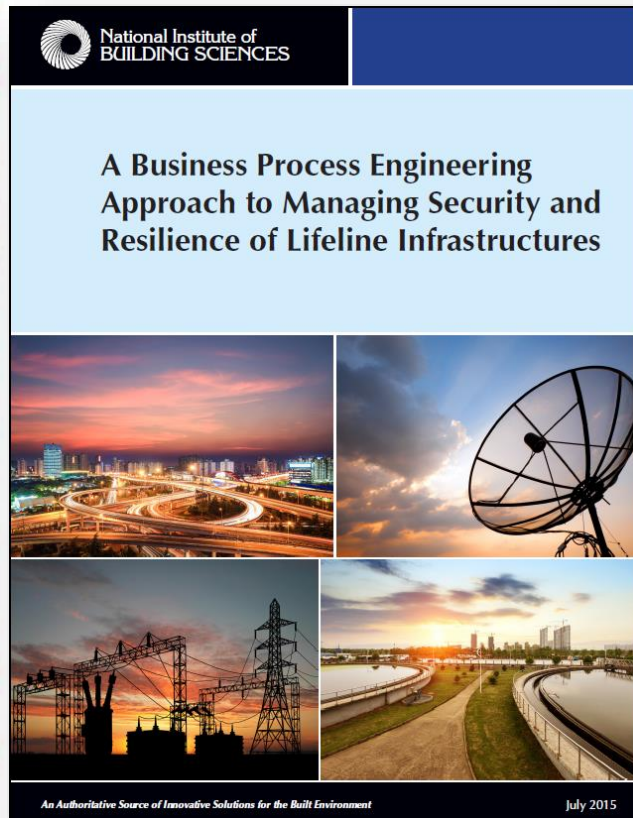
Governor Deukmejian Courthouse, Long Beach



- Public-Private Partnership/DBFOM
- The performance-based contract allowed the courthouse to be constructed without any public funding and provides for the ongoing maintenance and performance of the facility.
- Judicial Council can deduct a specific amount from the availability payment if components of the building do not work.
- For example, there is a \$5,000 deduct for every two hours that certain elevators are inoperable.



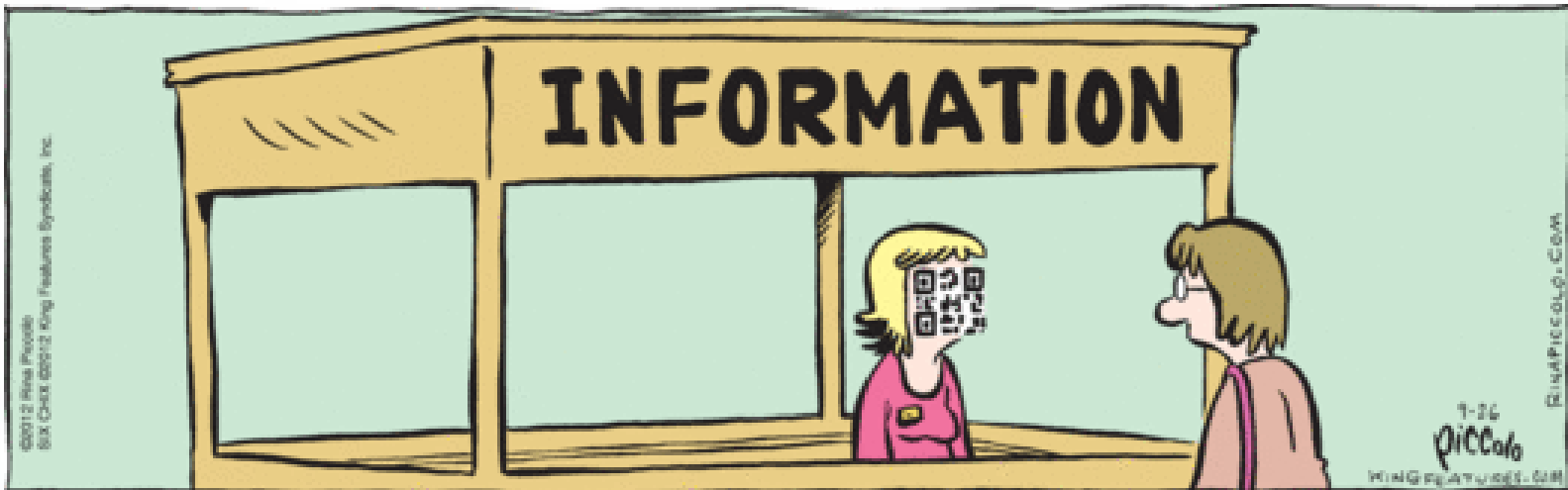
Management Processes for Resilience



[https://www.nibs.org/
?page=irdp_projects](https://www.nibs.org/?page=irdp_projects)

- The Critical Infrastructure Security and Resilience Risk Management Process (CISR-RMP) objective is a model process that can be implemented by a variety of tools and adaptations of existing processes to provide results for comparisons, interdependencies analysis, options valuation, aggregations and major resource decisions at multiple scales.
- Operationalizing the NIPP 2013
 - Set Goals & Objectives
 - Identify Infrastructure
 - Assess & Analyze Risk
 - Implement Risk Management Activities
 - Measure Effectiveness

Data and Information Supporting Performance



Rethinking the Data Ecosystem



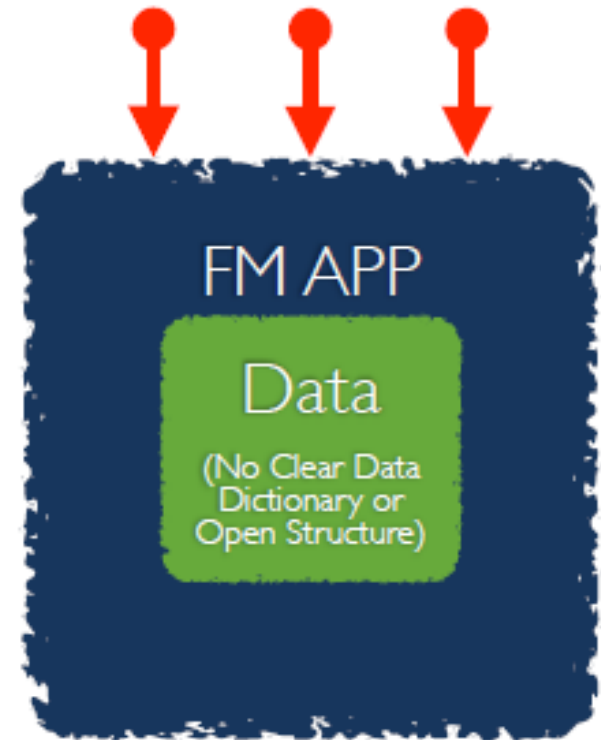
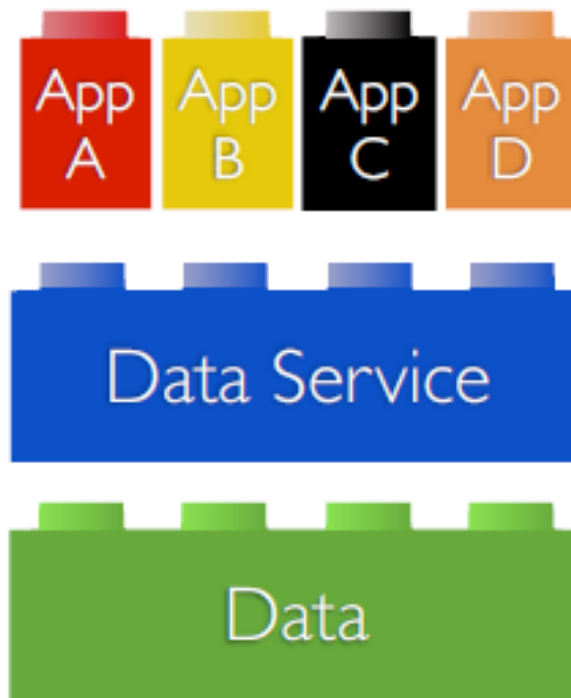
iFM

vs.

Closed App

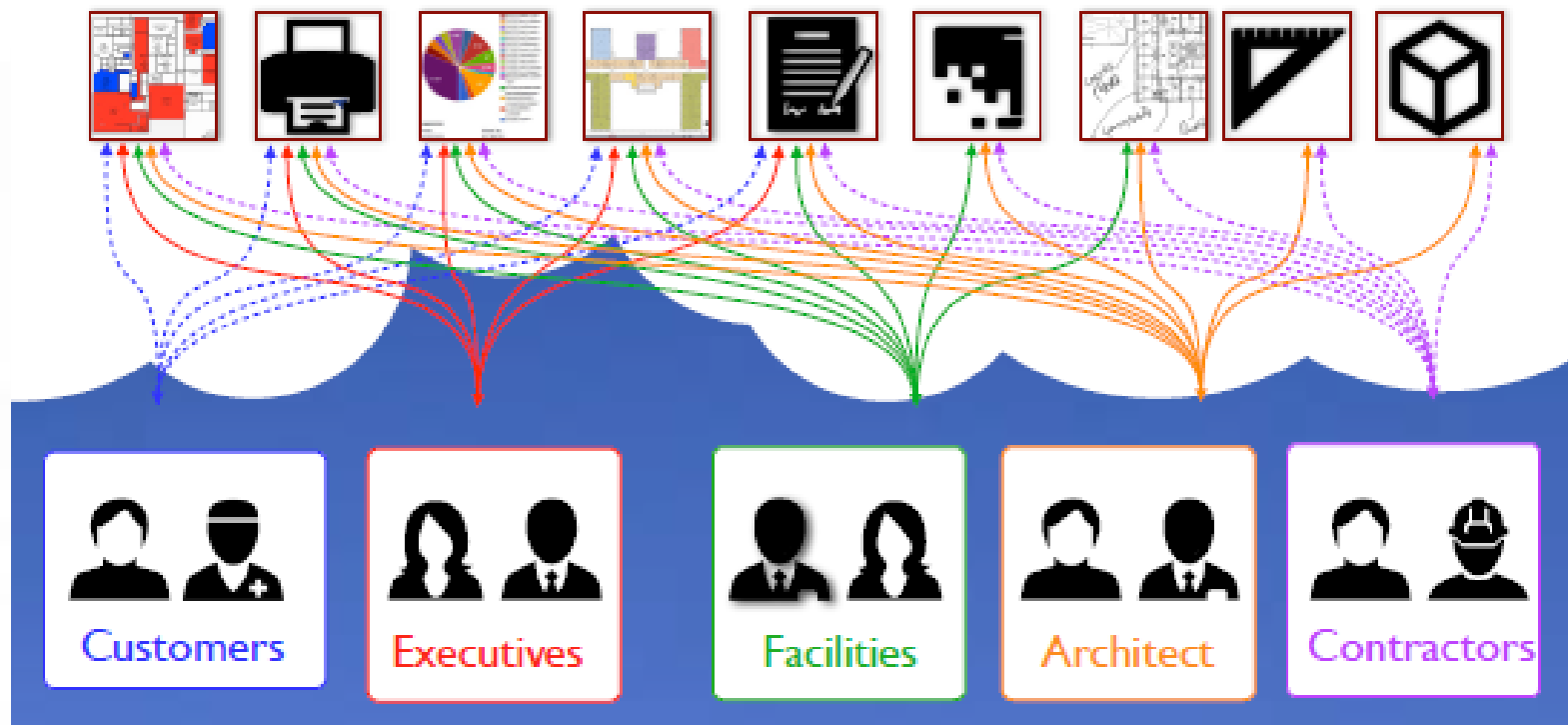
Open Connections


No Open Connections



“Black Box” Application with Application Locked to the Data

Shared Services + Access to Data

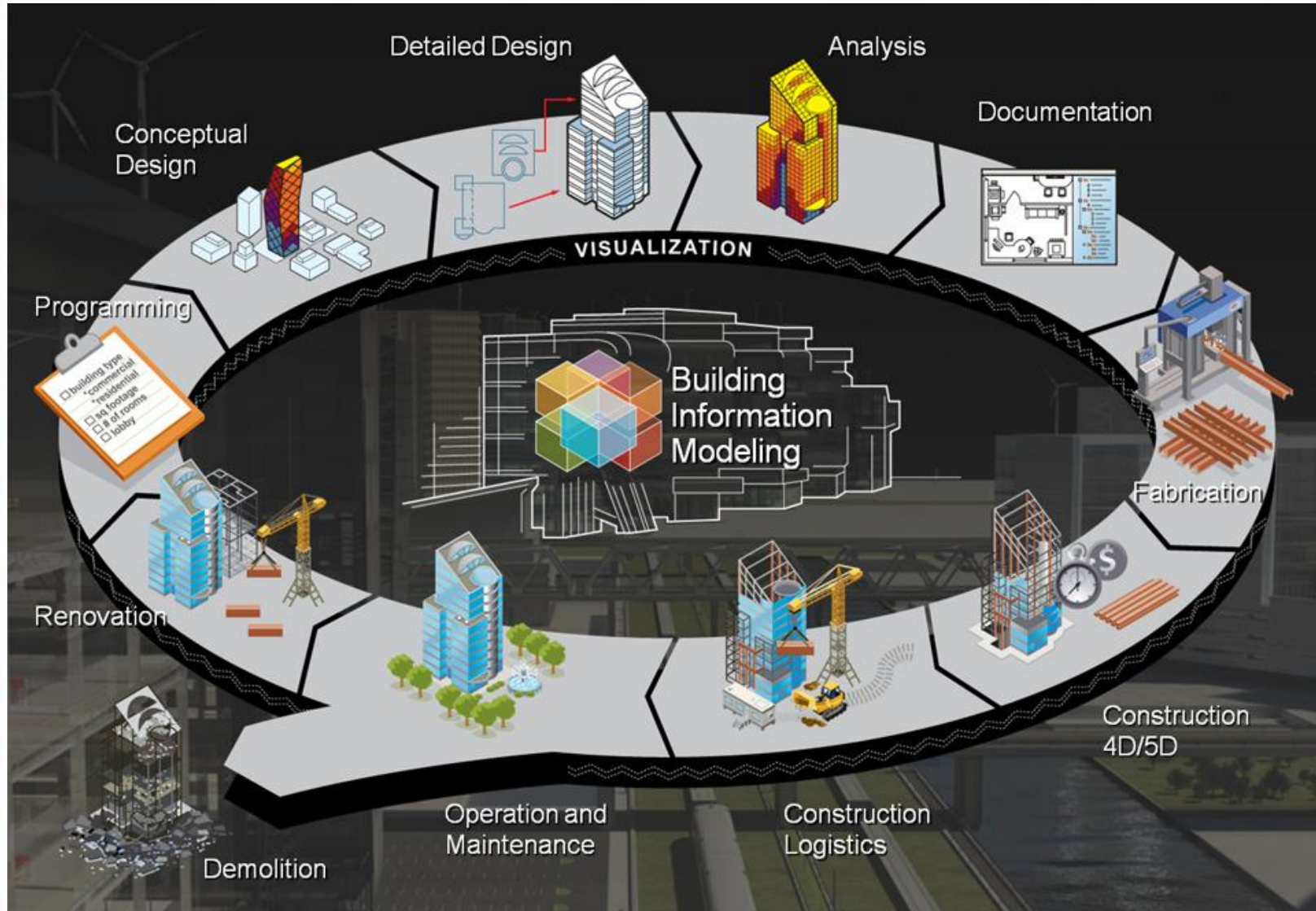




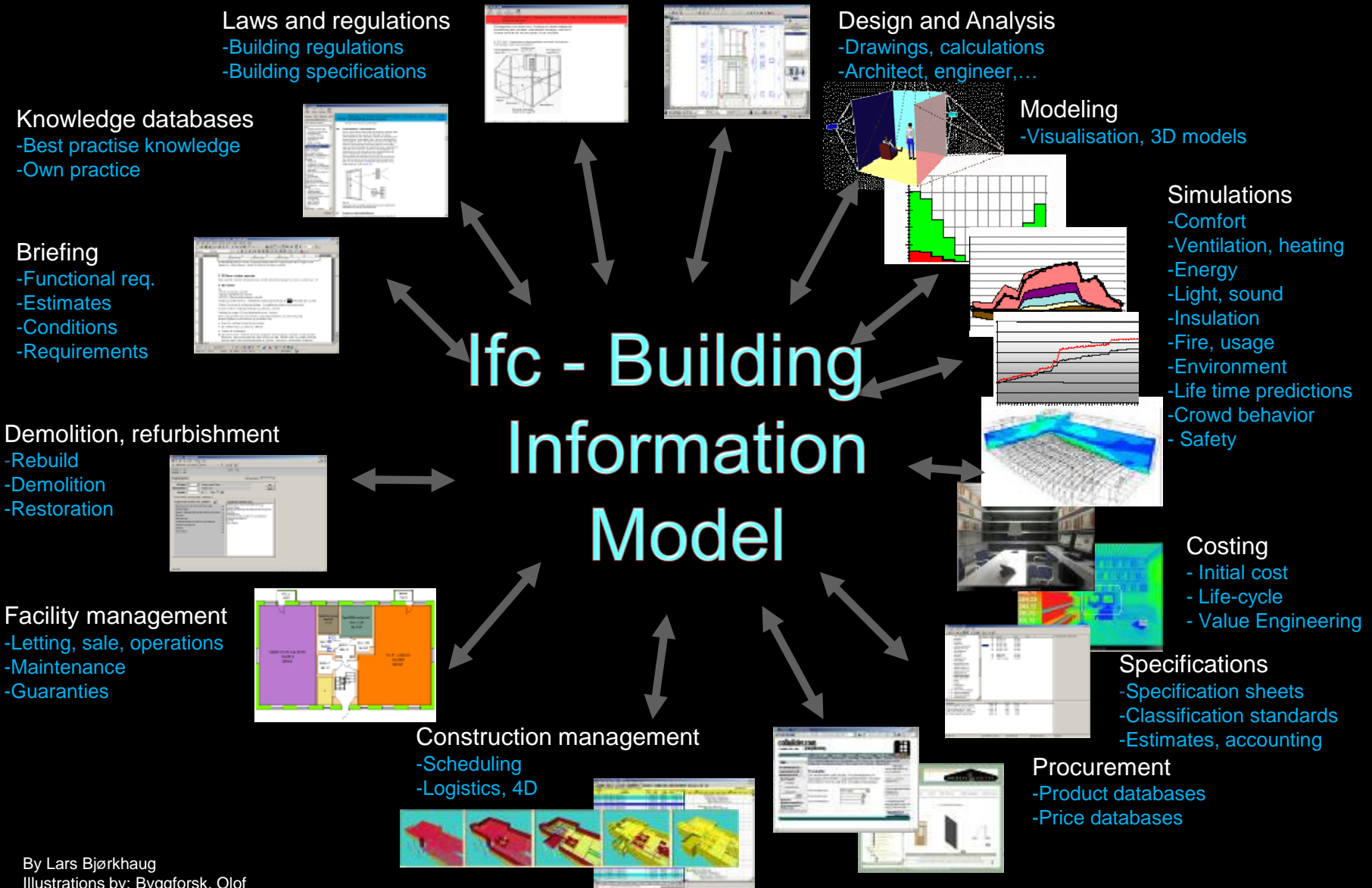
A **Building Information Model (BIM)** is a digital representation of physical and functional characteristics of a facility. As such it serves as a **shared knowledge resource for information** about a facility forming a reliable basis for decisions during its life-cycle from inception onward.

A basic premise of BIM is collaboration by different stakeholders at different phases of the life cycle of a facility to insert, extract, update or modify information in the BIM process to support and reflect the roles of that stakeholder. The BIM is a shared digital representation founded on open standards for interoperability.

The Facility Lifecycle

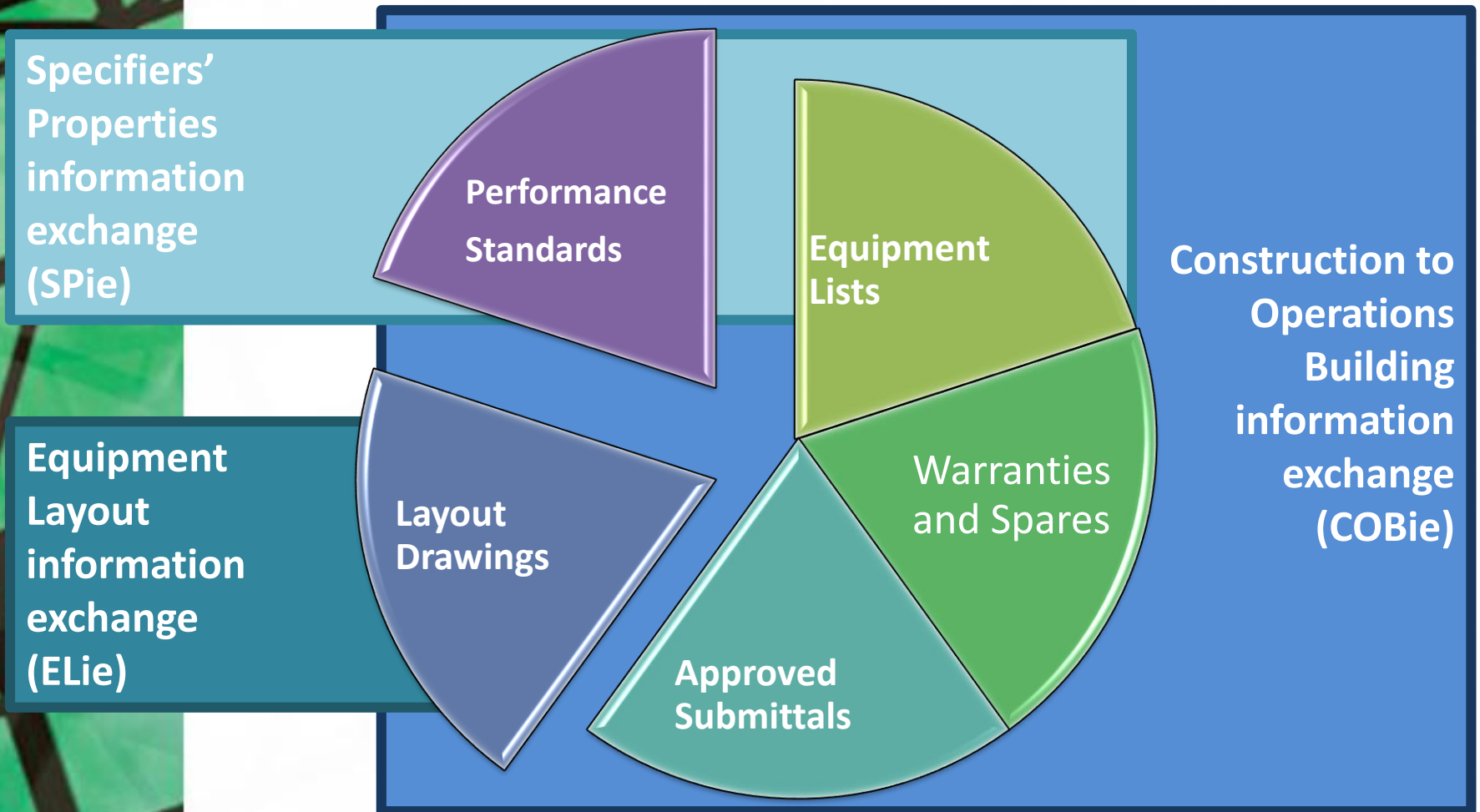


Courtesy of Autodesk

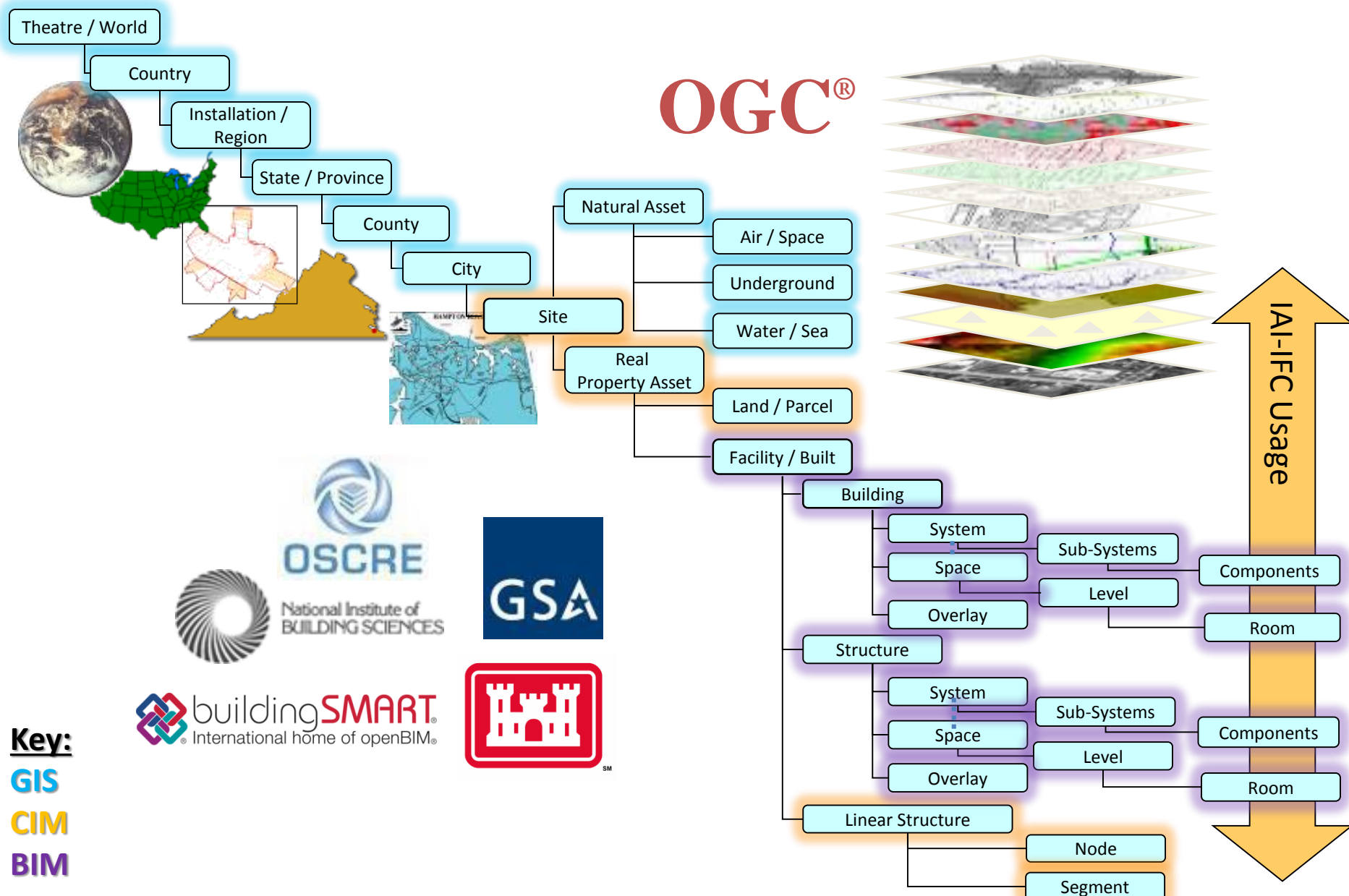


By Lars Bjørkhaug
 Illustrations by: Byggforsk, Olof
 Granlund, NBLN University of
 California, Stanford University

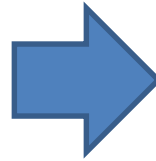
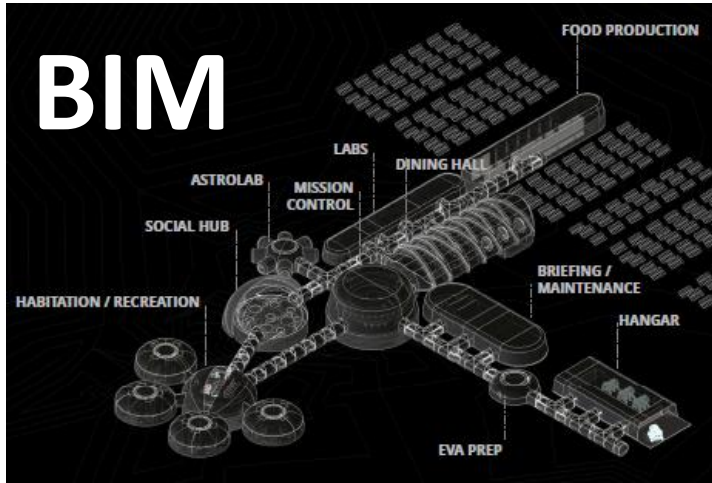
Keys to Facility Management Handover



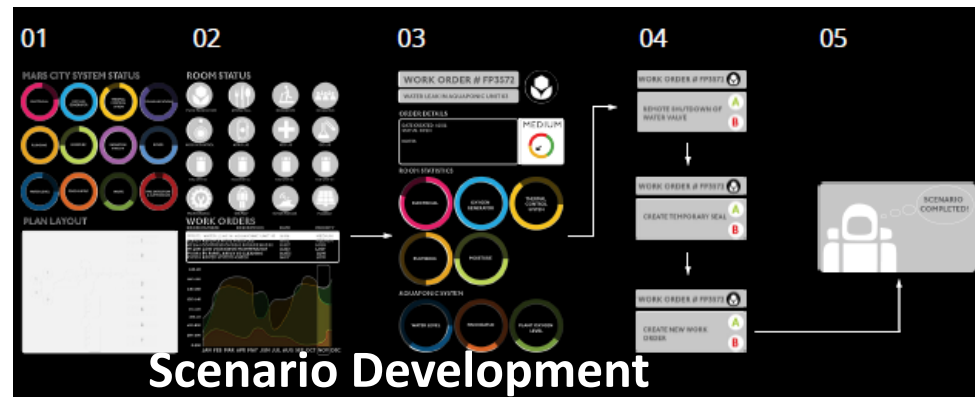
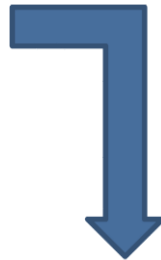
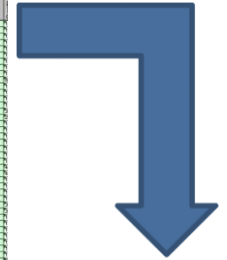
Information Hierarchy – GIS-CIM-BIM Relationship



Using BIM, Gaming & VR to Optimize Facility Performance



COBie

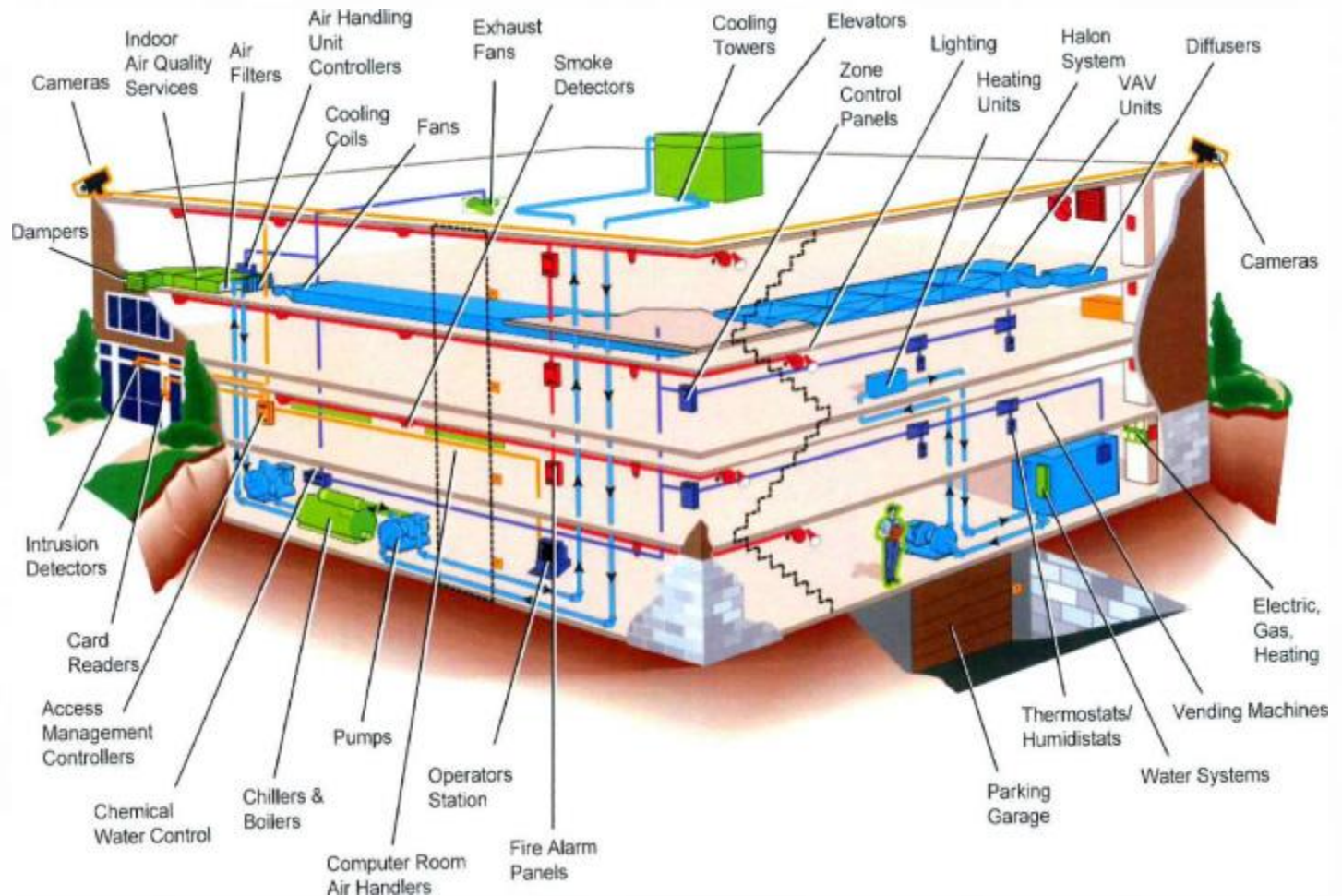


Integrated Rapid Visual Screening (IRVS)

- A simple, quick, and reliable means for obtaining preliminary risk and resilience scores and ratings
- A software tool designed to prepare rapid but comprehensive assessments
- An all hazard approach
- Applicable to facilities in federal, state and local agencies and the private sector
- Covers buildings, tunnels and mass transit stations
- Allows individual facility assessments to be customized to specific protection strategies for specific hazards
- Includes automated checklist for ISC criteria evaluation



Sensors, Controls and the Internet of Things



OT IP Controllers are in Everything!

UNCLASSIFIED

Buildings



Weapon Platforms



Tactical



Electrical and HVAC



Pumps and Motors



Nuclear



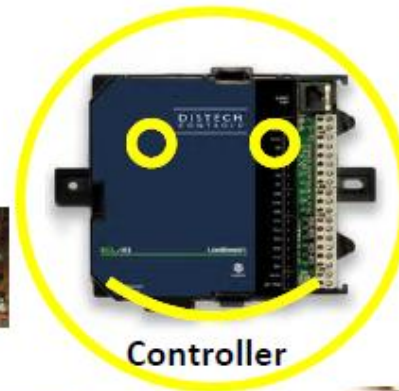
Electric Vehicles/Charging



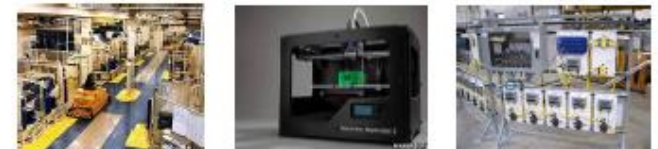
Medical



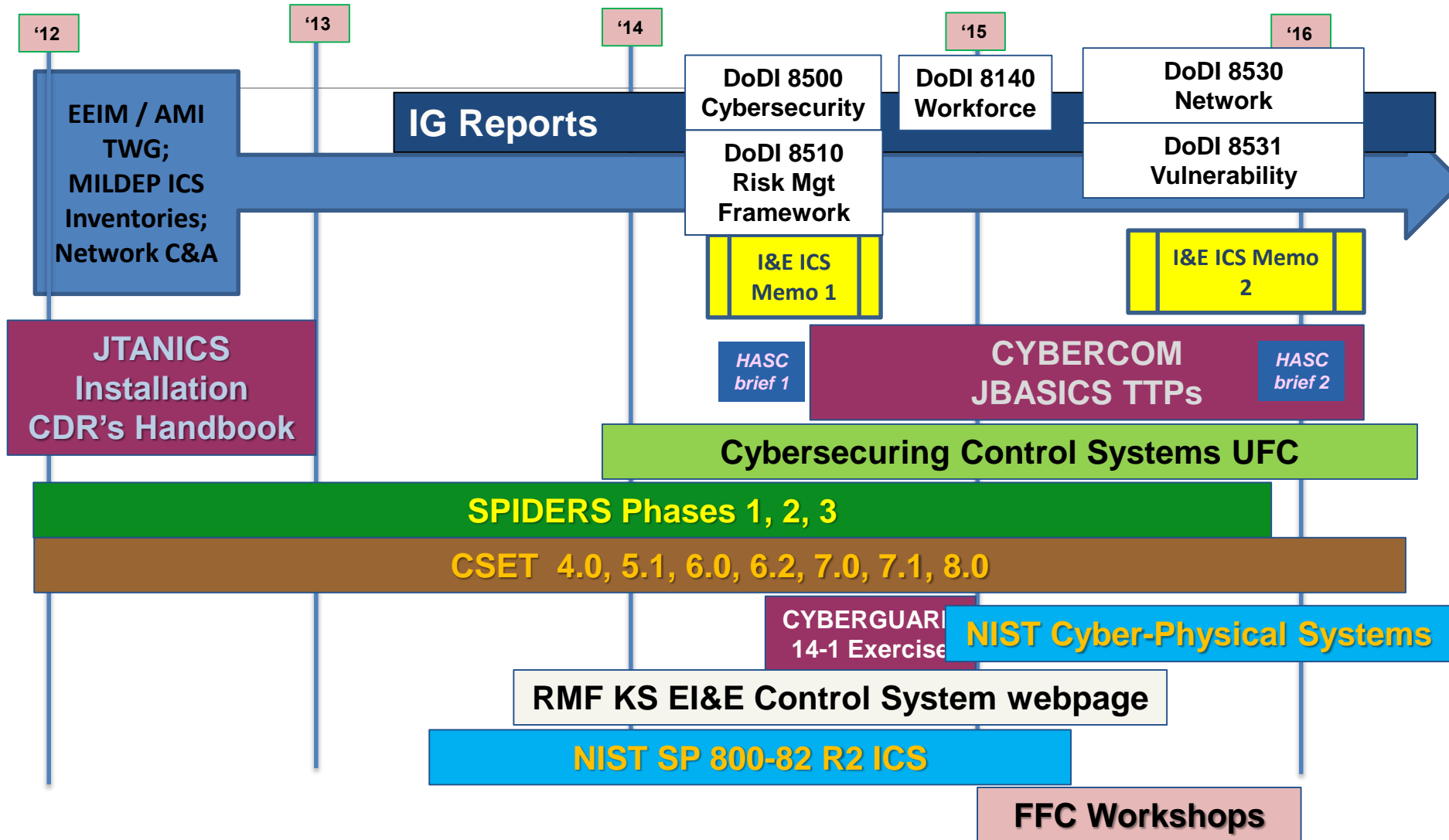
Controller



Manufacturing



EI&E Cybersecurity Efforts



Many Stakeholders; DoD Policy, Experiment, Exercise Roles

WBDG Cybersecurity Resource Page

[ABOUT](#)[SITE MAP](#)[CONTACT](#)[CREATE ACCOUNT](#)[LOG IN](#)[DESIGN RECOMMENDATIONS](#)[PROJECT MANAGEMENT - O & M](#)[FEDERAL FACILITY CRITERIA](#)[CONTINUING EDUCATION](#)[ADDITIONAL RESOURCES](#)[RESOURCE PAGES](#) / [CYBERSECURITY](#)

CYBERSECURITY

by Michael Chipley PhD, PMP, LEED AP

The PMC Group LLC

Updated: 03-27-2017



INTRODUCTION

Industrial Control Systems (ICS) are physical equipment oriented technologies and systems that deal with the actual running of plants and equipment, include devices that ensure physical system integrity and meet technical constraints, and are event-driven and frequently real-time software applications or devices with embedded software. These types of specialized systems are pervasive throughout the infrastructure and are required to meet numerous and often conflicting safety, performance, security, reliability, and operational requirements. ICSs range from building environmental controls (HVAC, lighting), to systems such as the electrical power grid. With the increasing interconnectivity of ICS to the internet, the ICS can be an entry point into the organization's other IT systems.

Within the controls systems industry, ICS systems are often referred to as Operational Technology (OT) systems. Historically, the majority of OT systems were proprietary, analog, vendor supported, and were not internet protocol (IP) enabled. Systems key components, such as Remote Terminal Units (RTUs), Programmable Logic Controllers (PLCs), Physical Access Control Systems (PACs), Intrusion Detection Systems (IDSs), closed circuit television (CCTV), fire alarm systems, and utility meters have become digital and IP enabled. OT systems use Human Machine Interfaces (HMIs) to monitor the processes, versus Graphical User Interfaces for IT systems. Most current ICS systems and subsystems are now a combination of Operational Technologies (OT) and Information Technologies (IT).

The Stuxnet, Duqu, Flame and Shamoon malware were specifically designed to target ICS and cause physical damage to the processes or equipment. Stuxnet "spoofed" the integrity of the uranium centrifuges and caused the centrifuges to overspin and self-destruct, while the operators console showed the system was operating within normal parameters. The Duqu malware looks for information that could be useful in attacking industrial control systems. Its purpose is not to be destructive; the known components are trying to gather information. The Flame malware looks for engineering drawings, specifications, and other technical details about the systems and records audio, screenshots, keyboard

WITHIN THIS PAGE

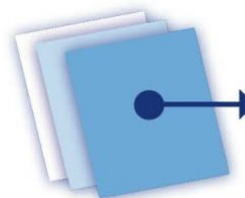
- [Introduction](#)
- [Description](#)
- [Additional Resources](#)

<http://www.wbdg.org/resources/cybersecurity.php>

Workforce Credentials

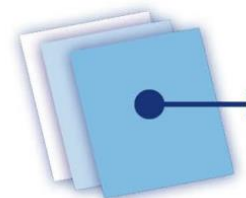


Voluntary guidelines for industry-delivered Better Buildings Workforce credentials



Professional certification schemes

AND



Certificate program requirements

In Development: Blast Design Professional



RECOGNIZED PROGRAM

MEETS U.S. DEPARTMENT OF ENERGY GUIDELINES

Workforce Credentials

Public Law 111–308
111th Congress

An Act

To provide for the training of Federal building personnel, and for other purposes.

Dec. 14, 2010

[S. 3250]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Federal
Buildings
Personnel
Training Act of
2010.
40 USC 581 note.

SECTION 1. SHORT TITLE.

This Act may be cited as the “Federal Buildings Personnel Training Act of 2010”.

SEC. 2. TRAINING OF FEDERAL BUILDING PERSONNEL.

(a) IDENTIFICATION OF CORE COMPETENCIES.—Not later than 18 months after the date of enactment of this Act, and annually thereafter, the Administrator of General Services, in consultation with representatives of relevant professional societies, industry

Deadlines.
Notice.
Comment period.

The screenshot shows the website for the Facilities Management Institute (FMI) titled "Implementing the Federal Buildings Personnel Training Act (FBPTA)". The page features a navigation menu with links for Home, Events, Forum, FBPTA & Downloads, Accelerate FM, Resources (links etc), About, and FAQ. A search bar is located in the top right corner. The main content area includes a banner for "ACCELERATE FM" with the text "The FBPTA Skills Assessment Web Tool has been upgraded, Welcome to Accelerate FM!". Below the banner is a "WELCOME!" section with a paragraph about FMI's mission and a "Read more" link. On the right side, there is a "Calendar" for the month of March and a "Forum" section with links to "2015 FBPTA Update" and several "Link to scored course files".

Facilities Management Institute
Implementing the Federal Buildings Personnel Training Act (FBPTA)

Site Map | Accessibility | Contact

Home Events Forum FBPTA & Downloads Accelerate FM Resources (links etc) About FAQ Login Register

FACILITIES MANAGEMENT INSTITUTE
ACCELERATE FM

The FBPTA Skills Assessment Web Tool has been upgraded, Welcome to Accelerate FM!

WELCOME!

FMI is a cloud Institute bringing together government, industry and academia with the goal of integrating, aligning and innovating all aspects of the Facilities Operations and Management profession through continuous collaboration on core competencies, curriculum, continuing education and knowledge networking.

Read more

Calendar

« March »

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Upcoming Events

FMI Industry Day at NFMT 03/23/2016 - 12:00


Forum

2015 FBPTA Update
Link to scored course files
Link to scored course files
Link to scored course files
Link to scored course files

Workforce Cyber Skills – NIST NICE

NATIONAL INITIATIVE FOR CYBERSECURITY EDUCATION (NICE)


THE NATIONAL CYBERSECURITY WORKFORCE FRAMEWORK



INTRODUCTION
The ability of academic and public and private employers to prepare, educate, recruit, train, develop, and retain a diverse, qualified cybersecurity workforce is vital to our nation's security and prosperity. [\[full text version\]](#)

DEFINING CYBERSECURITY
Defining the cybersecurity population using common, standardized labels and descriptors is an essential step in ensuring that our country is able to educate, recruit, train, develop, and retain a highly-qualified workforce. The National Initiative for Cybersecurity Education (NICE), in collaboration with federal government agencies, public and private experts and organizations, and industry partners, has published version 1.0 of the National Cybersecurity Workforce Framework ("the Framework") to provide a common understanding of and access for cybersecurity work. [\[full text version\]](#)

THE CALL TO ACTION
Only in the universal adoption of the National Cybersecurity Workforce Framework can we ensure our nation's enduring capability to prevent and defend against an ever-increasing threat. Therefore, it is imperative that organizations in the public, private, and academic sectors begin using the Framework's lexicon (labels and descriptors) as soon as possible. [\[full text version\]](#)



SECURELY PROVISION

OPERATE AND MAINTAIN

PROTECT AND DEFEND

ANALYZE

OVERSIGHT AND DEVELOPMENT

INVESTIGATE

COLLECT AND OPERATE

Home | Using This Document | Sample Job Titles | Security Provision | Operate and Maintain | Protect and Defend | Investigate | Collect and Operate | Analyze | Oversight and Development

Collect and Analyze Data Capture cybersecurity workforce and training data to understand capabilities and needs.

Recruit and Retain Incentivize the hiring and retention of highly skilled and adaptive professionals needed for a secure digital nation.

Educate, Train, and Develop Expand the pipeline for and deliberately develop an unrivaled cybersecurity workforce.

Engage Educate and energize all cybersecurity workforces and the American public to strengthen the nation's front lines of cybersecurity.

Taking the Next Steps

- Optimizing Procurement and Management Processes
- Changing the Data Ecosystem, Operationalizing BIM
- Shifting to Performance/Outcome-Based Standards and Criteria
- Engaging the Workforce of Today and Tomorrow

Attracting The Next Generation



<http://www.nibs.org/MarsCity>



Addressing Challenges in Federal Facilities from Cyber Risk to Operational Performance

OSIsoft Intelligence and National Security Forum
April 20, 2017



National Institute of
BUILDING SCIENCES

*An Authoritative Source of Innovative Solutions
for the Built Environment*

Ryan M. Colker, J.D.
Director, Consultative Council/Presidential Advisor
National Institute of Building Sciences
1090 Vermont Ave., NW #700
Washington, DC 20005
202-289-7800 x133
rcolker@nibs.org
@rmcolker