The Risky Business of Integrative Pre-Design

Friday, March 9th, Session 4

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catalystpartners

catalystpartners

Our mission is simple:

We are committed to the creation of places where all species can flourish.

Learning Objectives:

1. Identify challenges caused by the traditional design process and ways to move past them with a whole systems thinking approach.

2. Meet these challenges by implementing an IDP mindset for the project team by applying the framework of the ANSI Standard for IDP and ASHRAE Standard 209.

3. Describe WHAT Integrative Pre-Design is, WHY it is vital to the overall Integrative Design Process, WHO the key team members and roles are, HOW it can solidify the project team's ability to successfully deliver high performance buildings

4. Identify the benefits of implementing Integrative Pre-Design on projects and the risks of not making mistakes fast enough.


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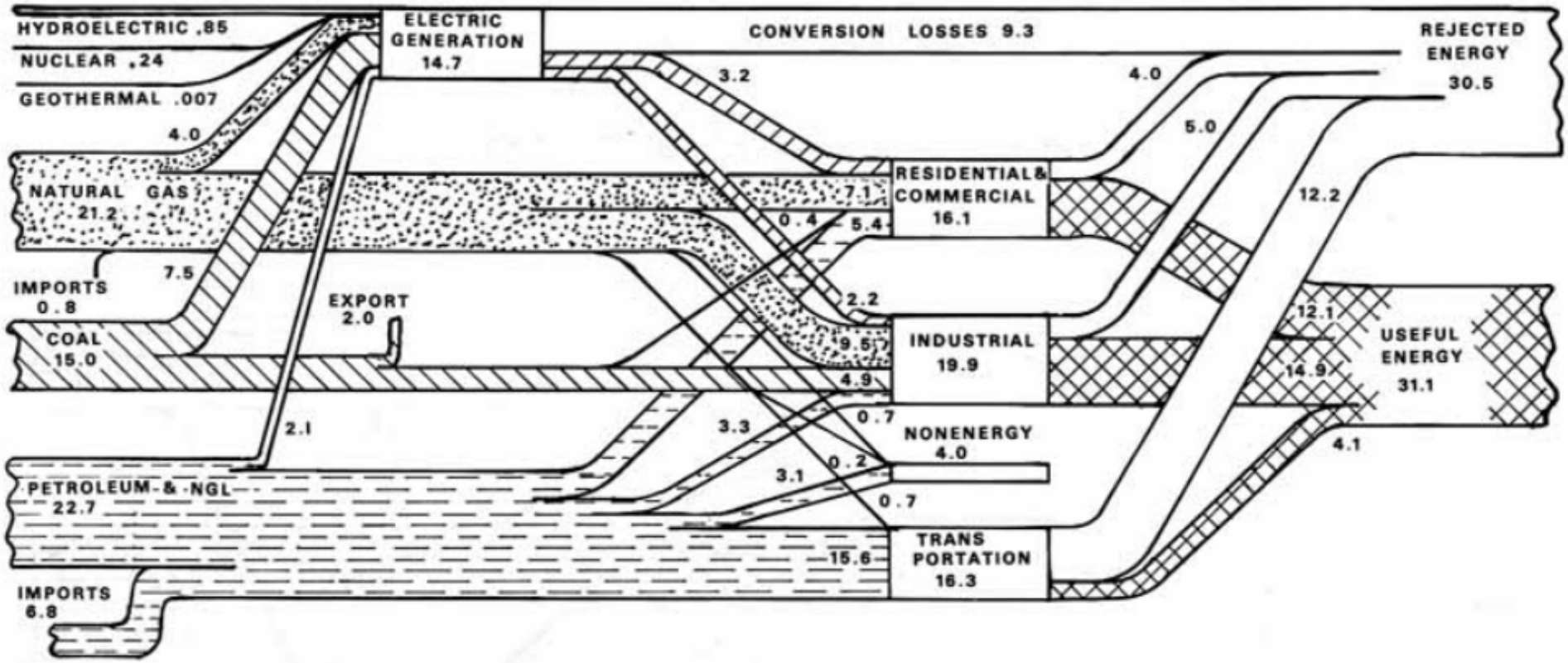
OUR TIME:

1. BACKGROUND: HOW ARE WE WORKING NOW?
2. CHALLENGES
3. THE PLAN FOR ACTION: IDP & ASHRAE 209
4. INTEGRATIVE PRE-DESIGN

HOW ARE WE WORKING NOW?


WHITE PINE
LUMBER
Life Style
furn
HYATT
HEADLINER
AUTO
PART
PARK
AUTO
USA
25.95
RESTAURANT
40
Chronicle / Michael Macor



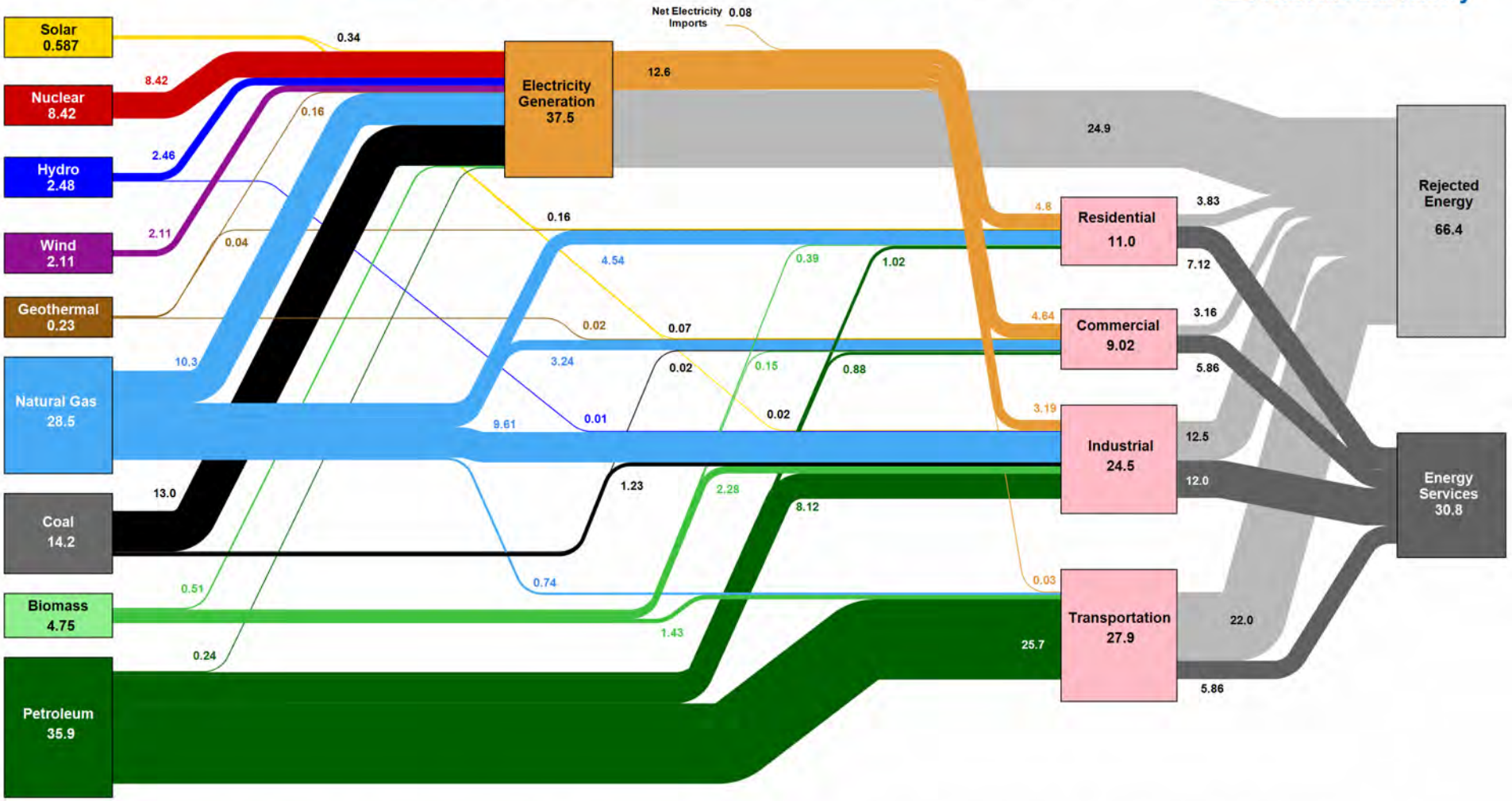
U.S. Energy Flow — 1970

All values $\times 10^{15}$ Btu (2.12×10^{15} Btu = 10^6 bbl/day oil)

Total energy consumption = 67.5×10^{15} Btu

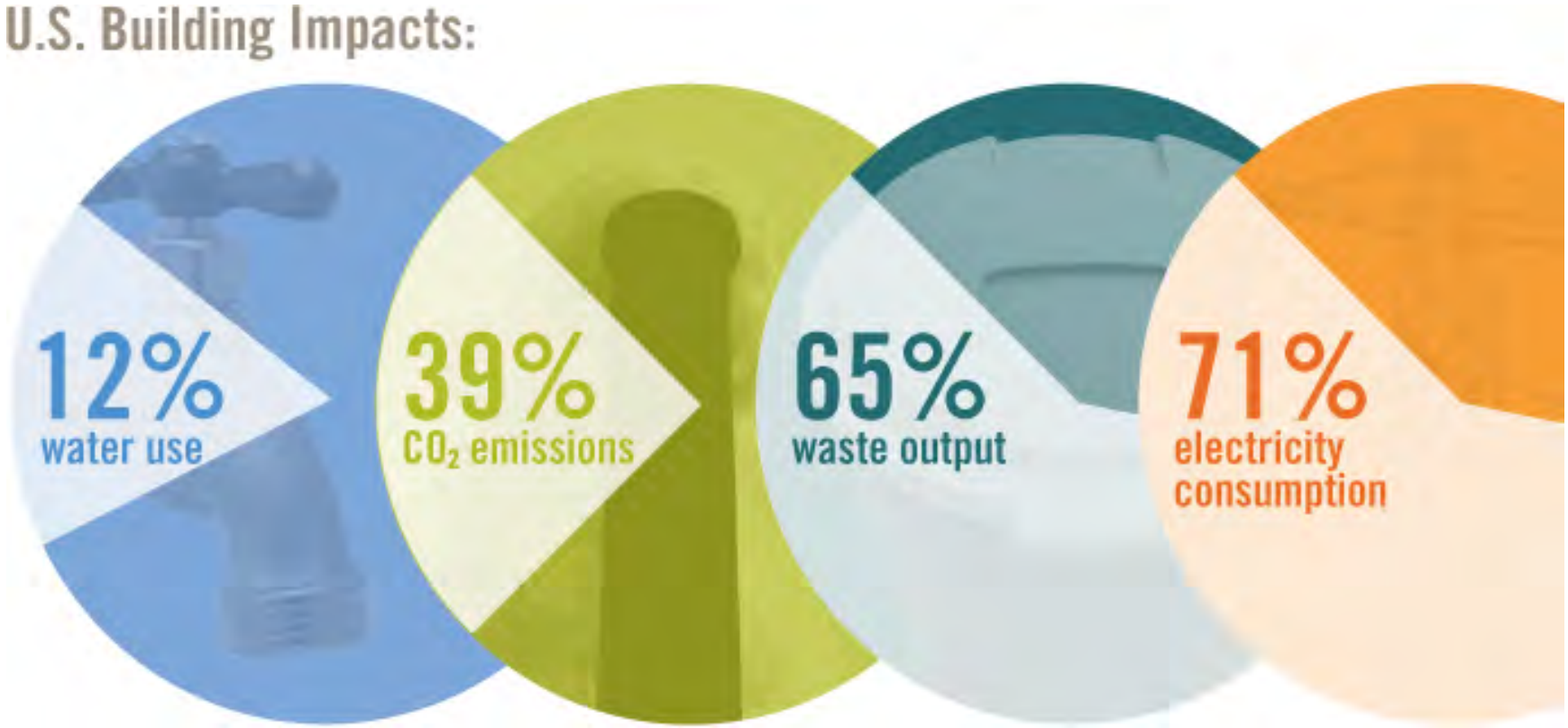
LAWRENCE LIVERMORE LABORATORY

Estimated U.S. Energy Consumption in 2016: 97.3 Quads

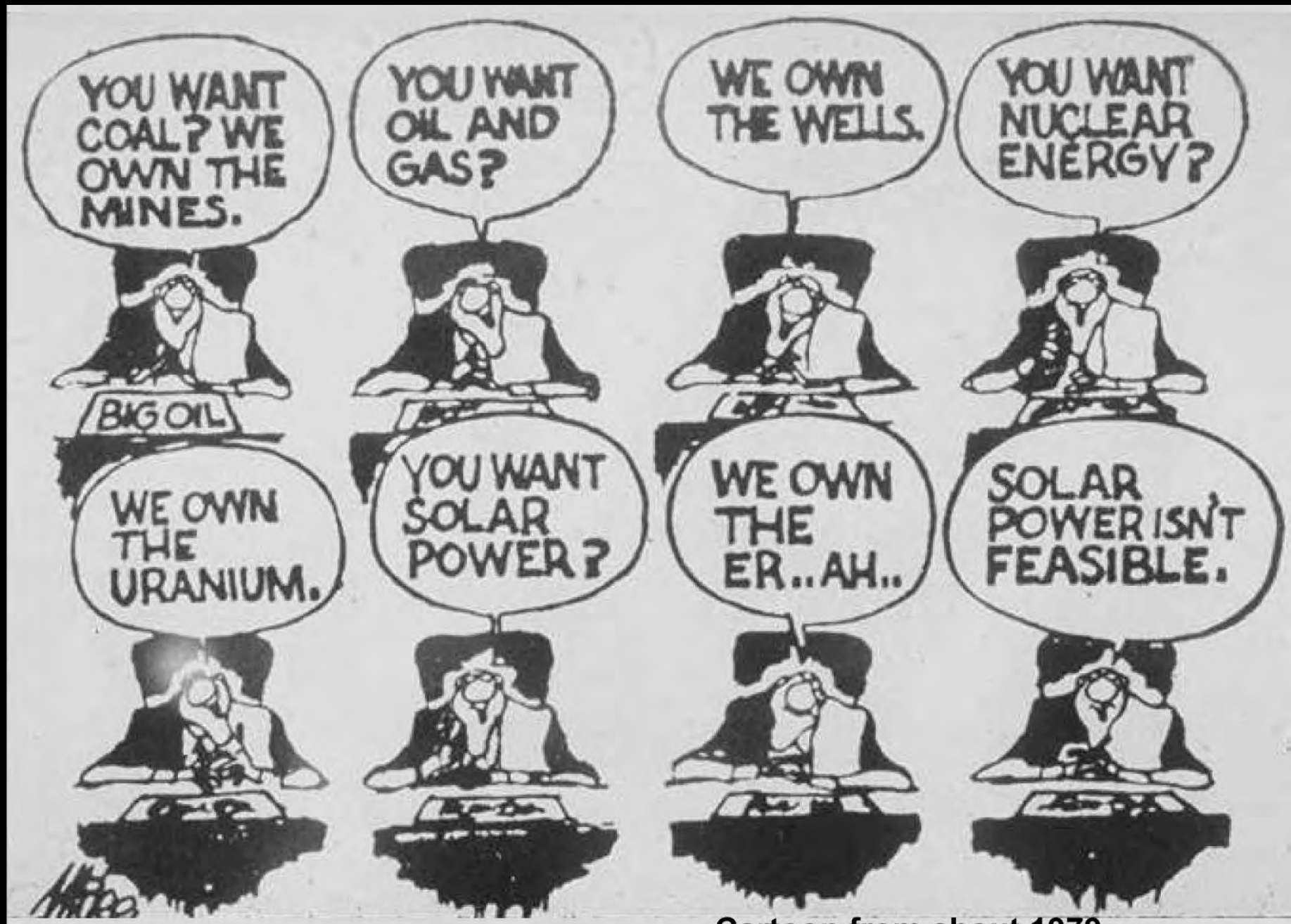


Source: LLNL March, 2017. Data is based on DOE/EIA MER (2016). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. This chart was revised in 2017 to reflect changes made in mid-2016 to the Energy Information Administration's analysis methodology and reporting. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector, and 49% for the industrial sector which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527

U.S. Building Industry Impacts



United States Green Building Council (USGBC)

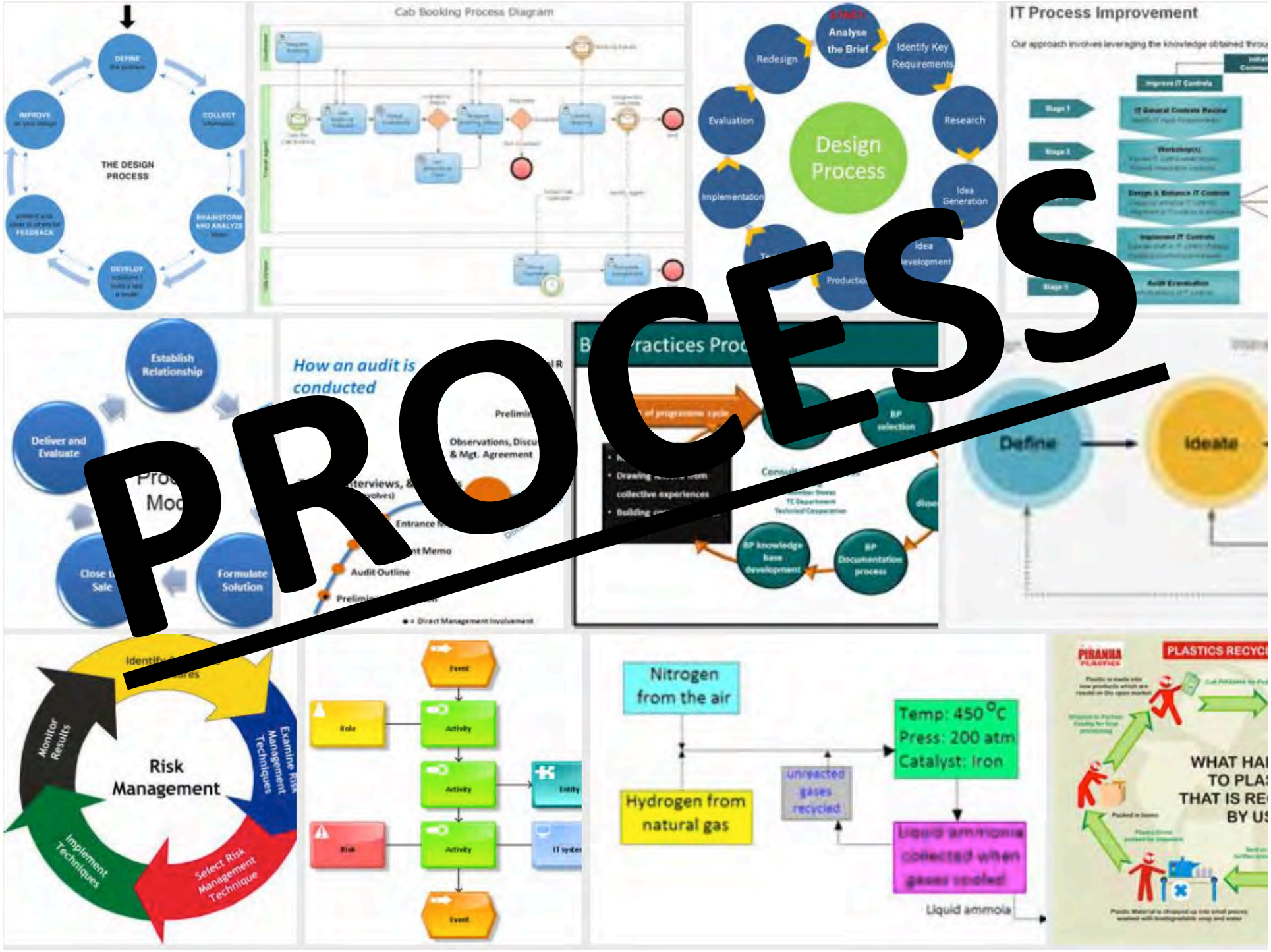


Cartoon from about 1979…

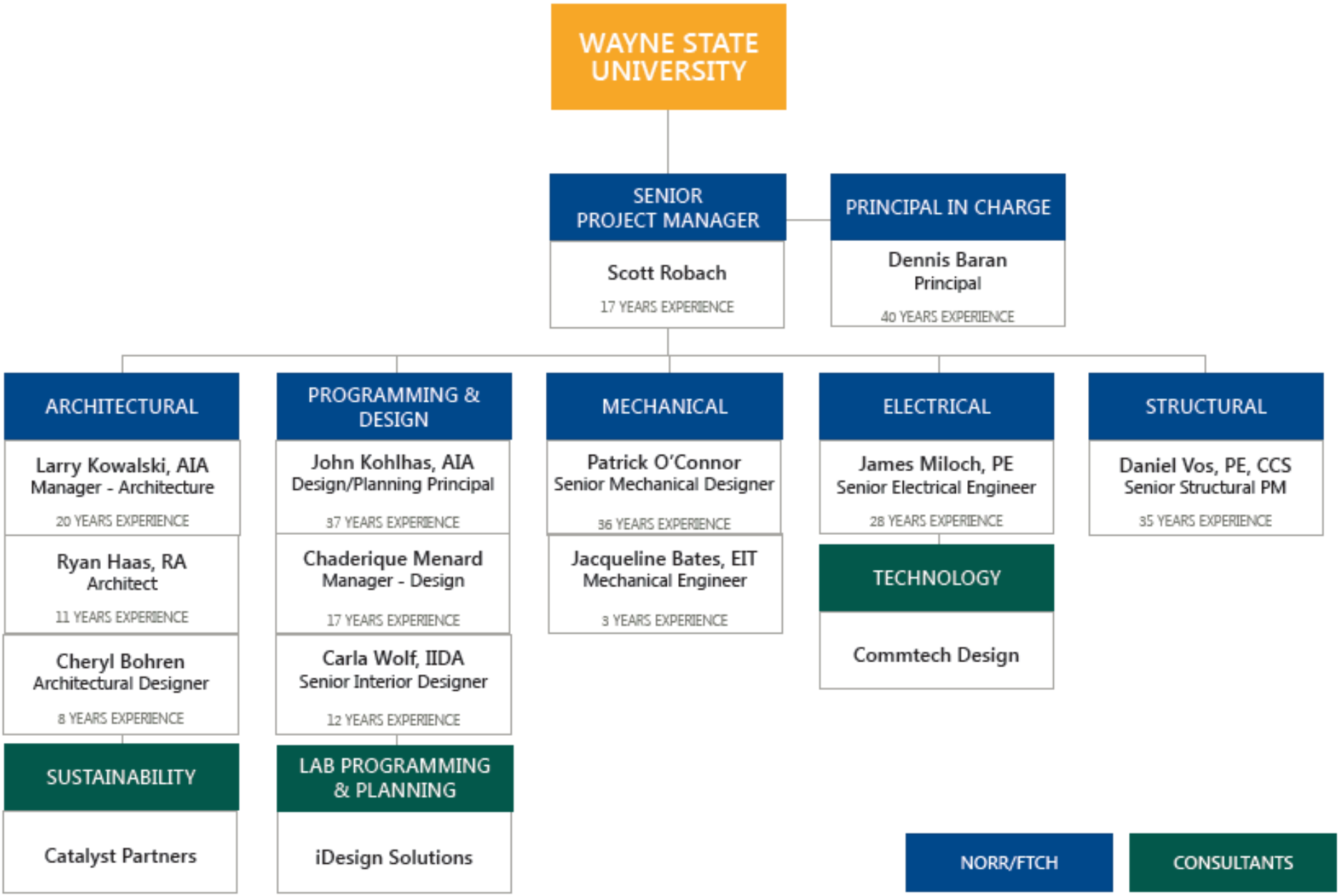

LISA, IF WE START
CONSERVING THE
ENVIRONMENTALISTS WIN.

So, what is really going on here and what does this have to do with us?

Everything!

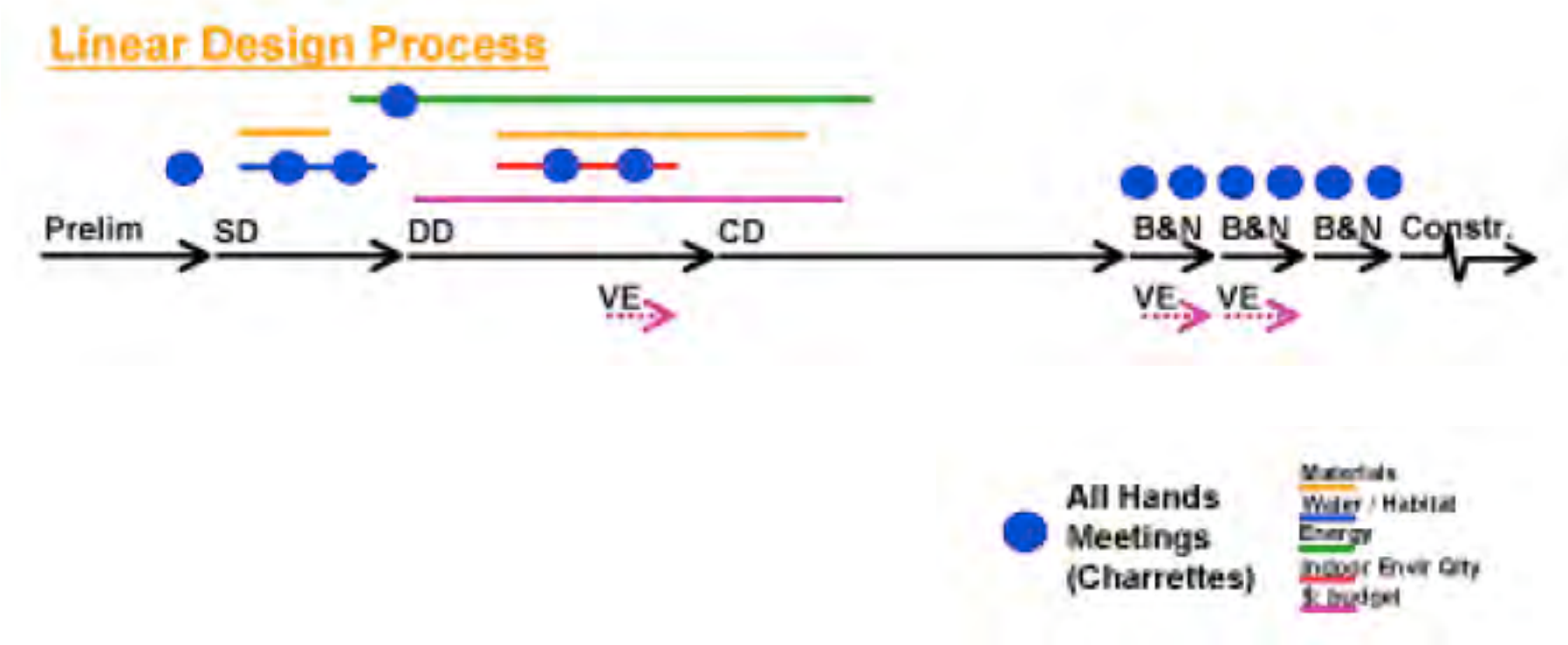

THE DESIGN PROCESS
DEFINE
COLLECT
BRAINSTORM AND ANALYZE
DEVELOP
IMPROVE
Cab Booking Process Diagram
Design Process
Analyse the Brief
Identify Key Requirements
Research
Idea Generation
Prototype
Evaluation
Redesign
Implementation
IT Process Improvement
Establish Relationship
Deliver and Evaluate
Formulate Solution
How an audit is conducted
Observations, Discussions & Mgt. Agreement
Audit Outline
Define
Ideate
Risk Management
Monitor Results
Examine Risk Management Techniques
Select Risk Management Technique
Implement Techniques
Event
Role
Activity
Entity
Risk
Nitrogen from the air
Hydrogen from natural gas
unreacted gases recycled
Temp: 450 °C
Press: 200 atm
Catalyst: Iron
Liquid ammonia
PIRANHA PLASTICS
PLASTICS RECYCL

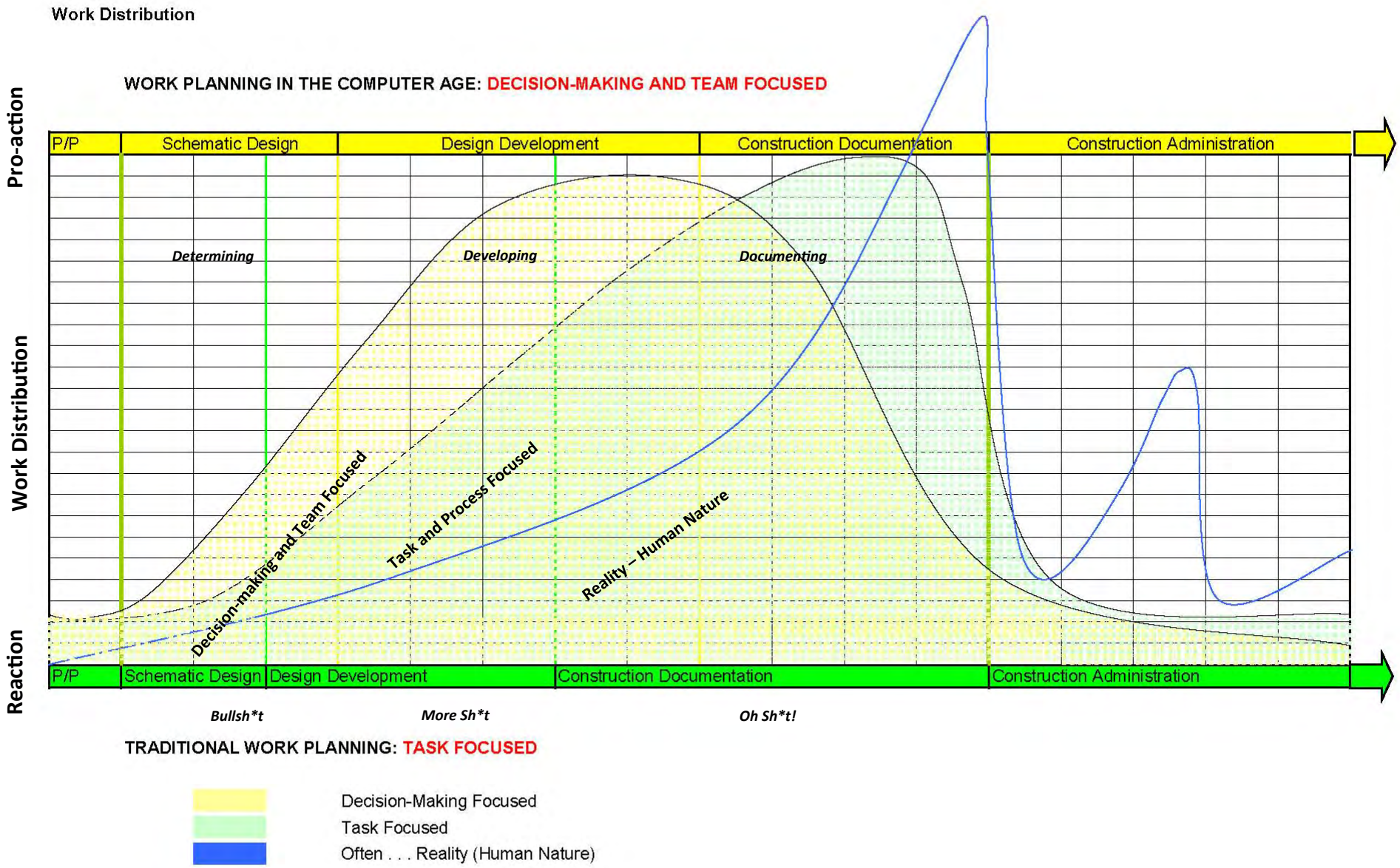
PROCESS


WAYNE STATE UNIVERSITY
SENIOR PROJECT MANAGER
Scott Robach
17 YEARS EXPERIENCE
PRINCIPAL IN CHARGE
Dennis Baran
Principal
40 YEARS EXPERIENCE
ARCHITECTURAL
Larry Kowalski, AIA
Manager - Architecture
20 YEARS EXPERIENCE
Ryan Haas, RA
Architect
11 YEARS EXPERIENCE
Cheryl Bohren
Architectural Designer
8 YEARS EXPERIENCE
SUSTAINABILITY
Catalyst Partners
PROGRAMMING & DESIGN
John Kohlhas, AIA
Design/Planning Principal
37 YEARS EXPERIENCE
Chaderique Menard
Manager - Design
17 YEARS EXPERIENCE
Carla Wolf, IIDA
Senior Interior Designer
12 YEARS EXPERIENCE
LAB PROGRAMMING & PLANNING
iDesign Solutions
MECHANICAL
Patrick O'Connor
Senior Mechanical Designer
36 YEARS EXPERIENCE
Jacqueline Bates, EIT
Mechanical Engineer
3 YEARS EXPERIENCE
ELECTRICAL
James Miloch, PE
Senior Electrical Engineer
28 YEARS EXPERIENCE
TECHNOLOGY
Commtech Design
STRUCTURAL
Daniel Vos, PE, CCS
Senior Structural PM
35 YEARS EXPERIENCE
NORR/FTCH
CONSULTANTS

TRADITIONAL PROJECT DELIVERY

> Timeline <




Work Distribution
WORK PLANNING IN THE COMPUTER AGE: DECISION-MAKING AND TEAM FOCUSED
Pro-action
Work Distribution
Reaction
P/P
Schematic Design
Design Development
Construction Documentation
Construction Administration
Determining
Developing
Documenting
Decision-making and Team Focused
Task and Process Focused
Reality – Human Nature
P/P
Schematic Design
Design Development
Construction Documentation
Construction Administration
Bullsh*t
More Sh*t
Oh Sh*t!
TRADITIONAL WORK PLANNING: TASK FOCUSED
Decision-Making Focused
Task Focused
Often . . . Reality (Human Nature)

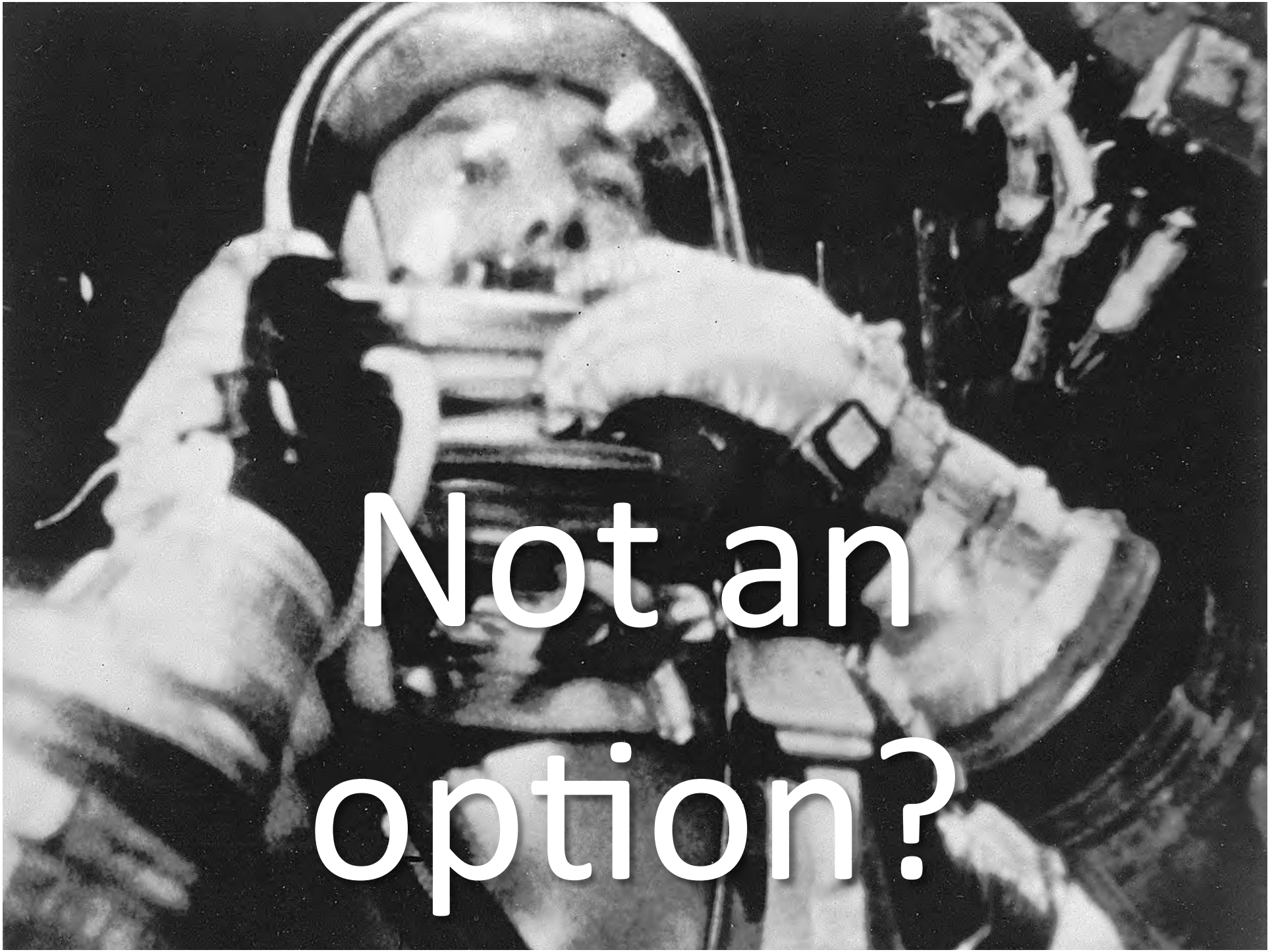

Post
grape
-nuts

TRADITIONAL PROJECT DELIVERY

> Challenges <

- Assumes all buildings are roughly equal in complexity and technical challenge
- Assumes that the team will self organize and do that multiple times
- Design, Construction, and Ownership are separated and segregated
- The players are motivated to 'perfect' their area of expertise
- True / Total 'Costs' identified late –especially energy

RESULT: Missed schedules, Busted budgets, LEED/green too costly


Not an
option?

Addressing these Challenges

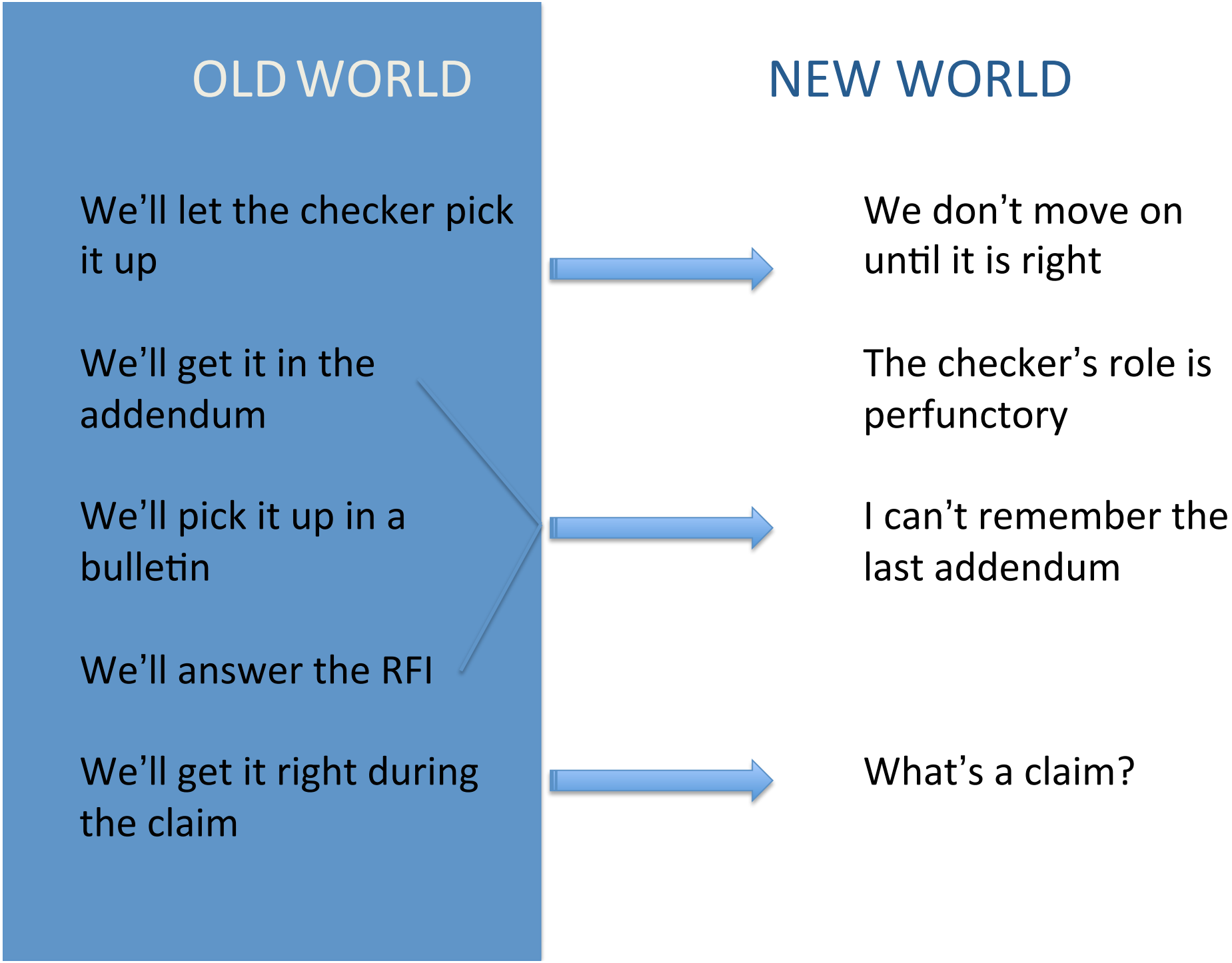
HOW THE WORLD HAS CHANGED

“In this current economy, the winners will be the re-thinkers, not the re-trenchers.”

- Roger Martin, Dean of the Rotman School of Management

OLD WORLD		NEW WORLD
Contractor sued us	→	Everyone in the food chain is going to sue us
<u>Choose between</u> • Quality • Budget • Schedule	→	You get all three
<u>Managers</u> Directed by fear and resentment	→	<u>Managers (Leaders)</u> • Teach • Enable • Coach

OLD WORLD		NEW WORLD
Discipline silos • What is most important for me and my discipline?	→	**Interdisciplinary teams** • What is most efficient for the project?
Benchmark against competition • We're no worse than the other guy • Why should we work to improve	→	**Benchmark against perfection** • Continual improvement strategy
Blame people	→	**Root cause analysis** • The power of 5 whys


OLD WORLD
NEW WORLD
We'll let the checker pick it up
We don't move on until it is right
We'll get it in the addendum
The checker's role is perfunctory
We'll pick it up in a bulletin
I can't remember the last addendum
We'll answer the RFI
We'll get it right during the claim
What's a claim?


OLD WORLD
NEW WORLD
Well, we had a seminar on quality
I talk to my staff everyday about quality
I sent an e-mail about quality
I search out those who exhibit the behaviors on quality I want
We threw a party and talked about quality
I continually search for ways to improve
I do want better quality
Everyday I provide feedback
How do we measure quality?
I can see improvement in quality
There is a quality guru
We are all responsible for quality

It's a

TRAP

OBSTACLES SURVEY

“Design is not a plan for decoration. Design is a plan for action.”

-Brian Collins, executive creative, Ogilvy and Mather

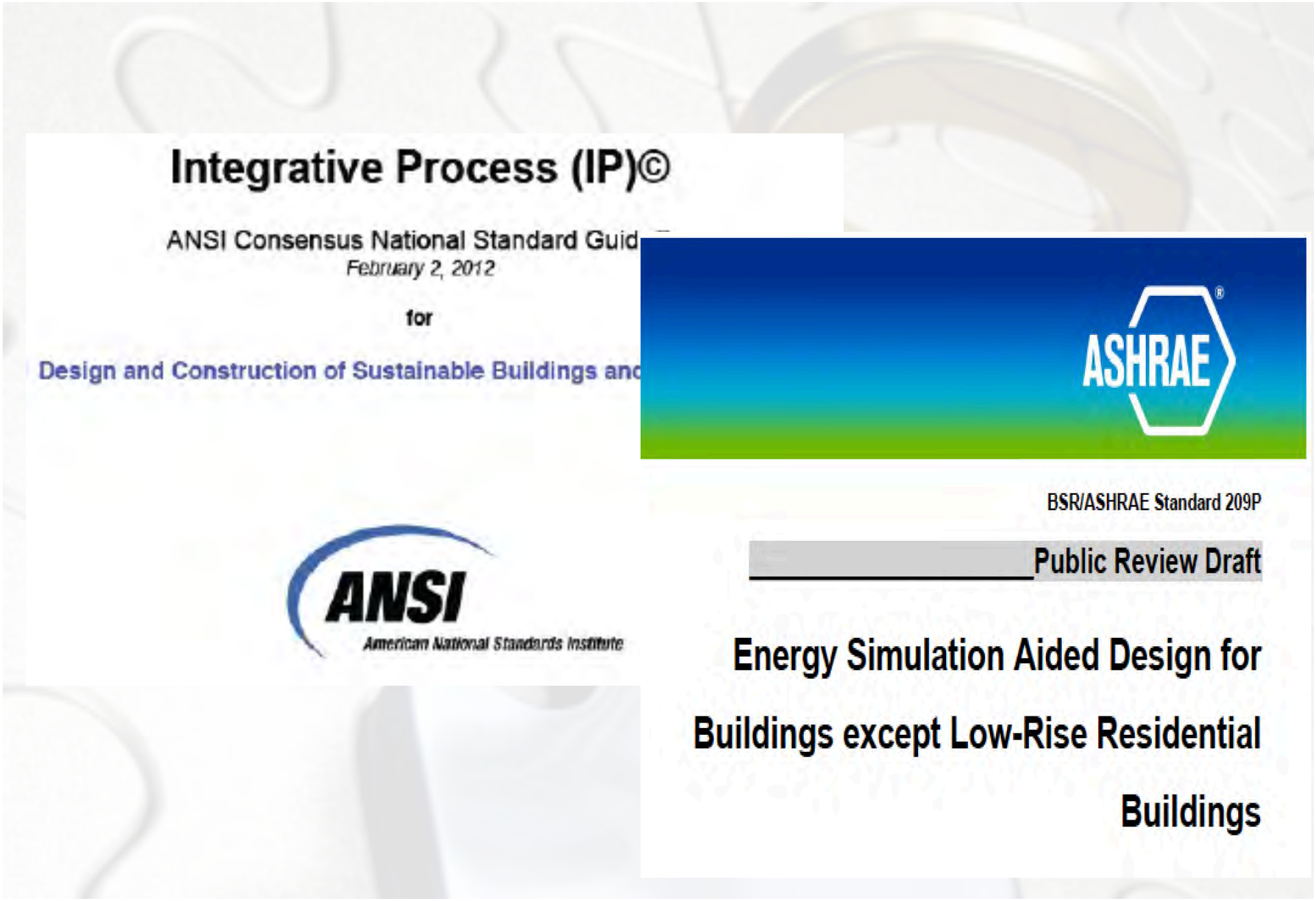
THE PLAN FOR ACTION

WHY THE IDP?

“When just 1 percent of a project's up front costs are spent… up to 70 percent of its life cycle costs may already be committed.”

—Joseph Romm

ADDRESSING THESE CHALLENGES



THE INTEGRATIVE PROCESS

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ASHRAE STANDARD 209

THE INTEGRATIVE PROCESS

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ASHRAE STANDARD 209

INTEGRATIVE PROCESS

> ANSI Standard <

Integrative Process (IP)©

ANSI Consensus National Standard Guide©
February 2, 2012

for

Design and Construction of Sustainable Buildings and Communities

ANSI
American National Standards Institute

MTS

The financial support of BetterBricks / Northwest Energy Efficiency Alliance in the development of this Standard, and leadership support of Bill Reed and John Boecker, are greatly appreciated.

Key Components:

- Building the Appropriate Team
- Early Effort
- Whole Systems Thinking
- Make Mistakes Faster
- Iterative
- Appropriate & Timely Engagement
- Mindset

INTEGRATIVE PROCESS

noun.

1. an iterative, collaborative approach that involves a project's stakeholders in the process from visioning through completion of construction and throughout building operation.

WHAT IS THE INTEGRATIVE PROCESS? … begin with definitions

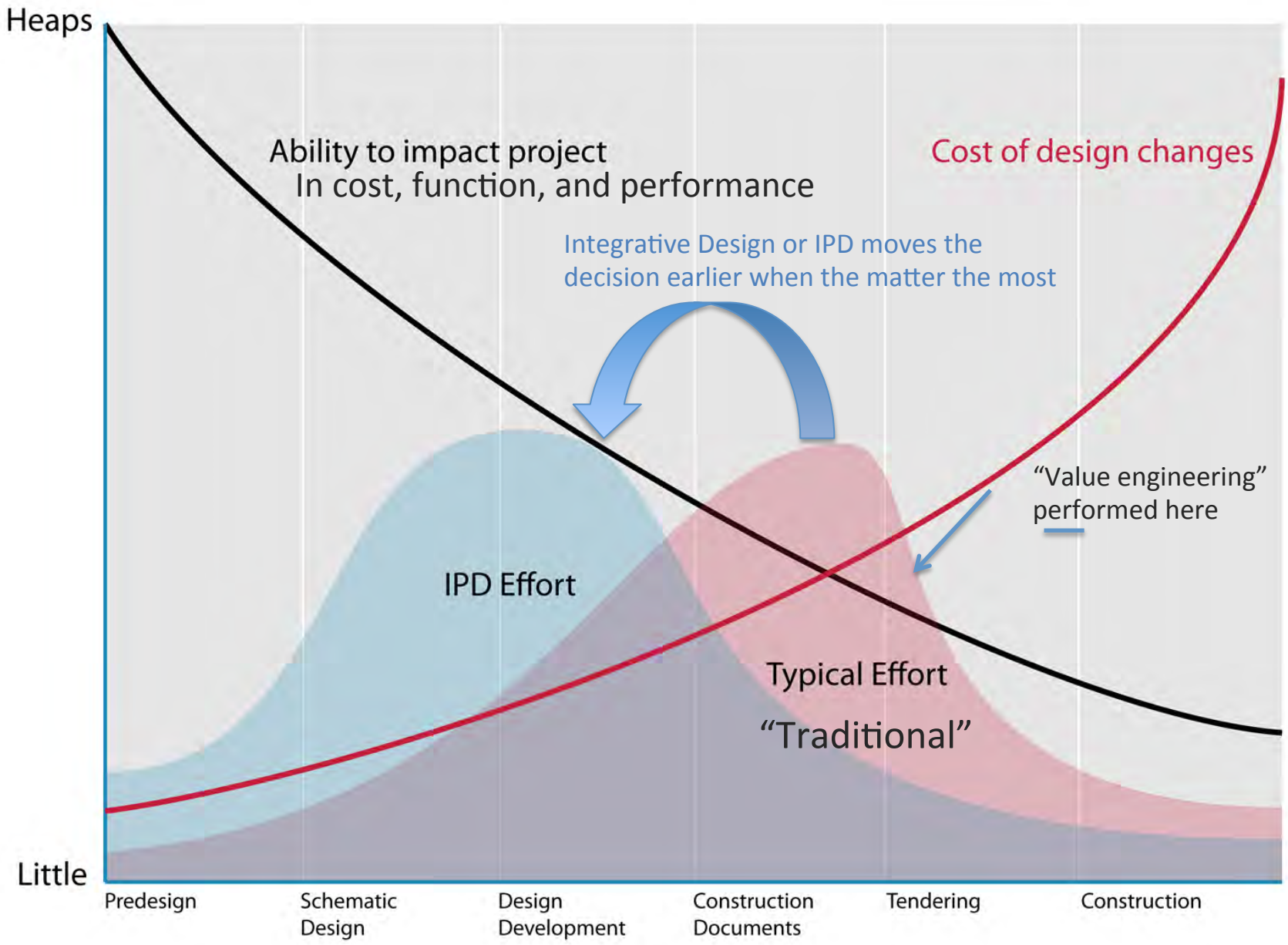
Integrate:
to make into a whole by bringing all parts together; unify

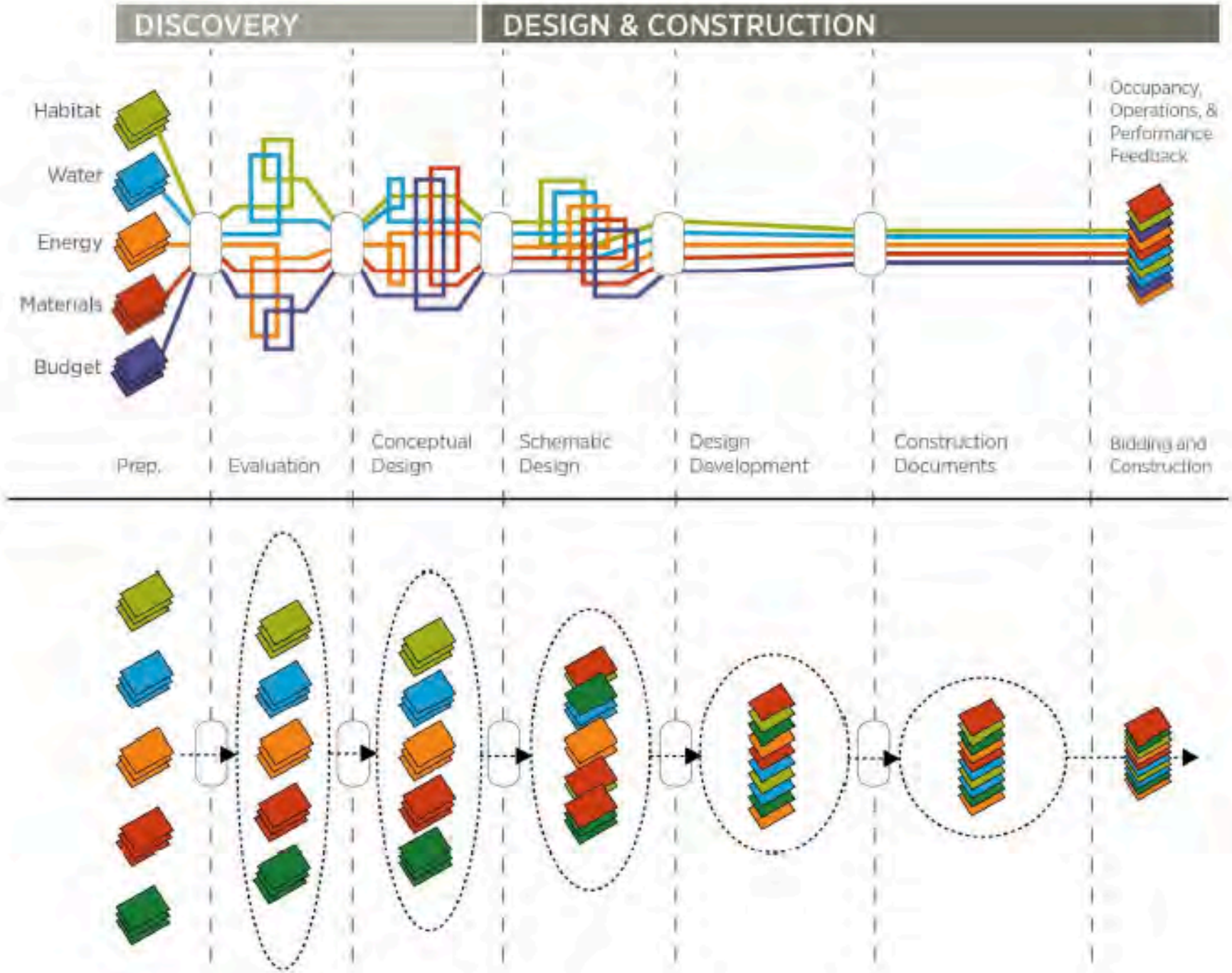
Whole:
containing all components;
complete; not injured

Heal:
to make whole*

Are we healing?
Are we wholing?

** from the Proto-Germanic khailaz, meaning "to make whole," which is the source of the Old English haelan, meaning "make whole, sound, and well."
*** attributed to John Boecker, 7Group


Heaps
Ability to impact project
In cost, function, and performance
Cost of design changes
Integrative Design or IPD moves the
decision earlier when the matter the most
"Value engineering"
performed here
IPD Effort
Typical Effort
"Traditional"
Little
Predesign
Schematic
Design
Design
Development
Construction
Documents
Tendering
Construction


DISCOVERY
DESIGN & CONSTRUCTION
Habitat
Water
Energy
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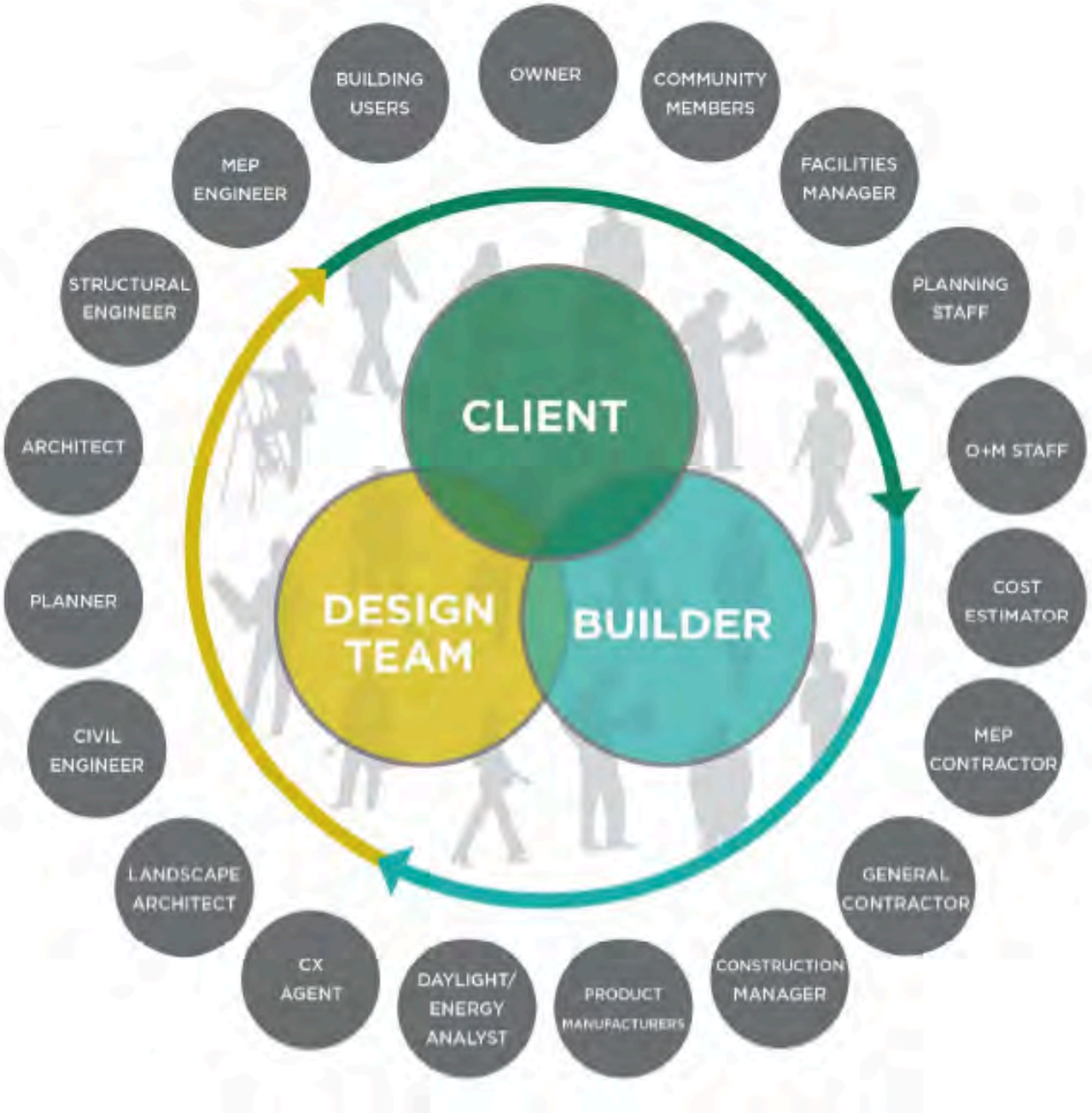
Budget
Occupancy, Operations, & Performance Feedback
Prep.
Evaluation
Conceptual Design
Schematic Design
Design Development
Construction Documents
Bidding and Construction


Flickr photo by Public Domain Photos


CLIENT
DESIGN TEAM
BUILDER
BUILDING USERS
OWNER
COMMUNITY MEMBERS
FACILITIES MANAGER
PLANNING STAFF
O+M STAFF
COST ESTIMATOR
MEP CONTRACTOR
GENERAL CONTRACTOR
CONSTRUCTION MANAGER
PRODUCT MANUFACTURERS
DAYLIGHT/ ENERGY ANALYST
CX AGENT
LANDSCAPE ARCHITECT
CIVIL ENGINEER
PLANNER
ARCHITECT
STRUCTURAL ENGINEER
MEP ENGINEER

WHAT IS THE STYLE OF YOUR CLIENT & HOW DO YOU BUILD YOUR TEAM?

A WHOLE BUILDING/SYSTEM MINDSET

Buildings are not a set of unrelated components; buildings are similar to living organisms with multiple systems that work together

Using a holistic approach we can optimize and possibly even eliminate entire systems

THE INTEGRATIVE DESIGN PROCESS

> as much a Mindset as it is a Process <

Credit: Jeff Singer

Get engaged.

Don’t be afraid.

Unlearn to learn.

Change is possible.

Stay flexible.

Pay out.

Not for everybody.

THE INTEGRATIVE DESIGN PROCESS

> as much a Mindset as it is a Process <

Mindset	Principle	Strategies
• Inclusion and collaboration	• Broad collaborative team	• Careful team formation
• Outcome oriented	• Well-defined scope, vision, goals, and objectives	• Team building
• Trust and transparency	• Effective and open communication	• Facilitation training for team • Expert facilitation
• Open-mindedness and creativity	• Innovation and synthesis	• Visioning charrettes (with comprehensive preparation) • Brainstorming
• Rigour and attention to detail	• Systematic decision making	• Goals and targets matrix • Decision-making tools
• Continuous learning and improvement	• Iterative process with feedback cycles	• Post-occupancy evaluation • Comprehensive commissioning

Accountability:

An attitude of continually asking “what else can I do to rise above my circumstances and achieve the results I desire?”

Seeing it, owning it, solving it and doing it.

The Benefits

- Hear from all voices
- Map the process with milestones
- Add value in process
- Benefit all phases with life cycle approach
- Use resources efficiently (energy/water)
- Achieve higher value building
- Reduce costs
- Reduce change orders

THE INTEGRATIVE DESIGN PROCESS

> key principles <

- Mutual Respect & Trust
- Mutual Benefit & Reward
- Collaborative Innovation & Decision Making
- Early Involvement of Key Participants
- Early Goal Definition
- Intensified Planning
- Open Communication
- Appropriate Technology
- Organization & Leadership

THE INTEGRATIVE PROCESS

+

ASHRAE STANDARD 209

THE INTEGRATIVE PROCESS

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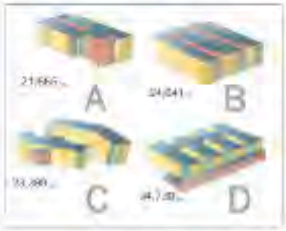
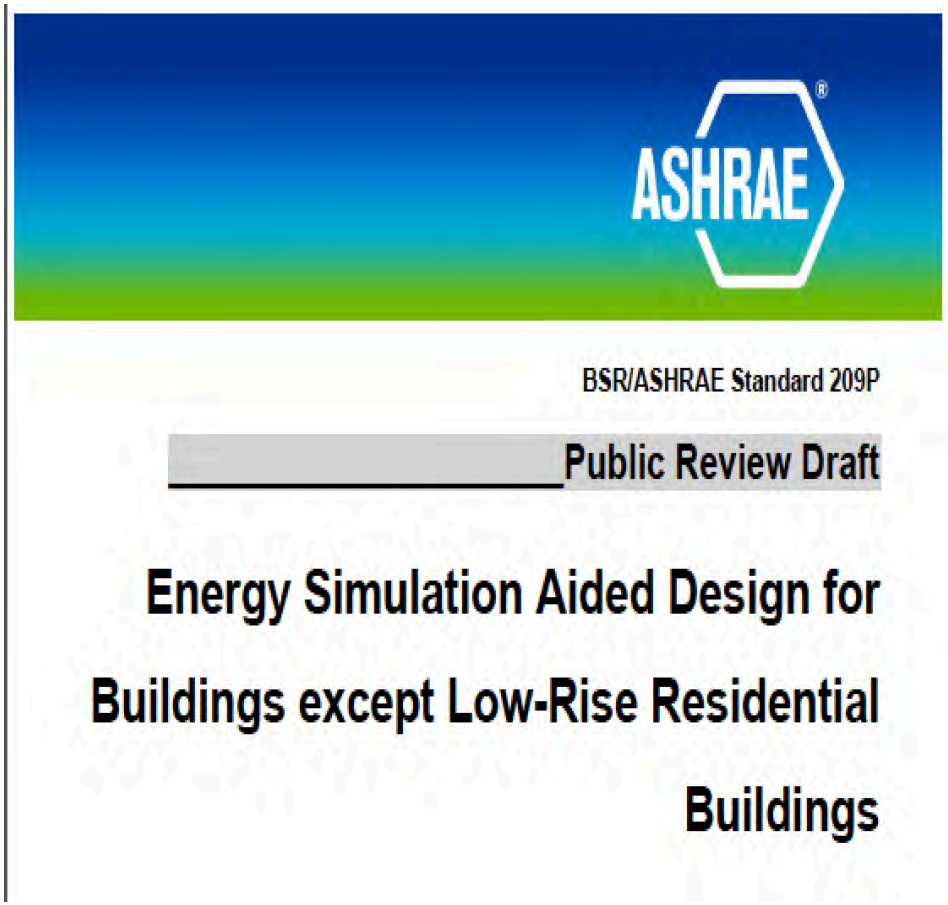
ASHRAE STANDARD 209

A Brief History of Energy Modeling

This is the only one that typically addresses/compares geometry and passive systems

Mechanical System Sizing (Peak Loads)	Comparing strategies. (Energy Conservation Measures, EEM/ECMs)	Compliance	Prediction	Design
How big are loads? Do I need 4 tons or 8 tons of cooling?	Is it better to insulate more or upgrade the boiler efficiency?	Is my building at least as good as a prescriptive code building??	Will the design and operations be able to meet 40 kBtu/sf/year?	What quality/quantity of daylight does each space have? Do I need more shading?
		 ASHRAE 90.1 LEED Energy Code		
Late in Design Phase	Middle of Design Phase	Usually late in Design Phase	Throughout Design Phases	Early Design Phase, Testing Geometry

ASHRAE Proposed Standard 209



Key Components:

- Informative Modeling
- Upfront Effort
- Alignment with IDP
- Early Problem Solving related to Cost Impacts
- Keep pace with energy efficiency demands

Why Create Standard 209?

- Until recently, new technologies have allowed new building designs to keep up with current energy standards, codes, and rating systems with *minimal effort or expertise*; e.g. LED lighting and auto dealerships, chilled beams, GSHP, etc.
- However, new technologies are no longer keeping pace with demands for increased energy efficiency in buildings; e.g., ASHRAE 90.1, LEED v4, Architecture 2030, LBC, etc.

Energy Performance Goals	EUI kBTU/sf
2016 Michigan Median	109.5
ENERGY STAR Certified	81
2015 2030 Challenge Goal (70%)	32.8
2020 2030 Challenge Goal (80%)	21.9
2025 2030 Challenge Goal (90%)	10.9
2030 2030 Challage Goal (100%)	0

Location	Annual Energy use (kBtu - per LEED submittal)	Modeled Area (sf - per LEED submittal)	Site EUI (kbtu/sf)*
Hamilton SC	1891070	23053	82 The form states 76.05, but that was based on 24,866 sf
Livonia SC			
Bad Axe SC	424,000	7,131	50 50.46
Jackson Innovation Center	1,254,000	26,249	48 7.8
Clare SC	866,440	17,199	50.4 The for EUI of 45.7 at was based on 18,948 sf
Employee Development Center	2,221,000	31,385	70 0.77

Current Practices/Future Needs

- Most projects do NO energy modeling; e.g., strip malls, design/build, small, etc.
- Most projects that DO include energy modeling include only compliance models.
- Energy models cost about the same, whether for compliance or to inform design.*
- Energy models are more valuable the earlier they are included in the design.

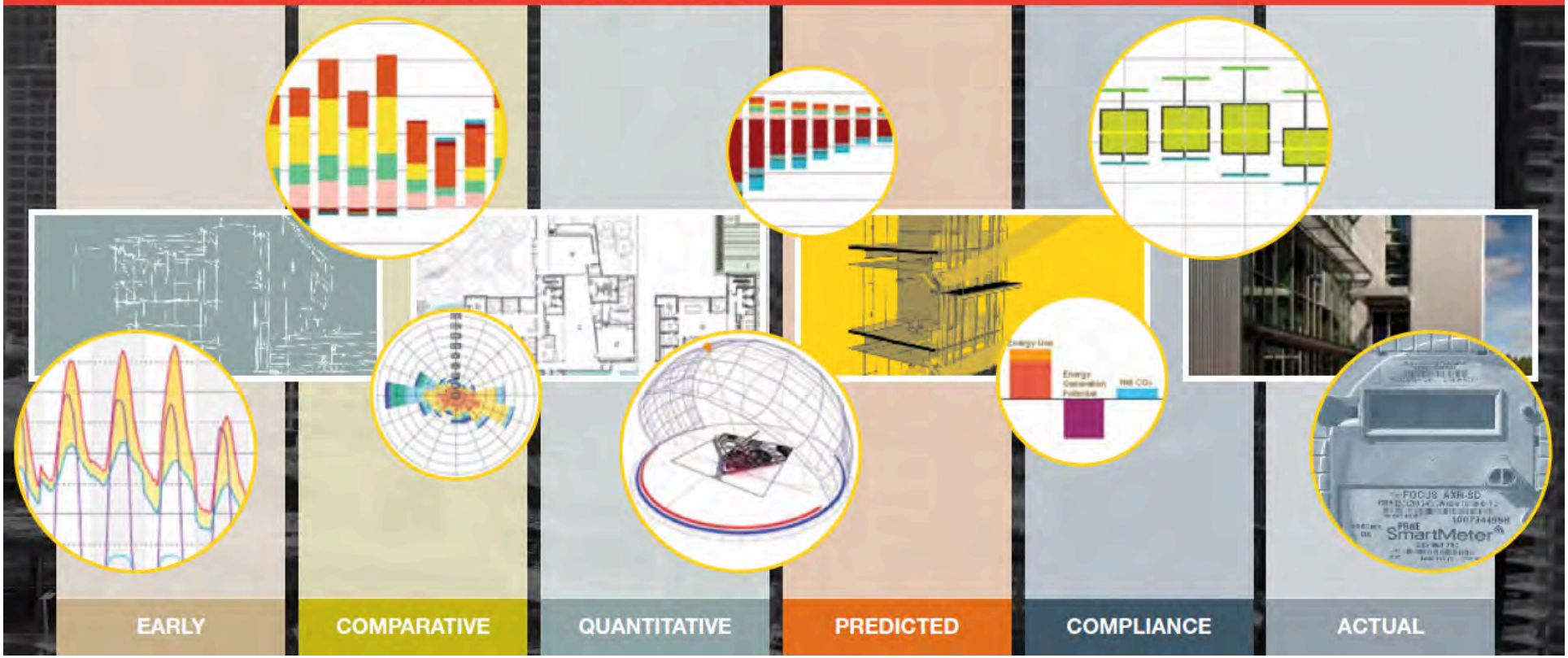
*If done wisely. While costs are similar, some costs are incurred earlier in the process.

According to the AIA's presentation on the Integrative Project Delivery Process, the Orcutt-Wislow Partnership reported the following:

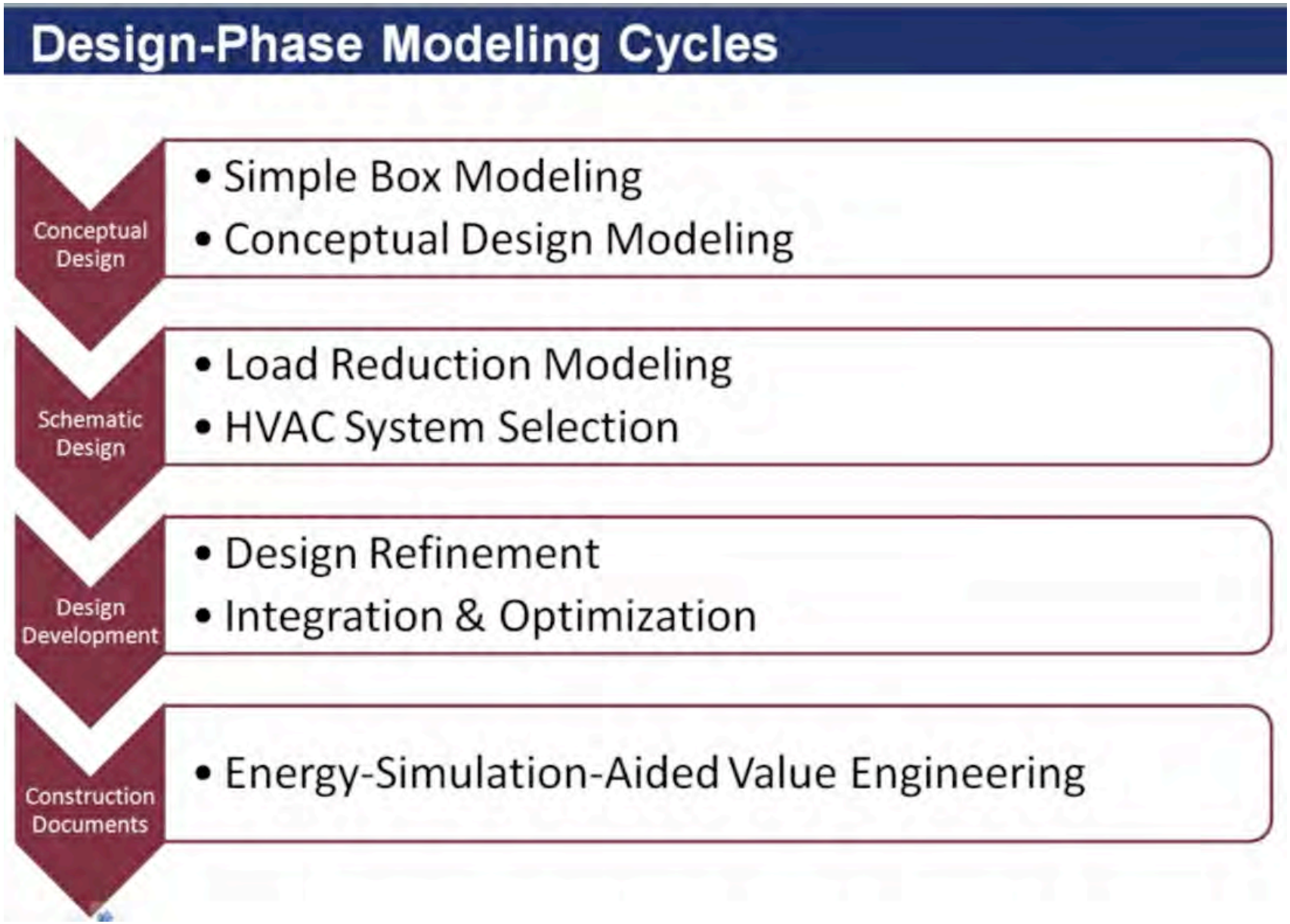
“We have found that when we've completed the design development phase, we're already close to 60% finished with construction documentation.”

Reed, Bill (2011-10-11). The Integrative Design Guide to Green Building: Redefining the Practice of Sustainability (Wiley Series in Sustainable Design) (Kindle Locations 5443-5445). Wiley Publishing. Kindle Edition.

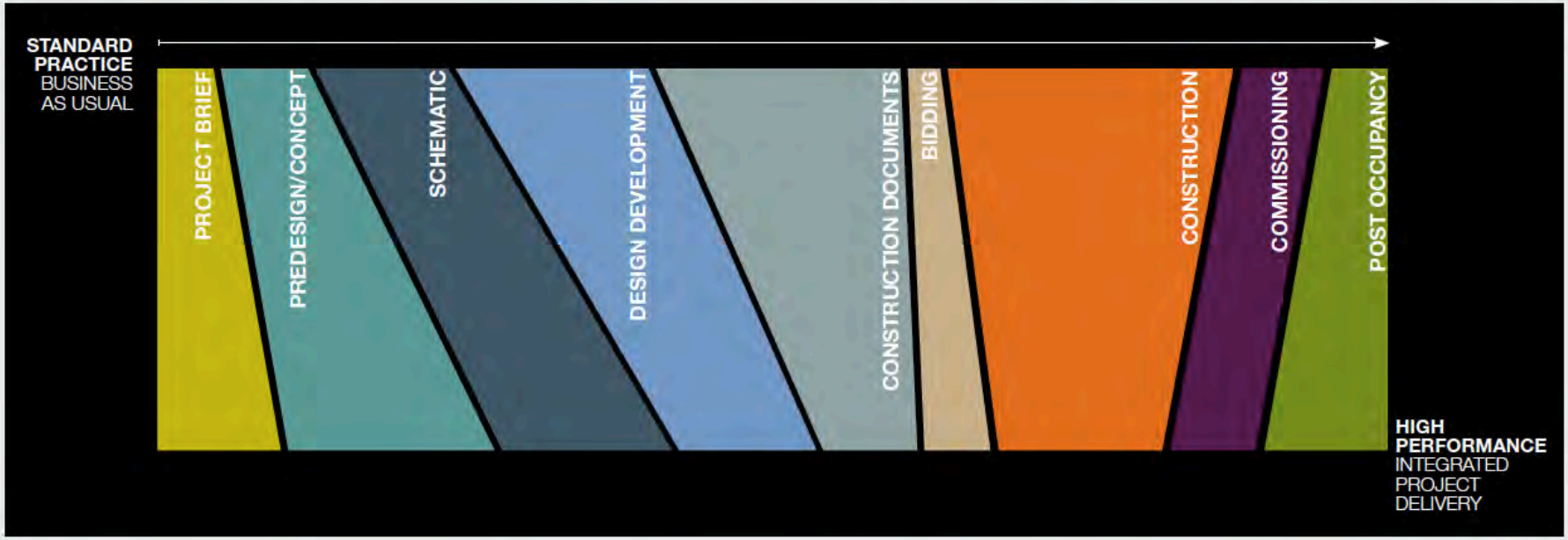
INTEGRATING
ENERGY MODELING
IN THE DESIGN PROCESS



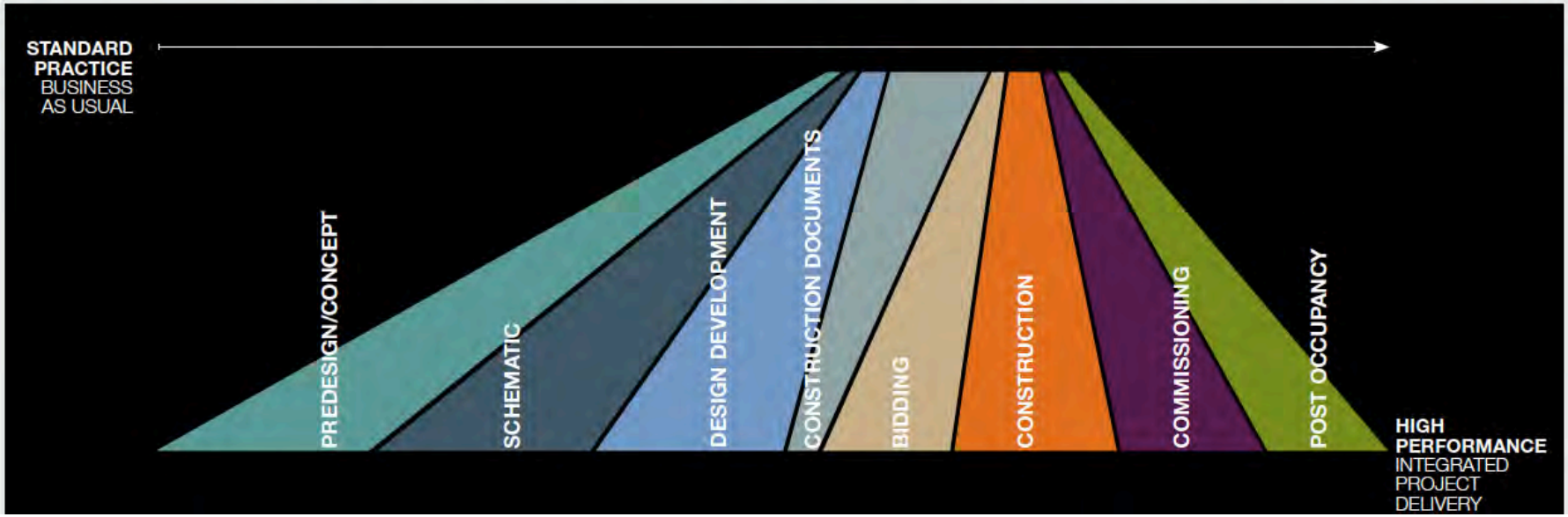
Modeling Cycles of Standard 209



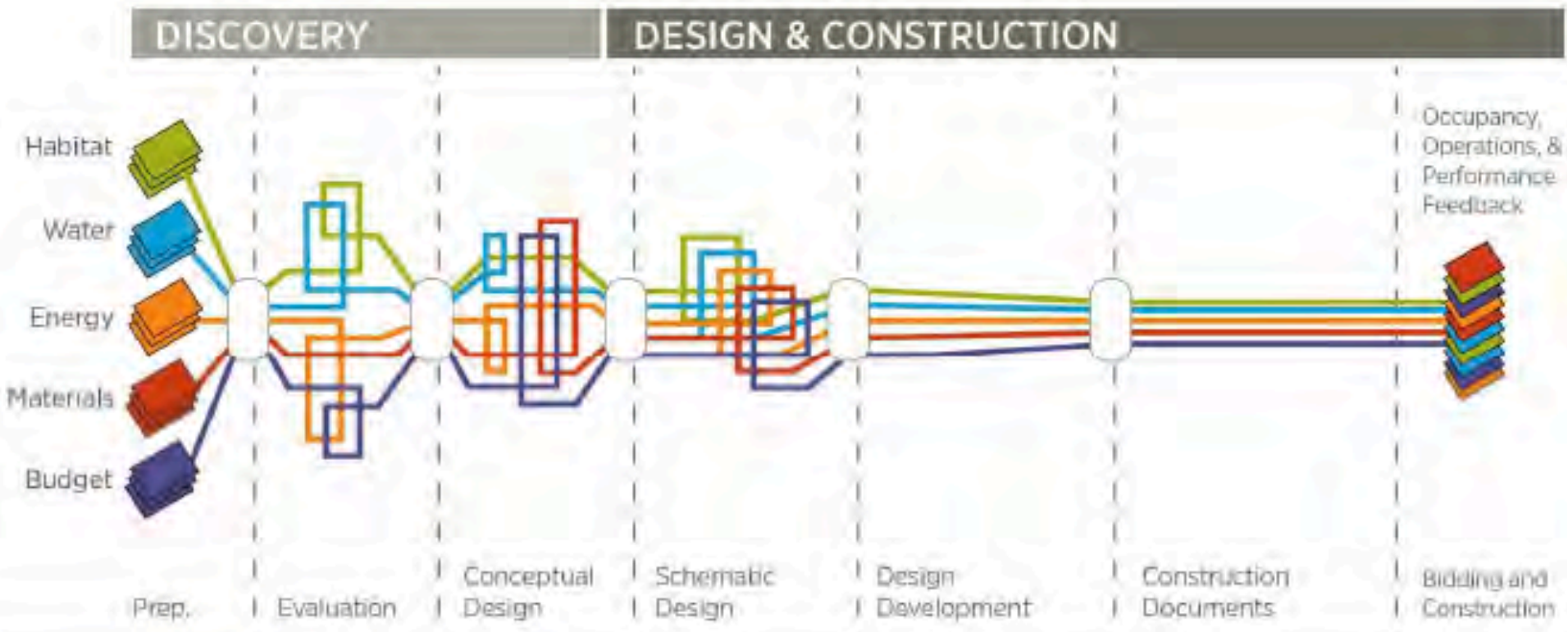
TYPICAL TIME (FEE) SPEND WITHIN THE TYPICAL PHASES OF THE DESIGN PROCESS



USE OF 'ENERGY' (PERFORMANCE) MODELING AS PART OF THE DESIGN PROCESS



HOW DO YOU DELIVER?


DISCOVERY
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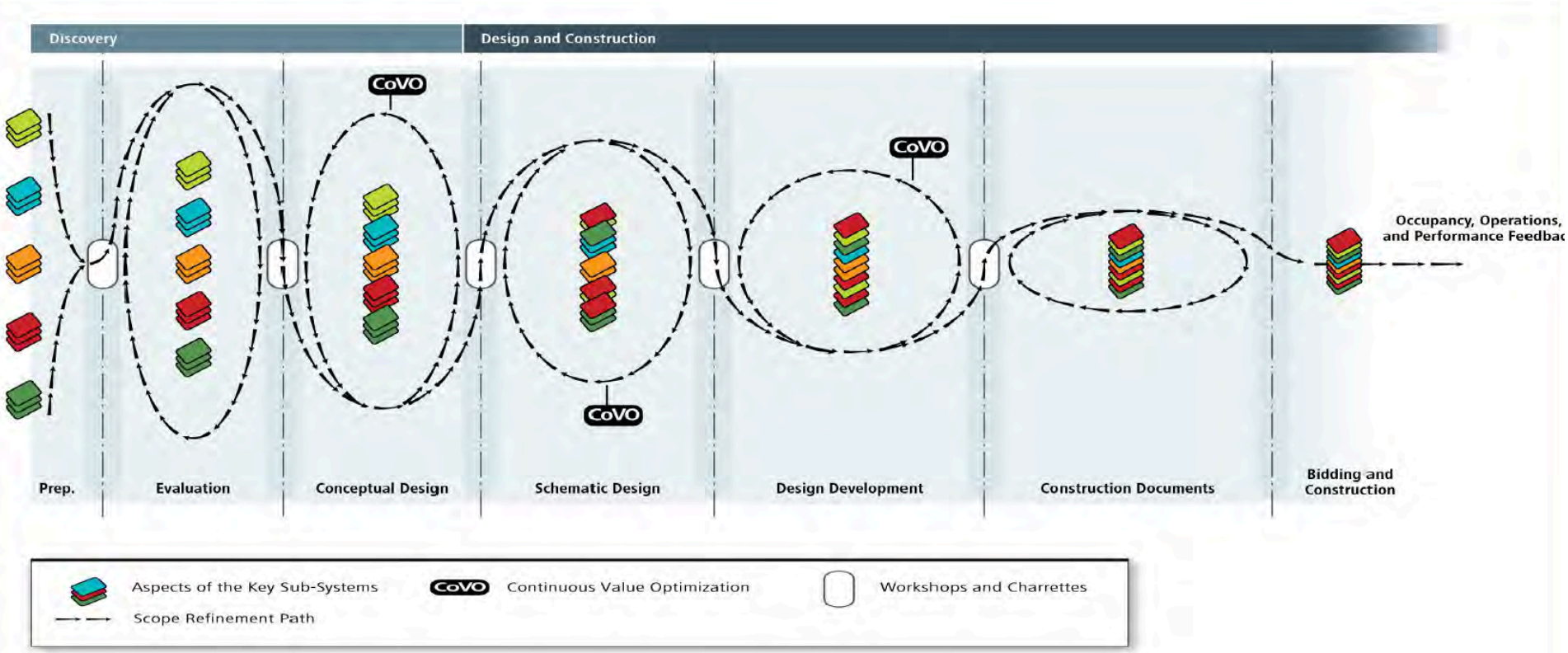
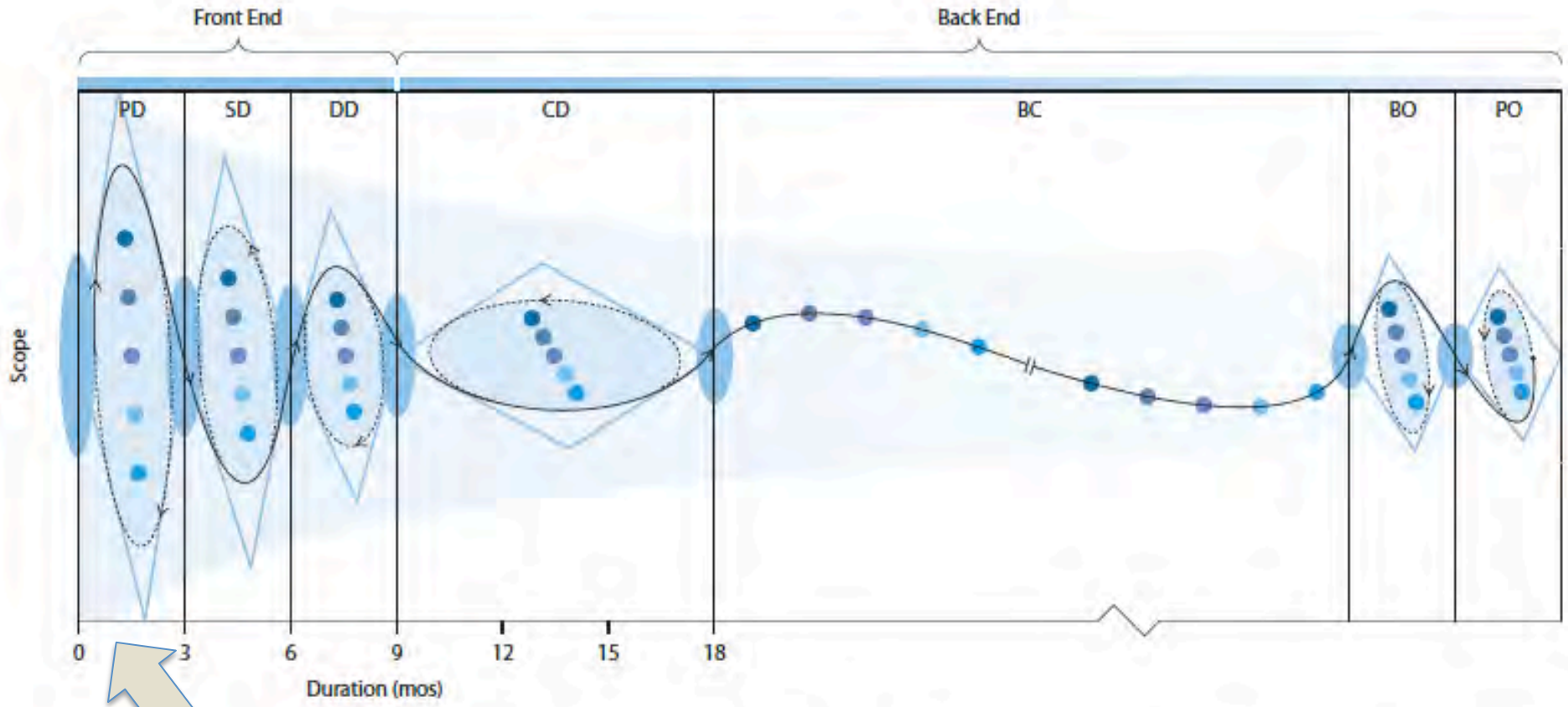

Discovery
Design and Construction
CoVO
CoVO
CoVO
Occupancy, Operations, and Performance Feedbac
Prep.
Evaluation
Conceptual Design
Schematic Design
Design Development
Construction Documents
Bidding and Construction
Aspects of the Key Sub-Systems
CoVO
Continuous Value Optimization
Workshops and Charrettes
Scope Refinement Path



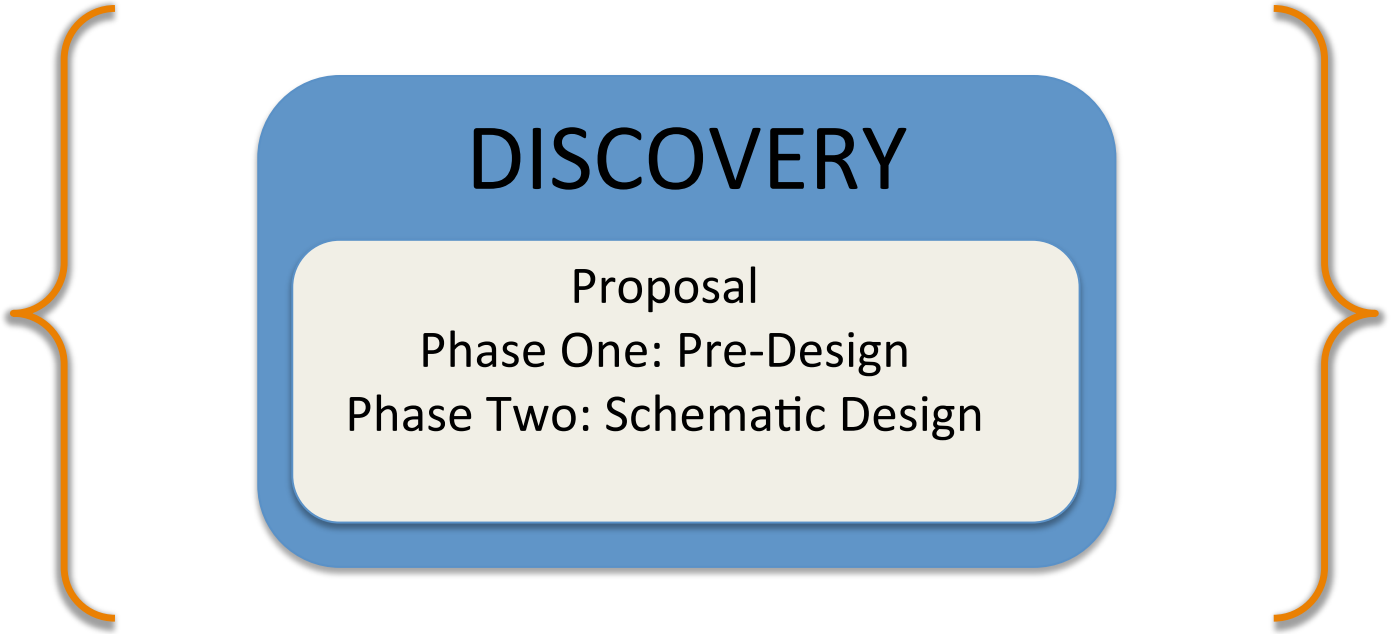
Phase One: Pre-Design

Proje[illegible]onstraints
Exploratory Design Process
All Team Workshop
Focused Team Workshops (water, energy, materials, etc)
Iterative Process
Additional Iterations as necessary

PD	Pre-design	BC	Bidding, Construction, Commissioning
SD	Schematic Design	BO	Building Operation (start up)
DD	Design Development	PO	Post-Occupancy (long term)
CD	Construction Documents		

Image Credit: Bill Reed of Integrative Design Collaborative, Doug Pierce of Perkins+Will and Busby Perkins+Will

DELIVERING AN INTEGRATIVE PROJECT:



Phase Three: Design Development
Phase Four: Construction Documentation
Phase Five: Bidding, Construction, Commissioning
Phase Six: Building Operation
Phase Seven: Post-Occupancy Tools

DELIVERING AN INTEGRATIVE PROJECT:

Proposal
Phase One: Pre-Design
Phase Two: Schematic Design

DESIGN & CONSTRUCTION

Phase Three: Design Development
Phase Four: Construction Documentation
Phase Five: Bidding, Construction, Commissioning

Phase Six: Building Operation
Phase Seven: Post-Occupancy Tools

DELIVERING AN INTEGRATIVE PROJECT:

Proposal
Phase One: Pre-Design
Phase Two: Schematic Design

Phase Three: Design Development
Phase Four: Construction Documentation
Phase Five: Bidding, Construction, Commissioning

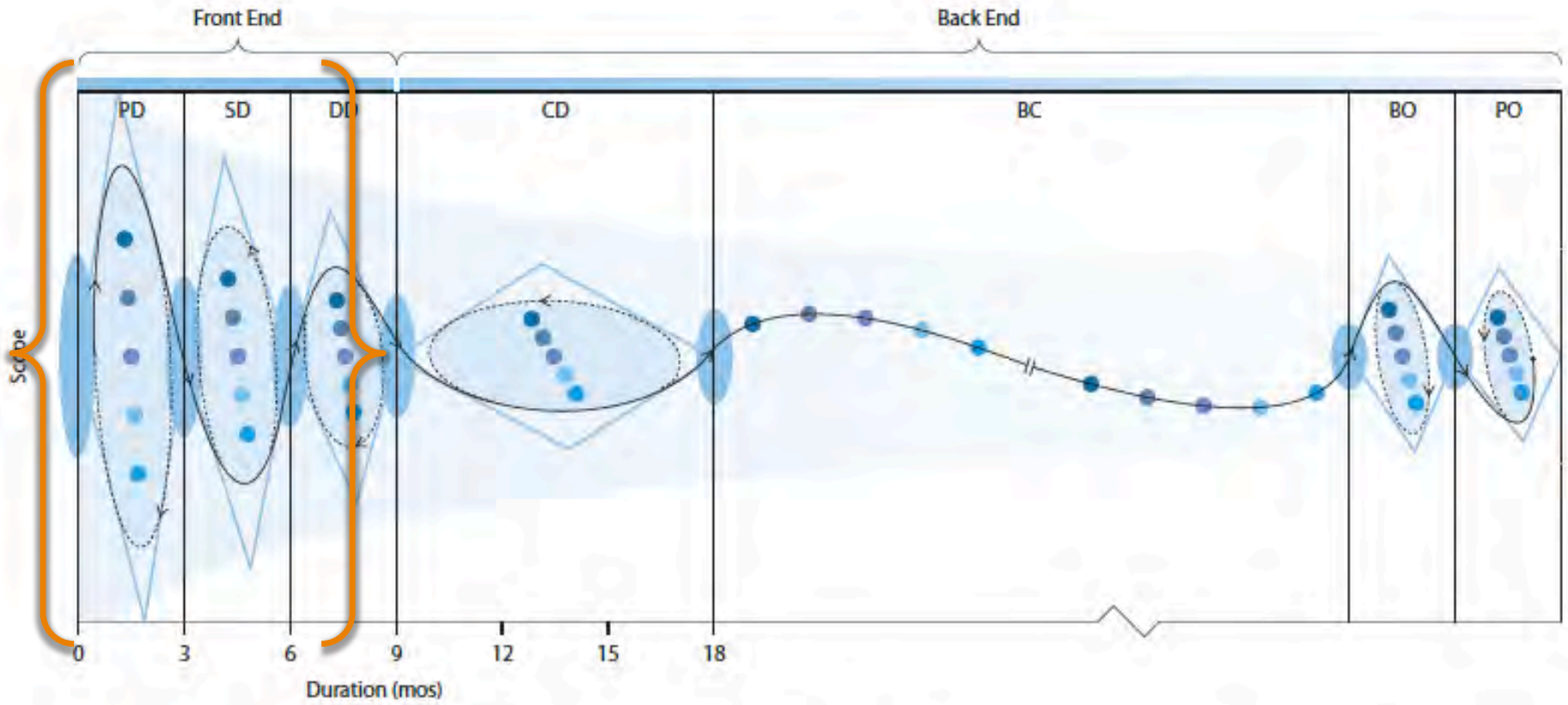
OCCUPANCY (OPERATIONS)

Phase Six: Building Operation
Phase Seven: Post-Occupancy Tools

DISCOVERY (PRE-DESIGN) (Schematic Design)

1%

70%



Integrative Pre-Design

Project Constrai

Exploratory Design F

All Team Workshop

Focused Team Workshops (water, energy, materials, etc)

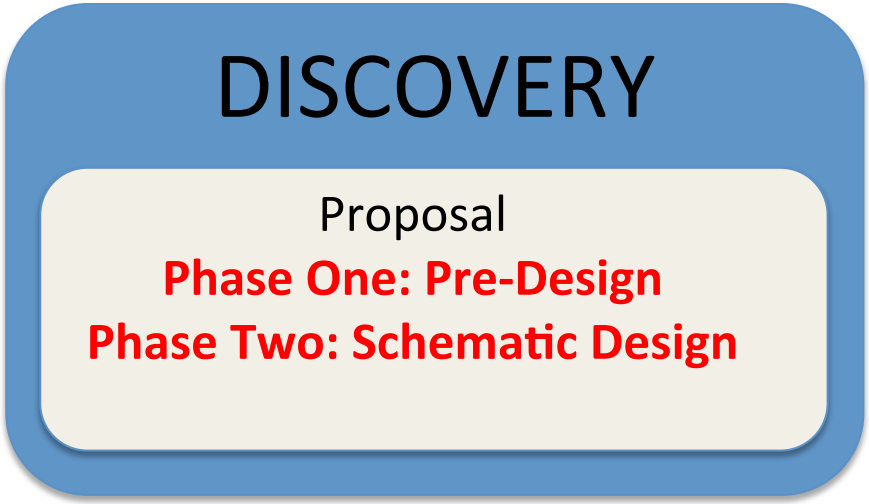
Iterative Process

Additional Iterations as necessary

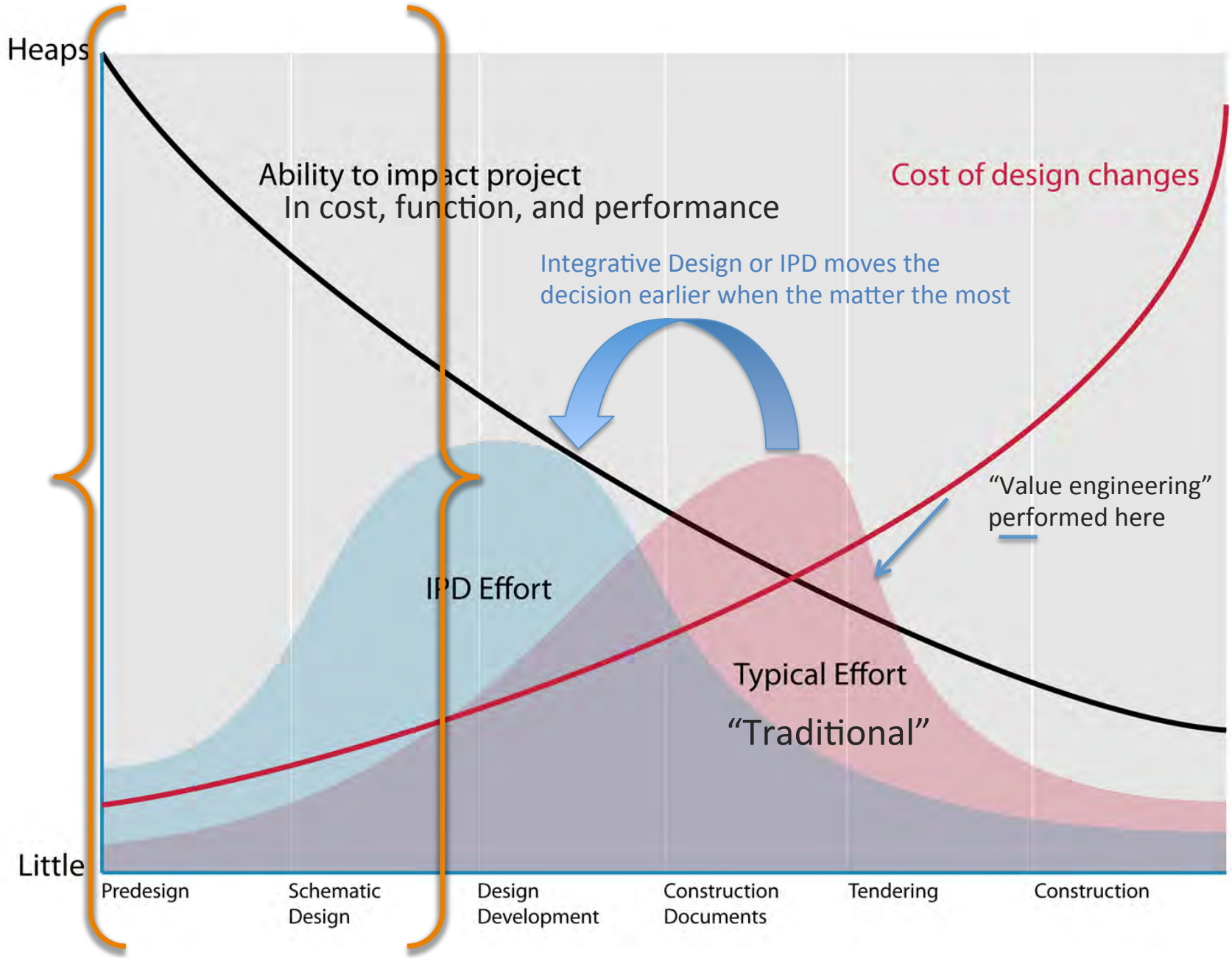
PD	Pre-design	BC	Bidding, Construction, Commissioning
SD	Schematic Design	BO	Building Operation (start up)
DD	Design Development	PO	Post-Occupancy (long term)
CD	Construction Documents		

Image Credit: Bill Reed of Integrative Design Collaborative, Doug Pierce of Perkins+Will and Busby Perkins+Will

DELIVERING AN INTEGRATIVE PROJECT:



Phase Three: Design Development
Phase Four: Construction Documentation
Phase Five: Bidding, Construction, Commissioning
Phase Six: Building Operation
Phase Seven: Post-Occupancy Tools


Heaps
Ability to impact project
In cost, function, and performance
Cost of design changes
Integrative Design or IPD moves the
decision earlier when the matter the most
"Value engineering"
performed here
IPD Effort
Typical Effort
"Traditional"
Little
Predesign
Schematic
Design
Design
Development
Construction
Documents
Tendering
Construction

PHASE ONE: PRE-DESIGN

> Conceptualization [expanded programming] <

Outputs

- Vision statement, goals and targets matrix
- Pre-design report including charrette synopsis
- Preliminary budget including cost of IDP activities such as energy modeling
- Established communication pathways

Process

Coordinate the team:

- Bring together a diverse and knowledgeable team
- Appoint an IDP Facilitator and/or Champion

Establish a foundation:

- Set fees to provide appropriate incentives to the design team

Plan key meetings:

- Charrette preparation
- Host visioning charrette or workshop
- Programming meeting
- Facilities management meeting
- Partnership meetings

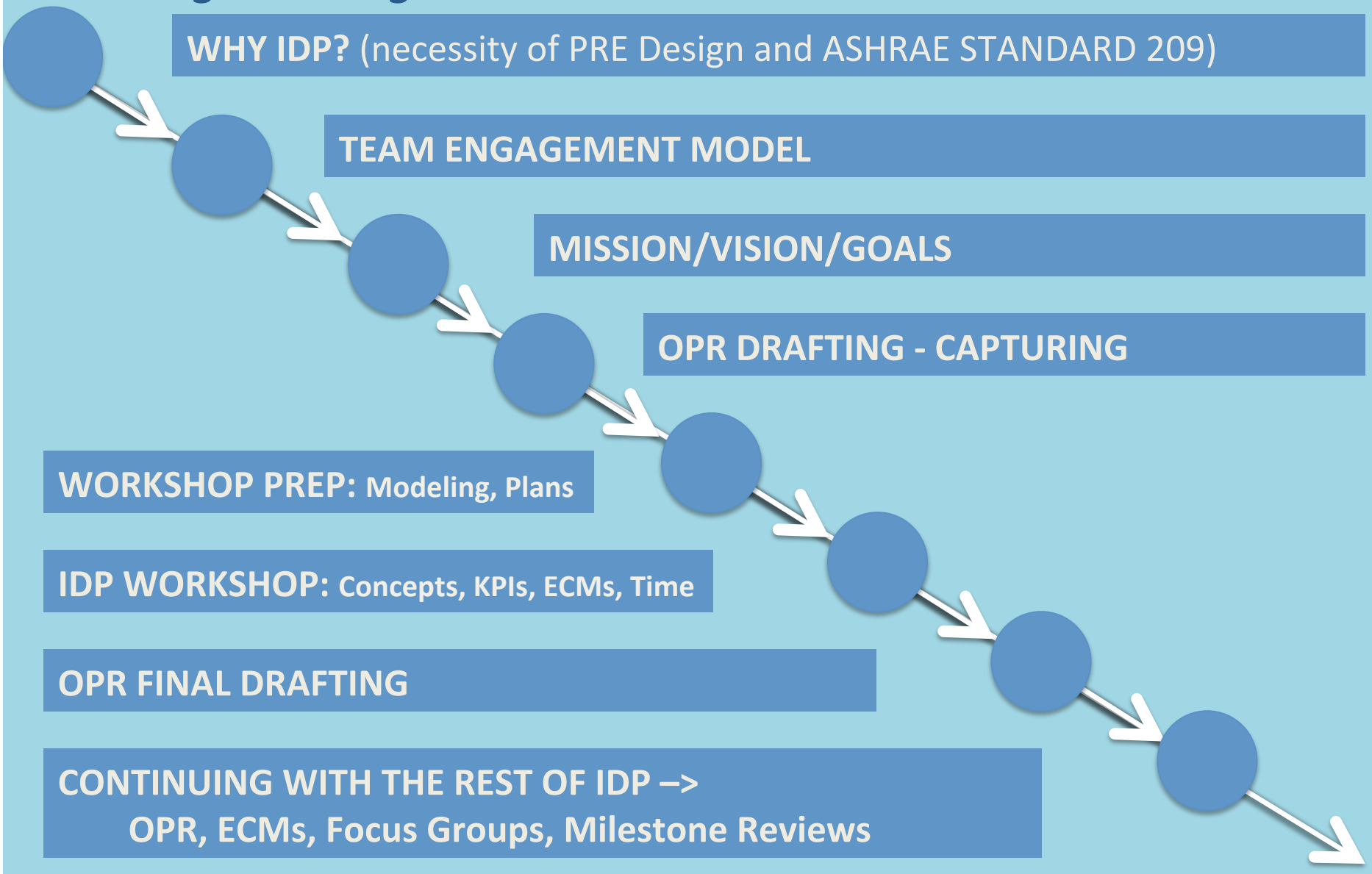
PHASE TWO: SCHEMATIC DESIGN

> Criteria Design [Expanded Schematic Design] <

Outputs	Process
• Goals and targets matrix • Preliminary energy analysis • Preliminary financial estimate • Schematic Design report • Roles and responsibilities matrix	Coordinate the team: • Enhance team cohesiveness and confirm team values • Encourage a team mindset supporting creativity and systems thinking Establish a foundation: • Keep the project's vision and goals at hand • Have a clear understanding of site challenges and opportunities • Ensure the functional program requirements and its implications for all disciplines are understood Plan key meetings: • Host design charrettes and workshops to brainstorm ideas, develop concepts, evaluate strategies, and refine options • Evaluate feasibility and energy impact of technologies and strategies • Report on opportunities

INTEGRATIVE PRE-DESIGN

> Pulling it all together now <



INTEGRATIVE PRE-DESIGN

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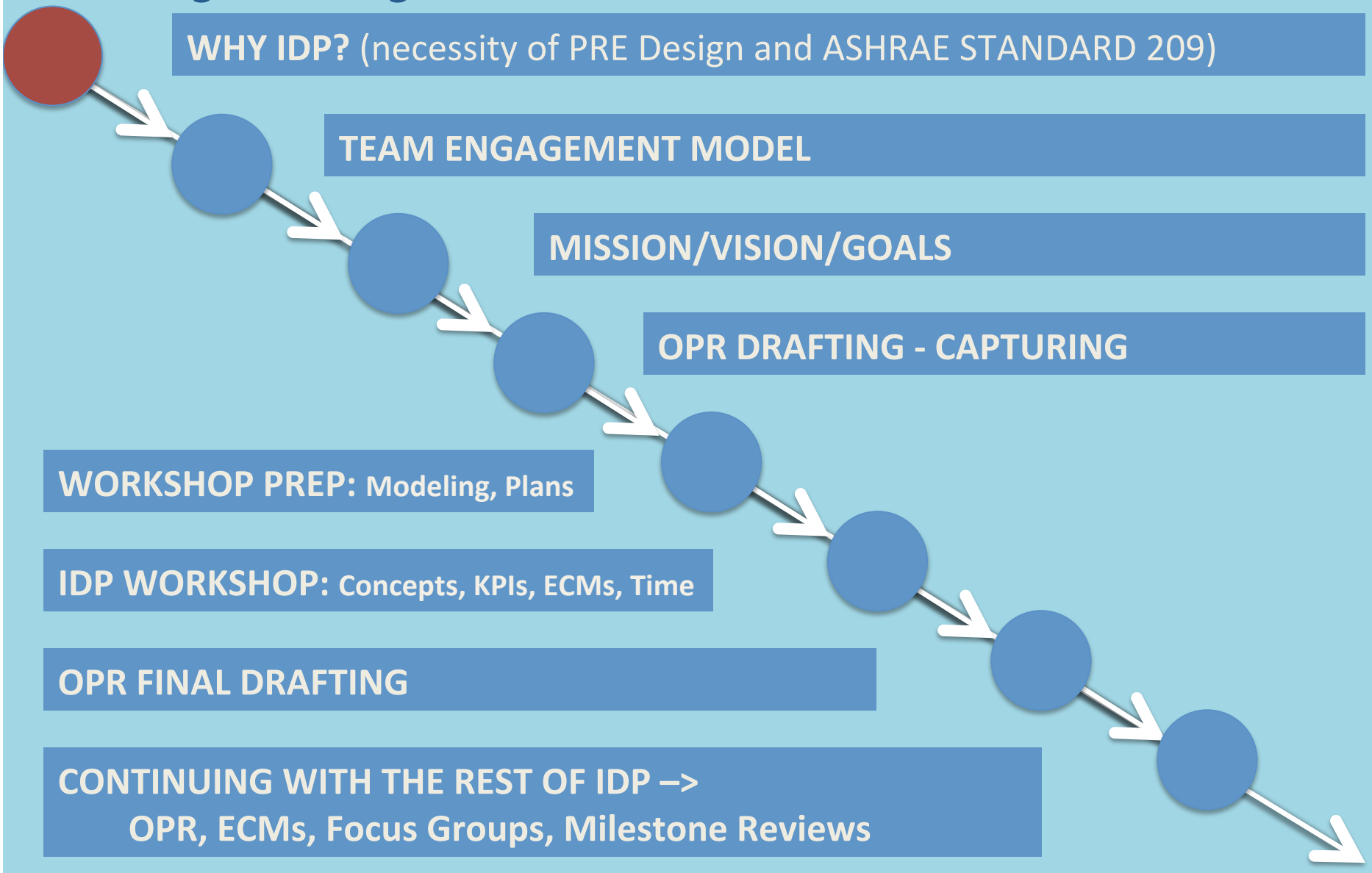

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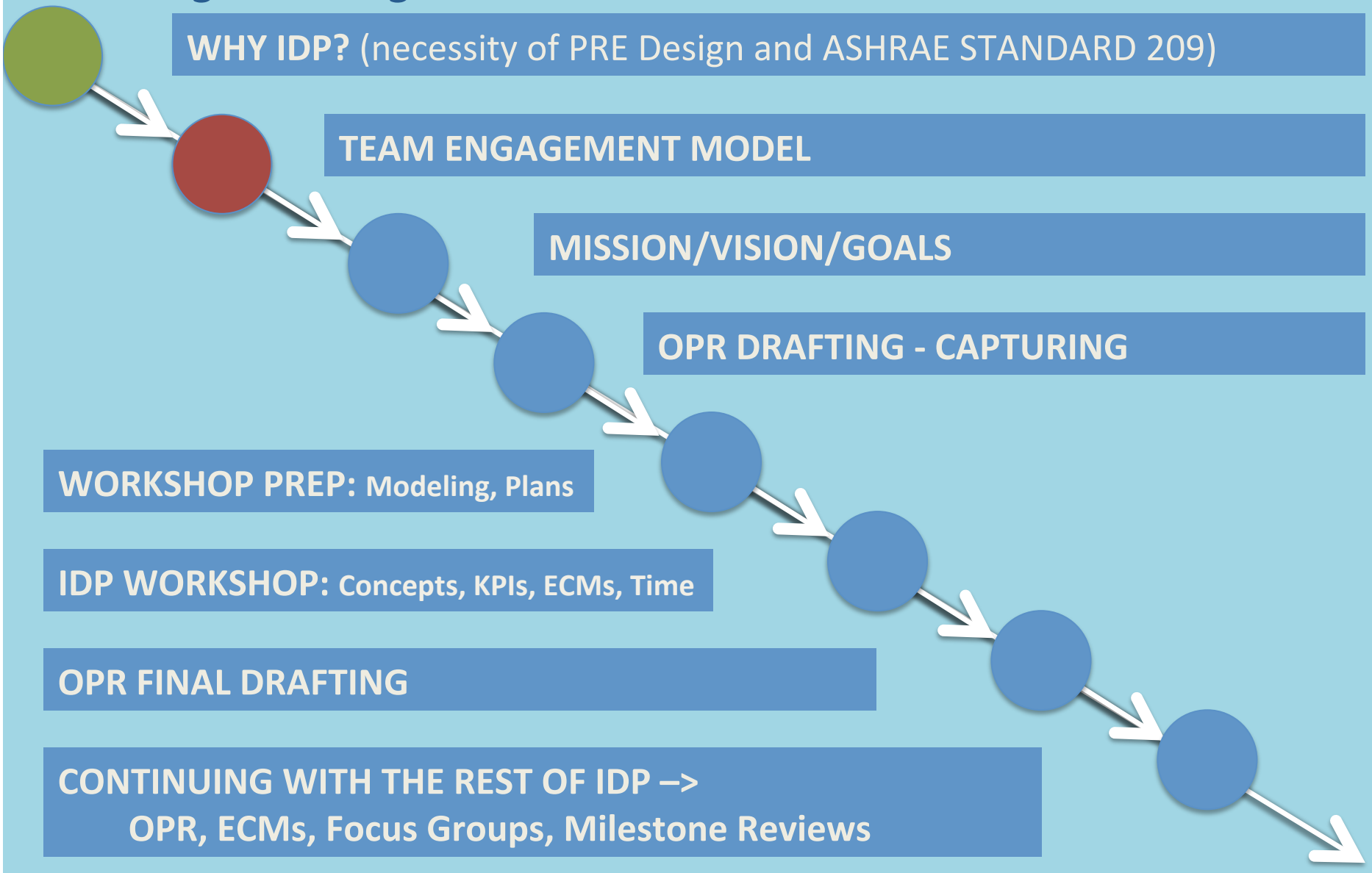
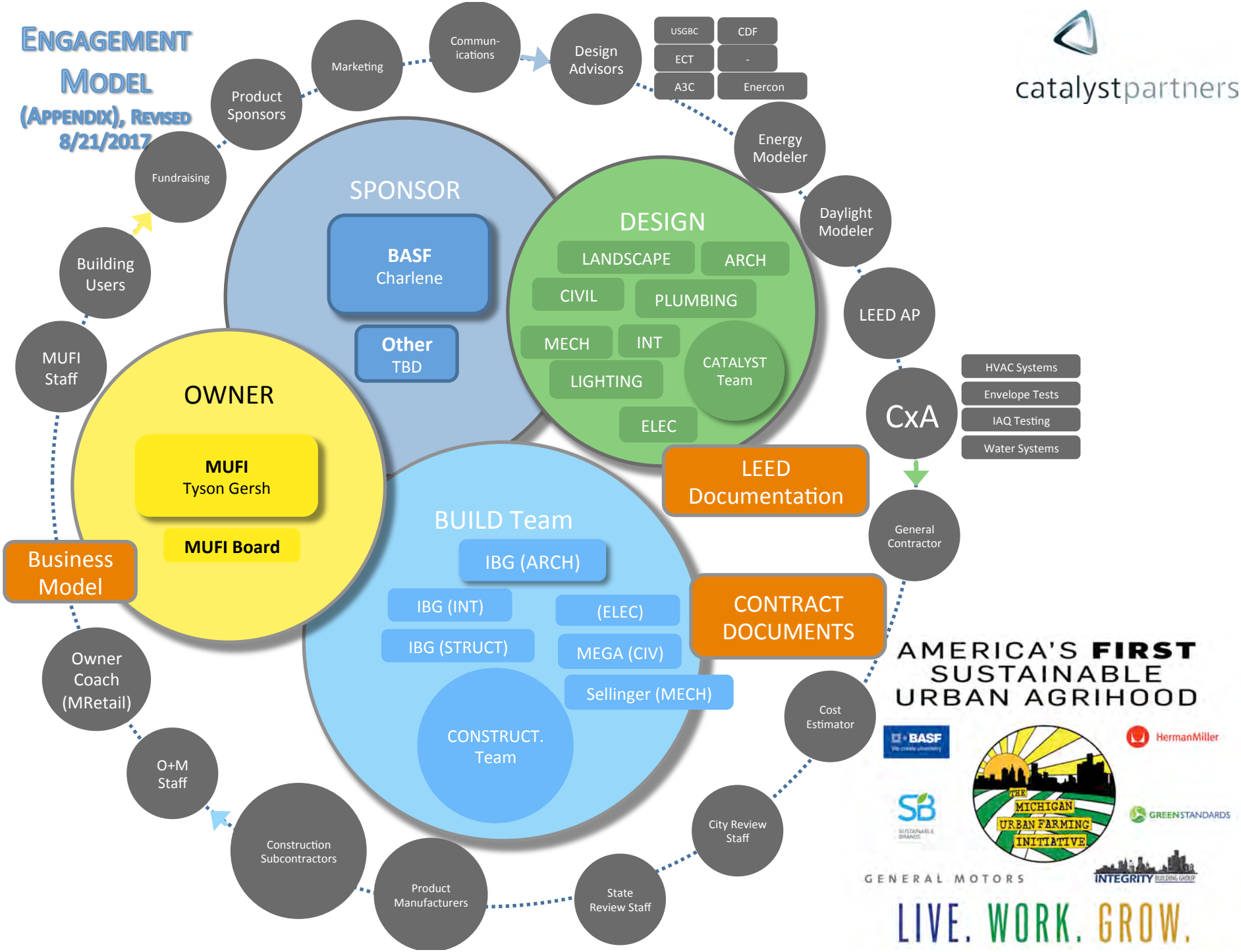


ENGAGEMENT MODEL (APPENDIX), REVISED 8/21/2017



INTEGRATIVE PRE-DESIGN

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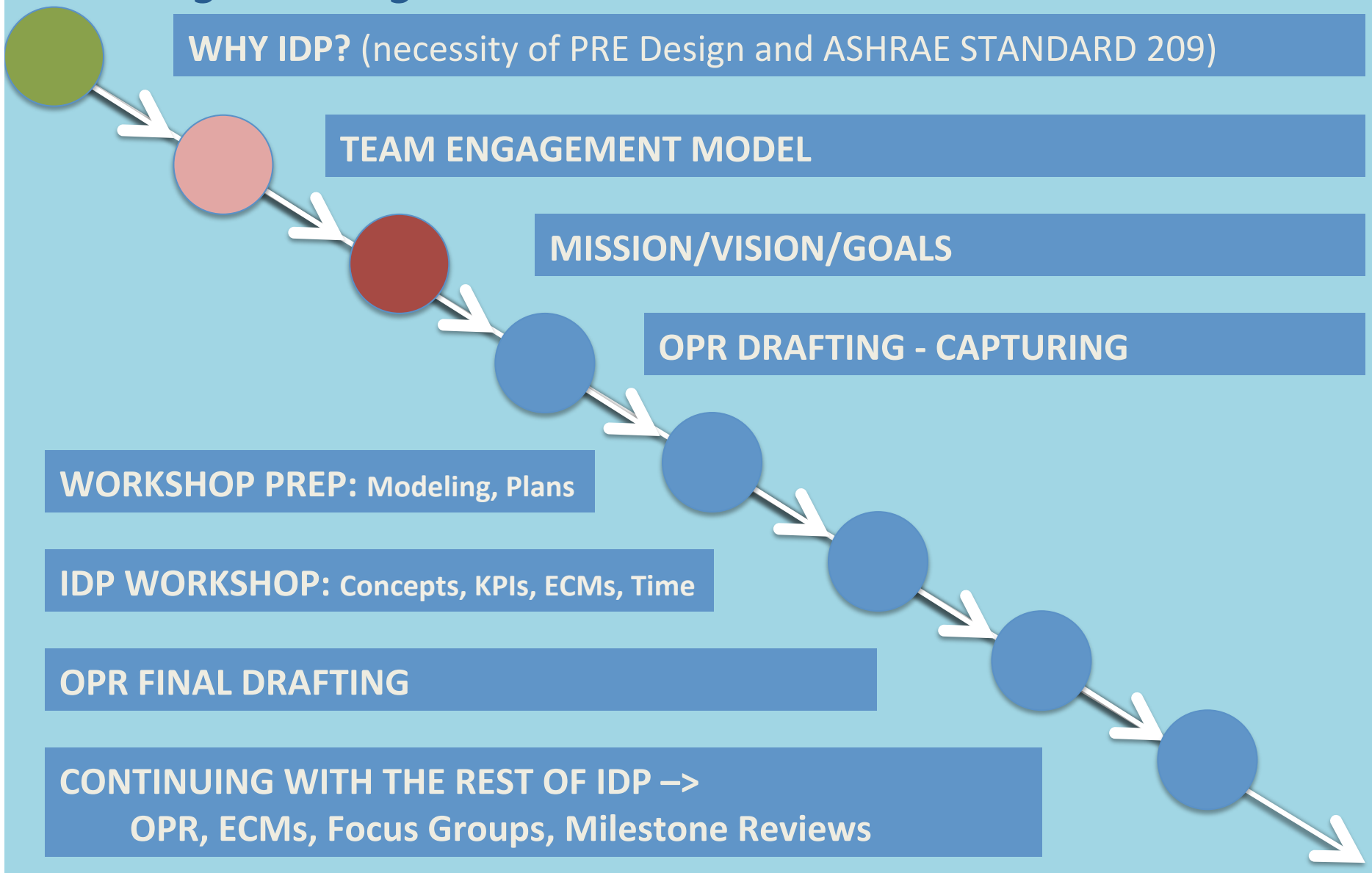


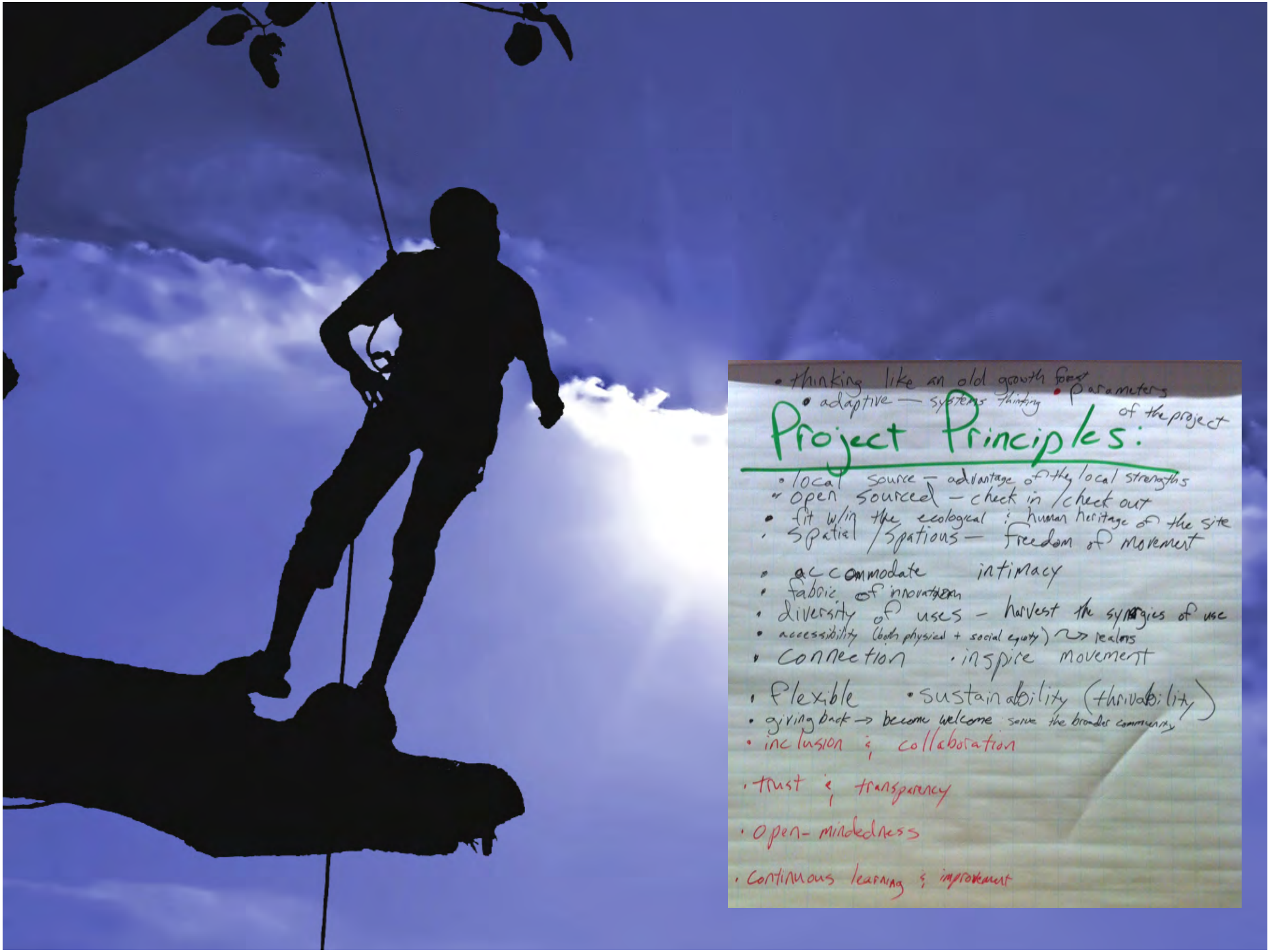
MISSION

Flickr photo by jurvetson

VISION

Flickr photo by sittered

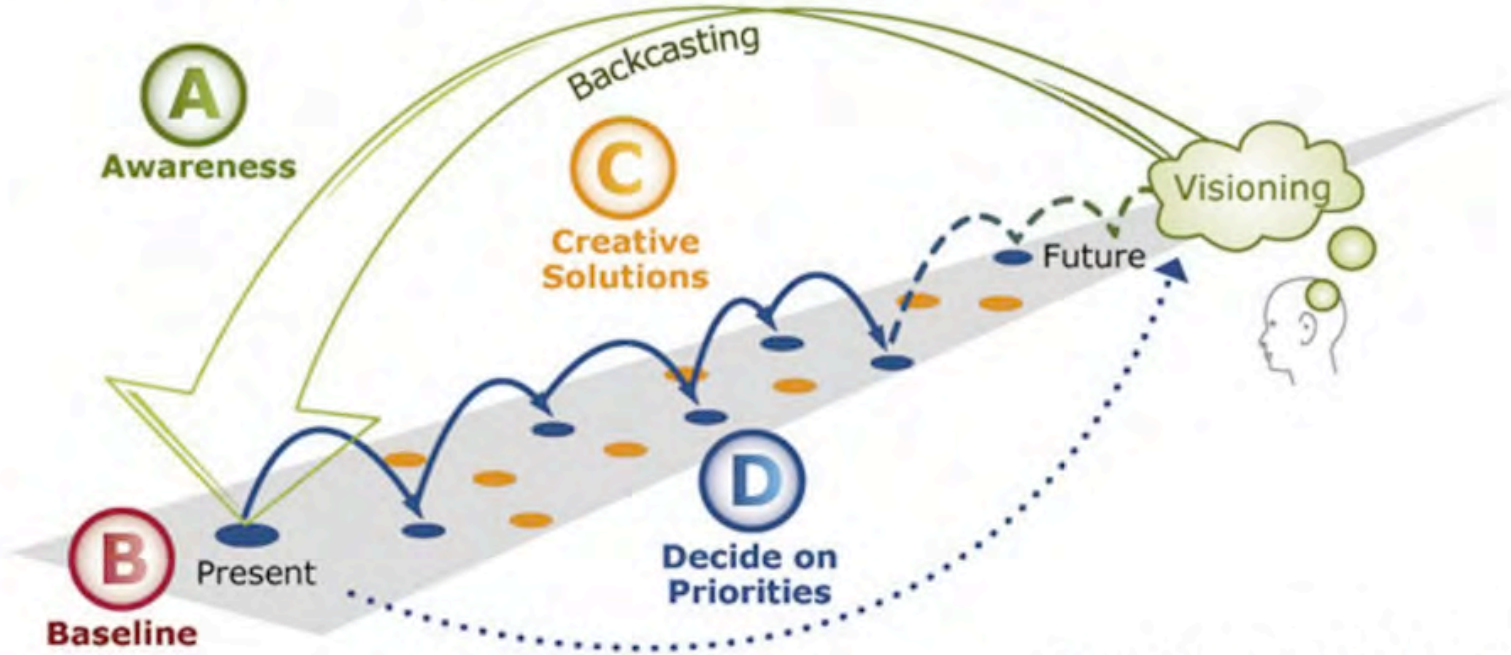
Flickr photo by rpongsaj


• thinking like an old growth forest
• adaptive — systems thinking
• parameters of the project
Project Principles:
• local source — advantage of the local strengths
• open sourced — check in / check out
• fit w/in the ecological & human heritage of the site
• spatial / spatious — freedom of movement
• accommodate intimacy
• fabric of innovation
• diversity of uses — harvest the synergies of use
• accessibility (both physical + social equity) → realms
• connection • inspire movement
• flexible • sustainability (thrivability)
• giving back → become welcome serve the broader community
• inclusion & collaboration
• trust & transparency
• open-mindedness
• continuous learning & improvement

Preparation

Flickr photo by Stacy Spensley

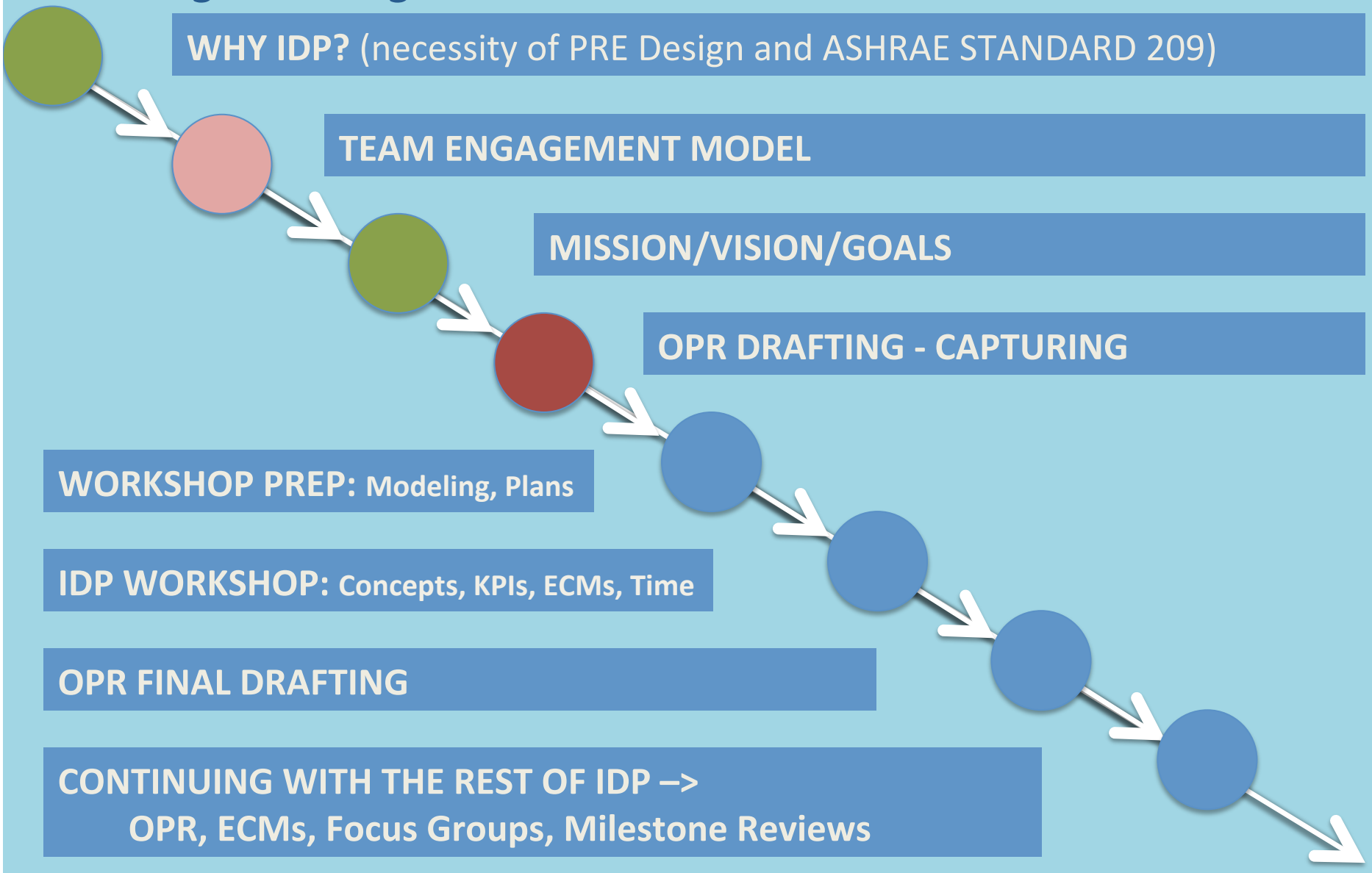
TOOLS LEVEL - ABCD PLANNING PROCESS



Does it move us in the right direction?
Is it a flexible platform?
Is it a good return on investment?

INTEGRATIVE PRE-DESIGN

> Pulling it all together now <



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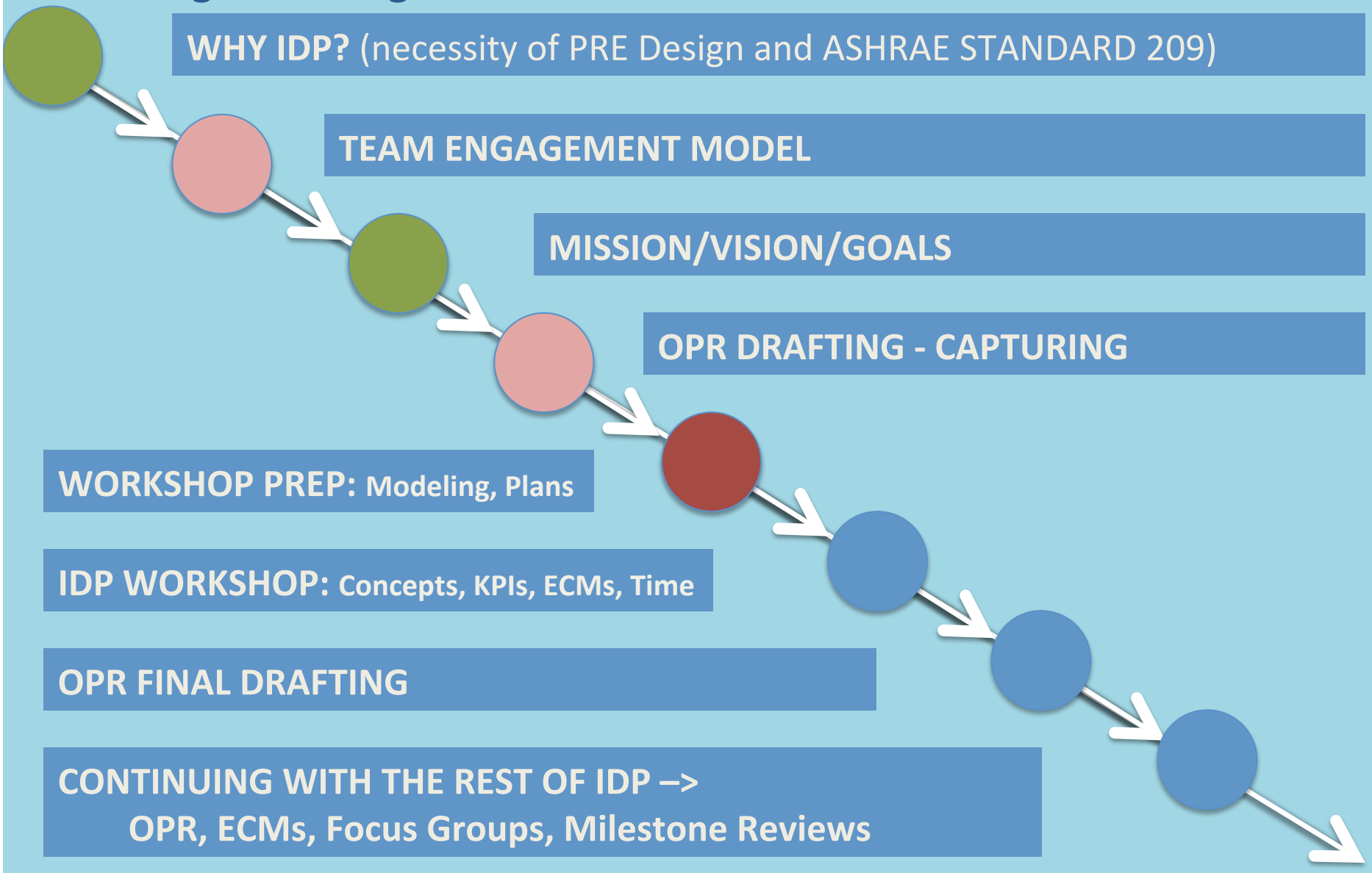

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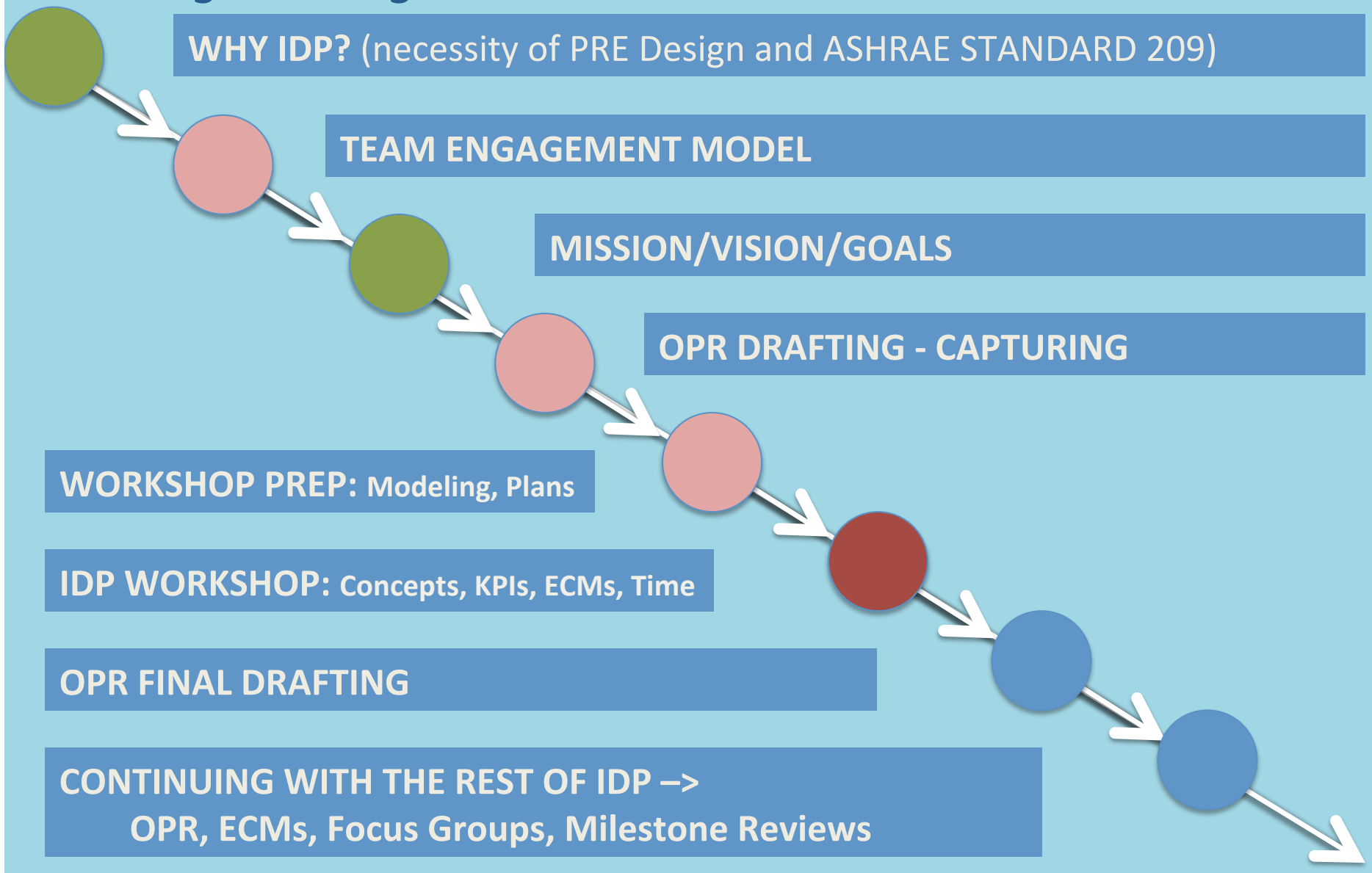

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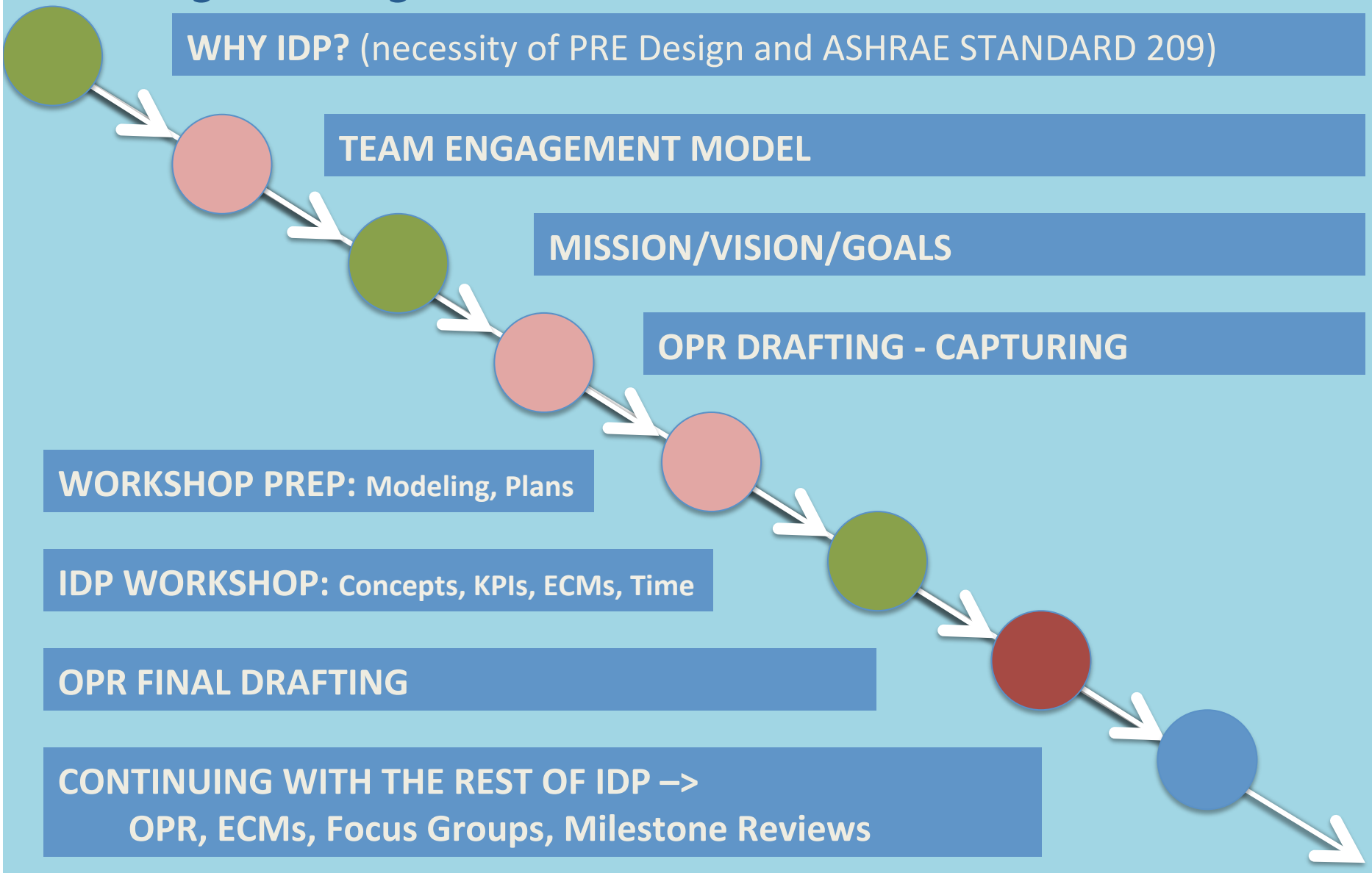

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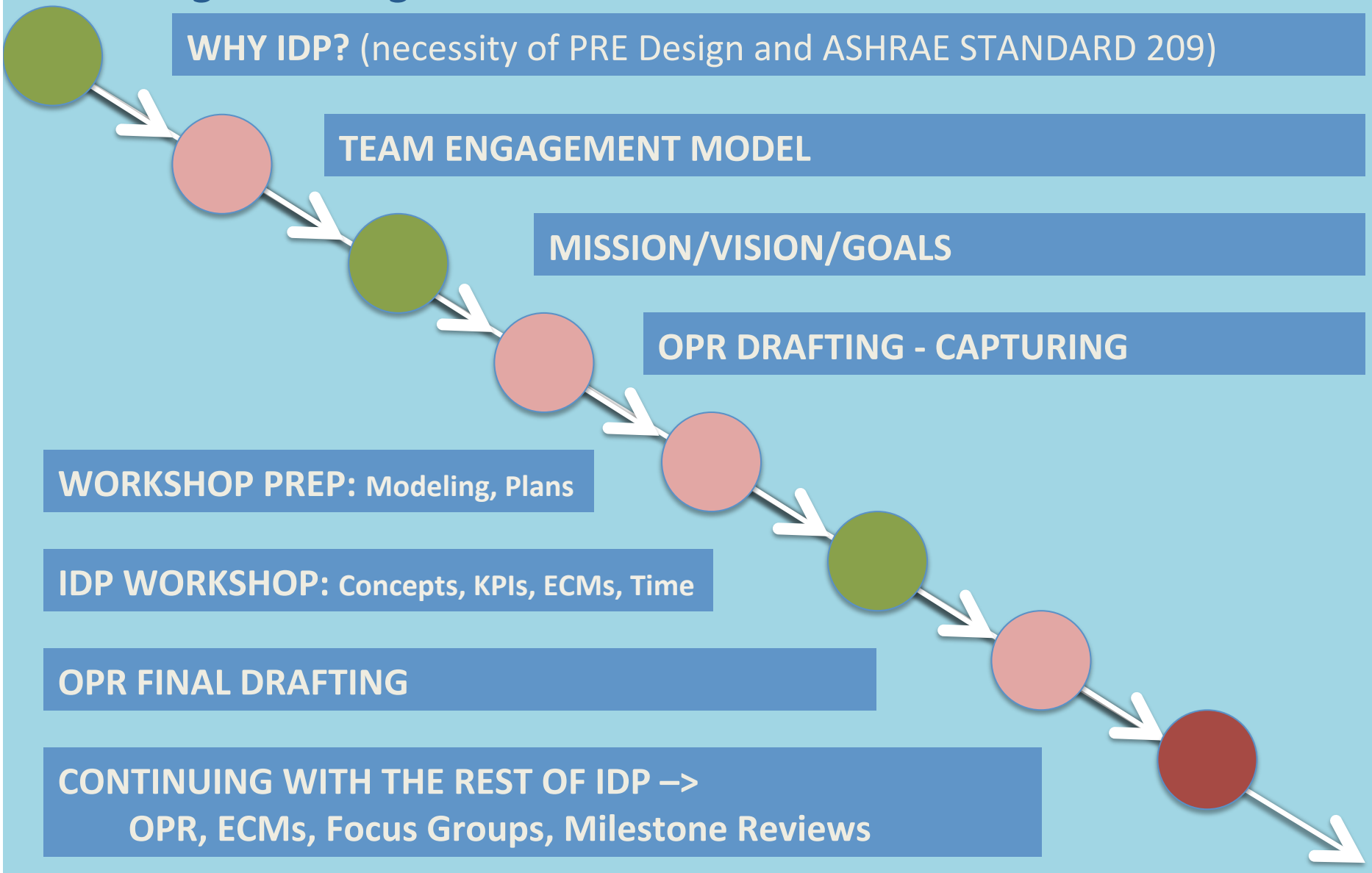
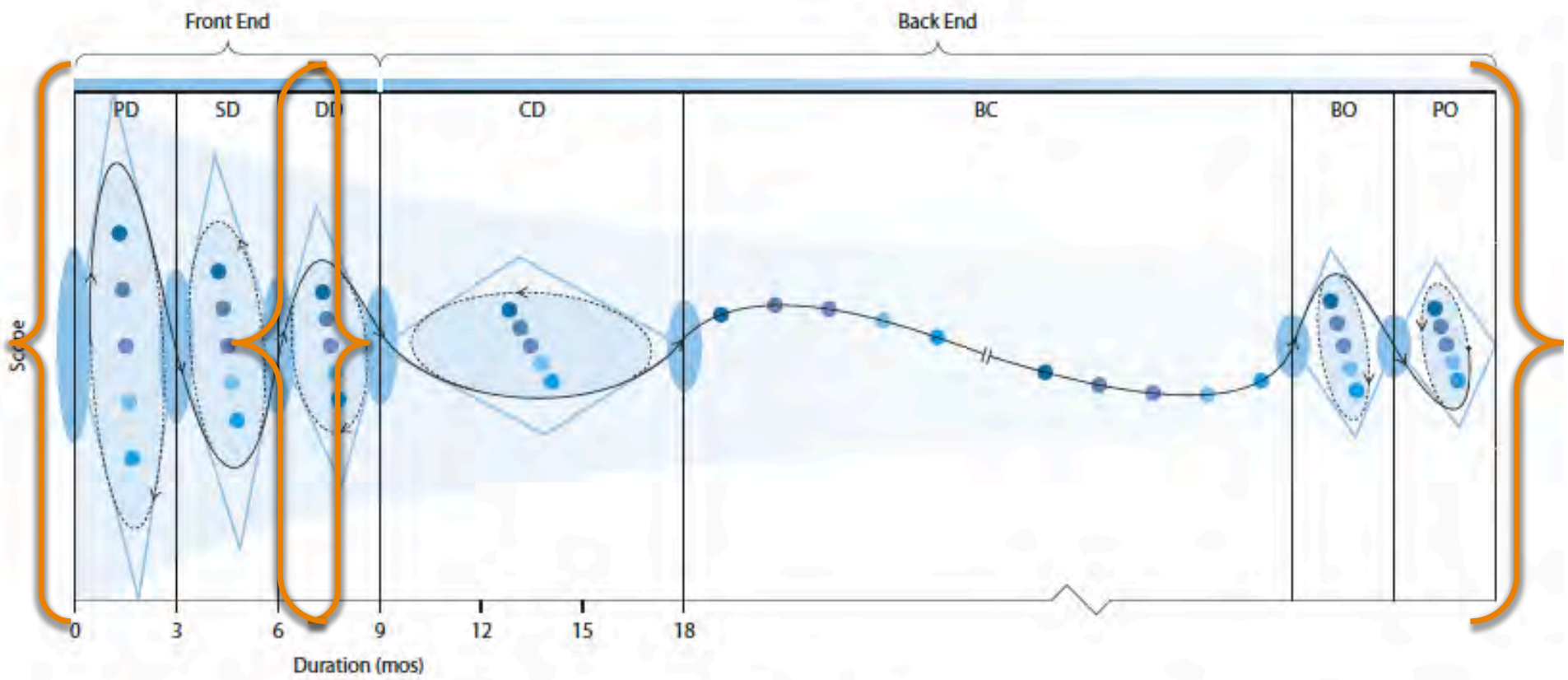


ENERGY CONSERVATION MEASURES (ECMs)

> Moving into more iterations <

- Building orientation/massing
- Percent Glazing/Layouts
- Glazing Frame/Glass
- Roof/Wall/Floor Insulation
- Lighting Power Densities
- Lighting/Daylight Controls
- Exterior Lighting Alternatives
- Mechanical System Types
- Mechanical Efficiencies
- Motor Efficiencies
- Variable Speed Drives
- Energy Recovery
- Ventilation Alternatives
- Thermal Storage
- On-site Renewable Energy
- Green Power
- Utility Types, Fuels, Rates, District Energy, etc.



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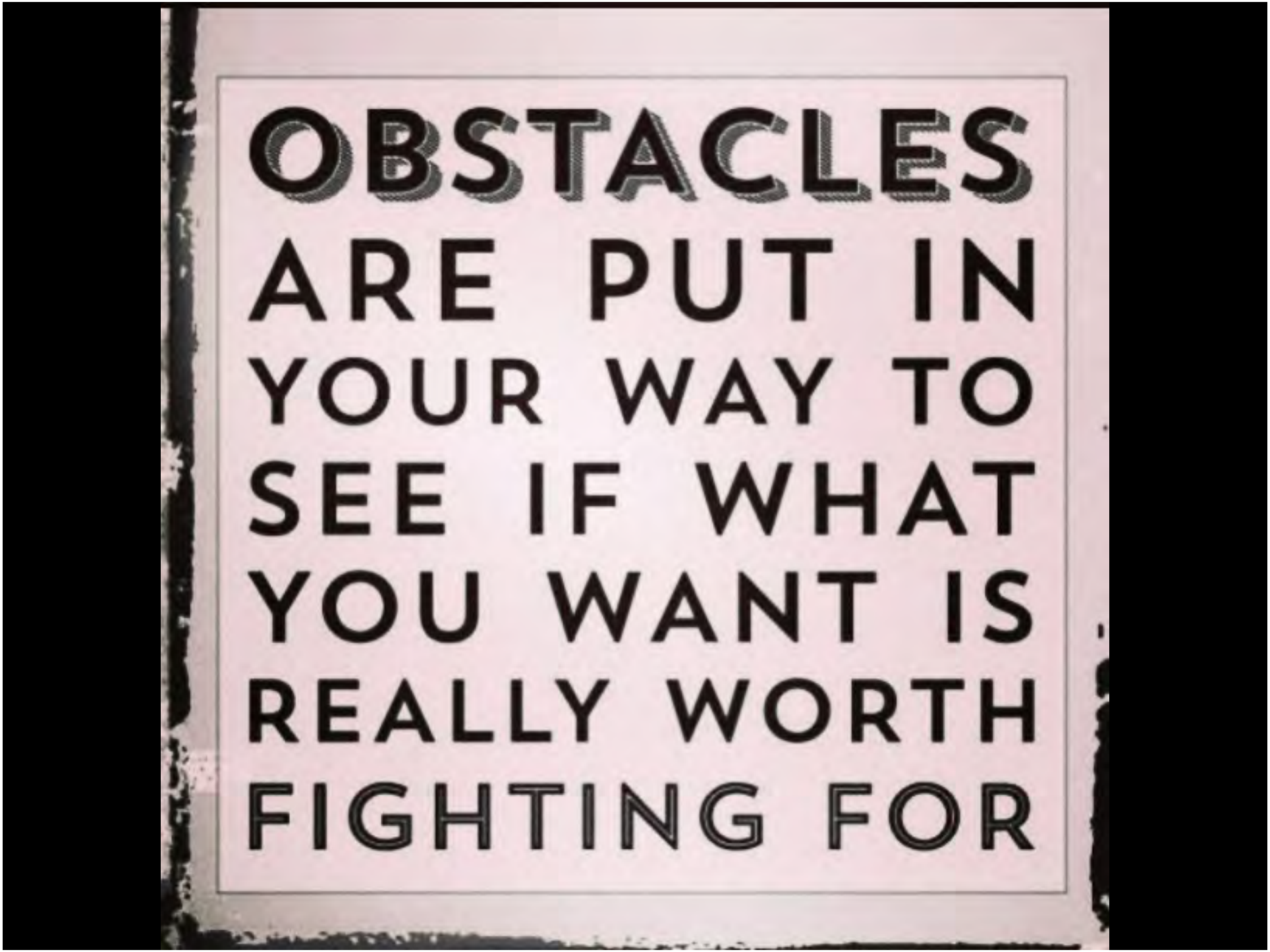
CONTINUOUS IMPROVEMENT
CONTINUOUS IMPROVEMENT
CONTINUOUS IMPROVEMENT

OBSTACLES


OBSTACLES
ARE PUT IN
YOUR WAY TO
SEE IF WHAT
YOU WANT IS
REALLY WORTH
FIGHTING FOR

"I believe that it is perfectly possible for an individual to **adopt the way of life of the future**...**without having to wait** for others to do so. And if an individual can observe a certain rule of conduct, cannot a group of individuals do the same? Cannot **whole groups of peoples** - whole nations? No one need wait for anyone **else to adopt a humane and enlightened course of action**." ~M.K. Gandhi

Today's buildings must do more!

&

the Change Agents must lead

Leadership

https://www.youtube.com/watch?v=hO8MwBZl-Vc

INTEGRATIVE PREDESIGN

The Risky Business of Integrative Pre-Design

THANK YOU!

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