Energy-Saving
HOMES, BUILDINGS, & MANUFACTURING

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Privatizing QA in Home Performance

Opportunities, Options & Opinions

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HOME PERFORMANCE WITH ENERGY STAR

Agenda

- Introduction and discussion of terminology
- Inspection vs. system based quality assurance
- Dealing with non-conformancies
- Context for quality: HPwES and other industries
- The cost of quality
- HPwES v1.5 QA approaches:
  - Quality Control Based Approach
  - Quality Management System Based Approach

Introduction

Home performance programs often discuss quality, but do we really know what we're talking about?

- What do we mean?
- Who is/are our customer(s)?
- What is our commitment?
- How do we manage our systems?
  - Do we have a system?
- How do we use information?
- The cost, man, what is the cost?

Six Sigma

Standards

QA

ISO 9001

SPC

Zero Defects

QC

QMS

Customer Satisfaction

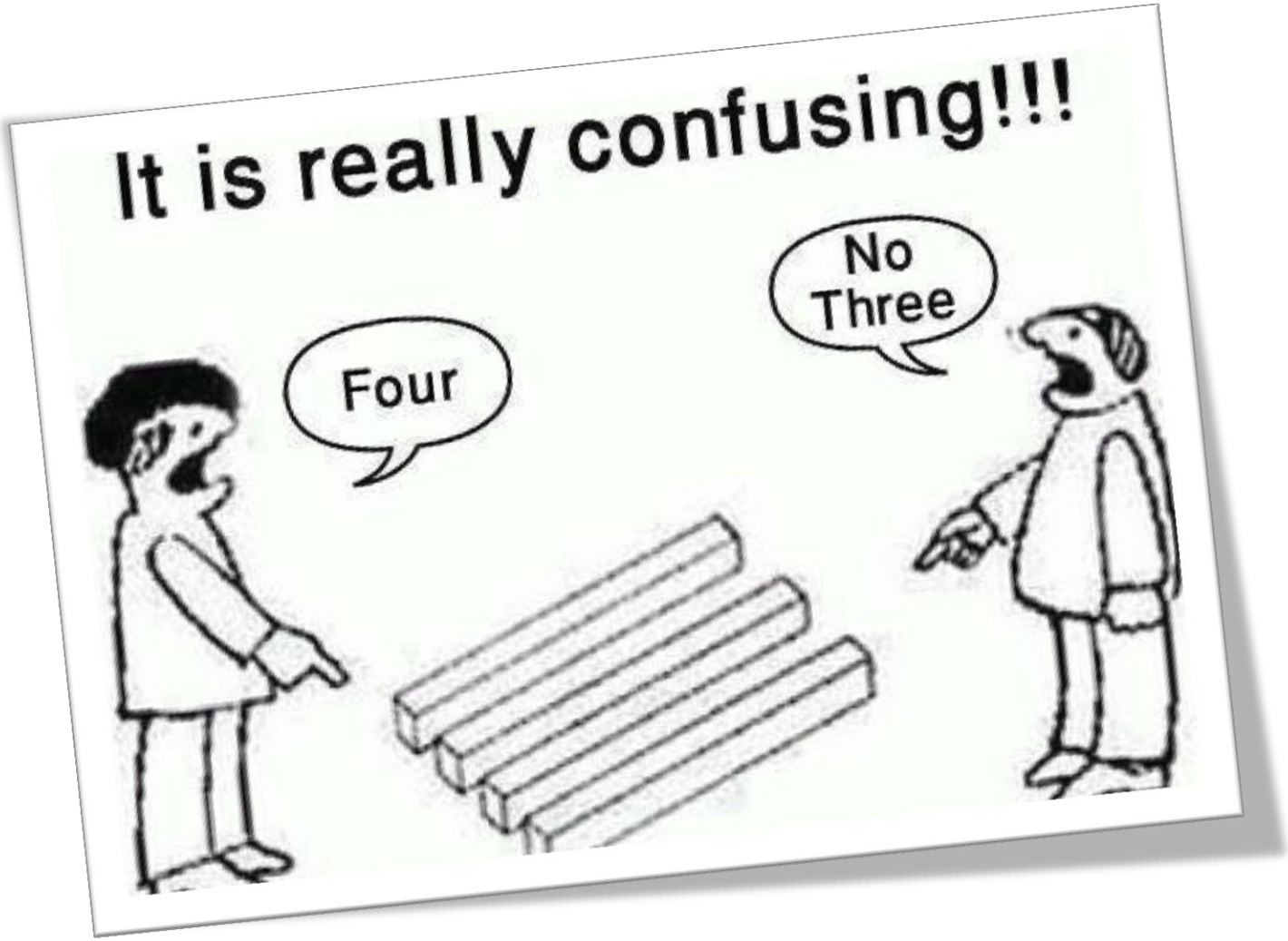
Brief Discussion of Terms

- Quality
- QC
- QA
- QMS
- Standards
- Customer Satisfaction

Quality

- ANSI/ISO/ASQC: *the totality of features and characteristics of a product that bear on its ability to satisfy given needs*
- Others:
  - Fitness for use or function
  - Degree to which a product conforms to design specifications
  - Providing products/services which meet customer expectations over the life of the product/service at a cost that represents customer value
- John Tooley - Doing work to agreed upon standards and requirements
  - **Must meet all desired outcomes and objectives that result in products and services that meet what customers and funders want, need, expect and are willing to pay for.**
- Mercedes vs. Hyundai

Quality



Conventional Thinking vs. Reality

Conventional Thinking	Reality
Quality is defined as goodness, and is therefore a vague concept	Quality is defined as conformance to requirements, and therefore is very specific
Quality is achieved through inspection, testing, and checking	Prevention is the only effective means to achieve quality
Performance standards should describe acceptable quality levels (or, “that’s good enough”)	Performance standards must be specific (e.g. “error free,” or “zero defect”)
Quality should be measured by indices and comparisons	We should calculate and quantify the price of non-conformance

Reference: Philip B. Crosby, “Quality Without Tears”

Defining Quality

Quality is defined as <u>conformance to the requirements</u>.

Relationship to HPwES:

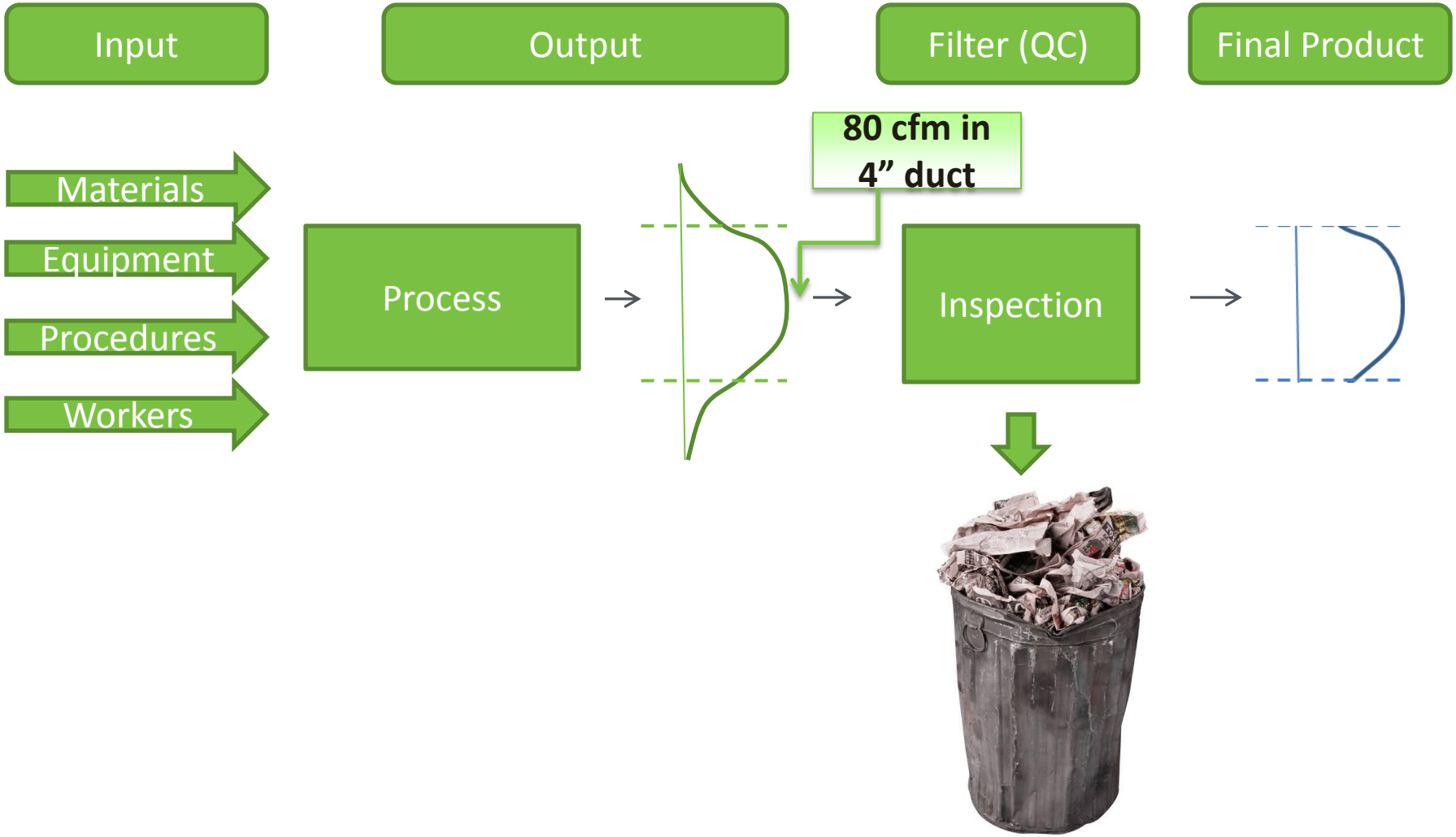
- Industry establishes technical requirements through published standards
- Government and regulatory bodies establish program goals and measurement criteria
- HPwES Sponsors establish program rules
- Contractors establish internal work requirements and procedures
- Customers define their own terms for satisfaction

Quality Control vs. Quality Assurance

- Quality Control (QC)
  - Product centered
  - Activities used to fulfill requirements for quality
  - Inspection aspects

- Quality Assurance (QA)
  - Process centered
  - Activities used to provide confidence that a system will provide products fulfilling requirements for quality
  - System aspects

Inspection-Based Quality



Inspection ≠ Quality

Prevention is the only effective means to achieve quality.

Relationship to HPwES:

- Inspections verify conformance but do not improve quality.
- Retroactive repairs, re-inspections, and re-training are expensive and may adversely impact customer satisfaction and contractor morale.
- Instilling a culture of quality at every level reinforces individual accountability and minimizes defects, the need for post-work verification and re-work.
- **Prevention is something we know how to do if we understand the process.**

We can do better

If this sounds familiar…

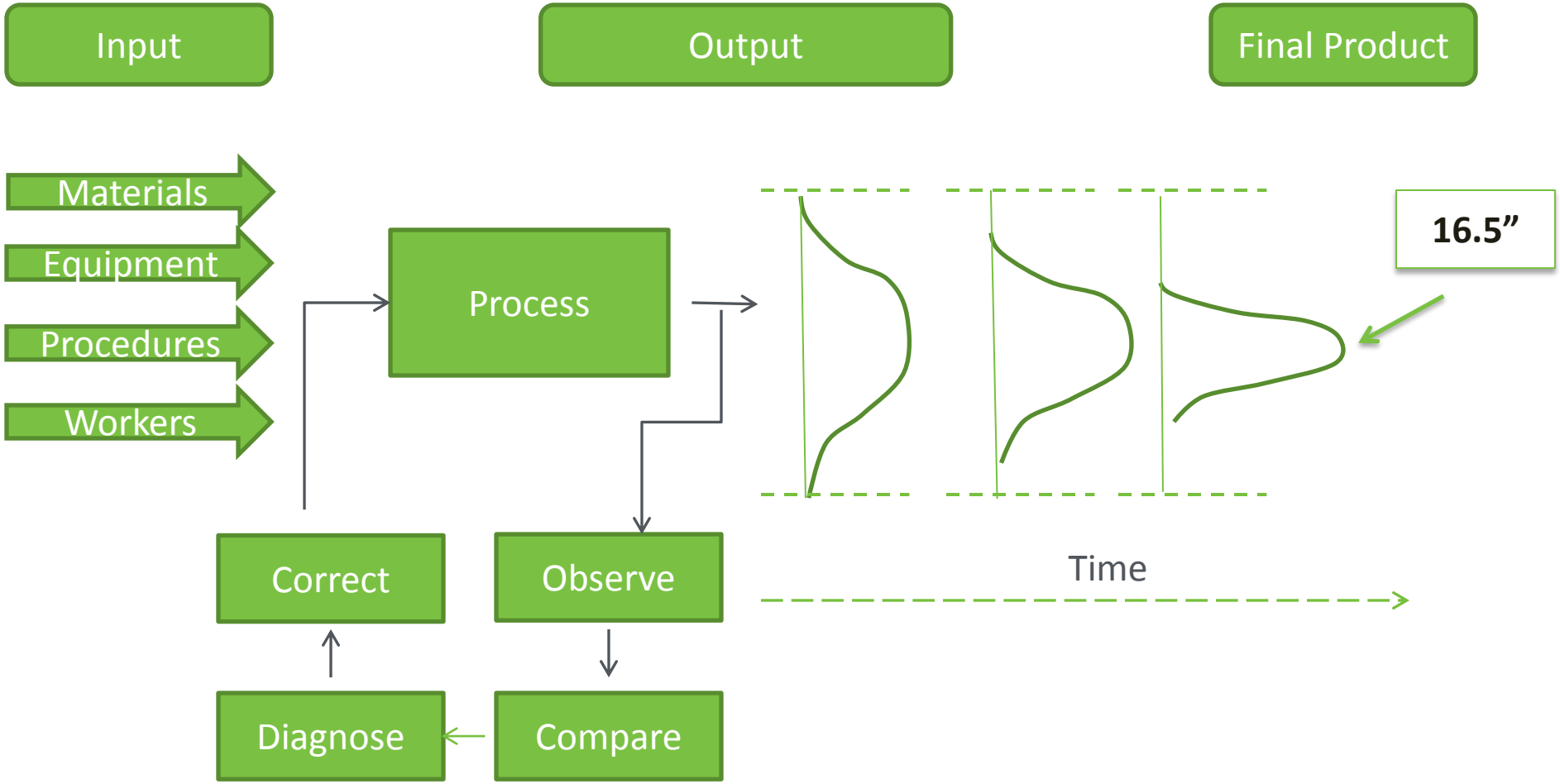
- Your program or company has an extensive field service network skilled in re-work and resourceful corrective action to keep the customer satisfied.

… then you need to know this:

- Appraisal is an expensive and unreliable way of getting quality.
- *Prevention is something we know how to do if we understand the process.*

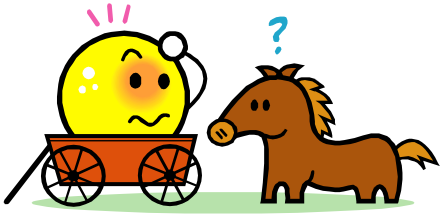
If you are too busy mopping the floor to turn off the faucet, it might be time to re-think the approach.

System-Based Quality



Specifications, Standards, and Customer Satisfaction

- **Standards** are typically developed by some authority which guides practice or product/service specifications
- **Specifications** are parameters under which a product/service is designed or goal for performance
- **Customer satisfaction** should guide the use or frame the basis for standards and specifications – ***commonly the opposite is attempted***



Zero Defect Mentality

Performance standards must be specific.

Relationship to HPwES:

- Performance metrics that include failure tolerances invite a “good enough” mentality.
- Error free performance occurs only when everyone takes personal responsibility for delivering zero defect products and services.
- Checks occur at the time of the work, defects are repaired upon detection, defects and repairs are documented along with final defect-free results.
- Defect reports are reviewed to determine the root cause and inform process improvements.

Context for Quality

- Programs
  - Customers may be ambiguous (homeowners, utility commissions…)
  - Maintain integrity
  - Desire to keep administrative costs down
- Trade Associations
  - Customers better defined
  - Maintain integrity
  - Costs often subsidized by fees or memberships
- Product Manufacturers
  - Customers more defined still
  - Reduce liability/increase market share & profitability
  - Costs assumed by manufacturers or subsidized by installers

Context for Quality

- Trade Contractors
  - Customer is both program and homeowner
  - Reduced liability/increased market share & profitability
  - Cost is assumed by the contractor
- Homeowner
  - S/he is the customer
  - Want the best product/service for the least price
    - Customer may not know what they need
  - May feel burdened by site visits and surveys

Types of Auditors (or Parties)

- **First-Party:** homeowner evaluates job to judge compliance to specifications, processes, and procedures

- **Second-Party:** contractor audits the job to compliance to specifications, processes and procedures

- **Third-Party:** an organization completely independent from the contractor/homeowner relationship audits the job for compliance to specifications, processes, and procedures. This includes QA providers contracted by the program

Context for Quality

- DOE perspective
  - Address key elements
  - Auditable by DOE/implementation contractor
  - Flexible for programs
  - Cost effective
  - Results oriented
  - Saves money

How Much Does it Cost?

The cost of non-conformance represents the value of quality.

Relationship to HPwES:

- The cost of our traditional approach to QA is high and does not necessarily result in improved performance over time
- Detected defects can be repaired but those repairs add to costs
- Undetected defects result in hard to measure but significant impacts like poor customer satisfaction, poor energy savings realization rates or other missed metrics
- Integrated QMS costs money to establish but reduces all defects over time

"If you don't have time to do it right, you must have time to do it over."

Examples from the Industry

- Trade Associations
  - BPI – Accredited contractors and ISO-9001 materials
  - RESNET – Provider network & EnergySmart Contractors
  - ACCA – Standards 4, 5, & 9: HVAC Quality Maintenance, Installation Specifications, and Verification Protocols respectively
  - NAHB – NHQA, NHQ Trade Contractor Quality Assurance System
- Product Representatives
  - Air Barrier Association of America
  - Insulation (Certainteed, Dow, etc)

- EPA's HVAC Quality Installation Program

Examples From Industry

<u>HUD Building Products Standards and Certification Program</u>

- Post-WWII effort to address new and innovative products going into housing (currently FHA or VA loans)
- Program specifications for some building products have not kept pace with changing industry specifications (e.g. treated lumber, structural panels, etc.)
- Many product manufacturers still belong to this legacy program, resulting in conflict between HUD spec's and their own
- **This is an example of a quality system that is disconnected from the customer's current needs**

Examples From Industry

Wathen-Castanos Hybrid Homes (Fresno, CA)

- Worked with IBACOS to implement QMS approach to quality
- While competitors sought to cut costs in new homes market downturn by cutting prices, down-grading specifications, and down-sizing, WCHH saw an opportunity to work more efficiently using QMS principles without sacrificing performance or quality
- Measurably improved customer satisfaction ratings, referral rates, and reputation as a good trade partner, and received NHQA recognition

*(refer to article published in **Home Energy Magazine** for more details on this project)*

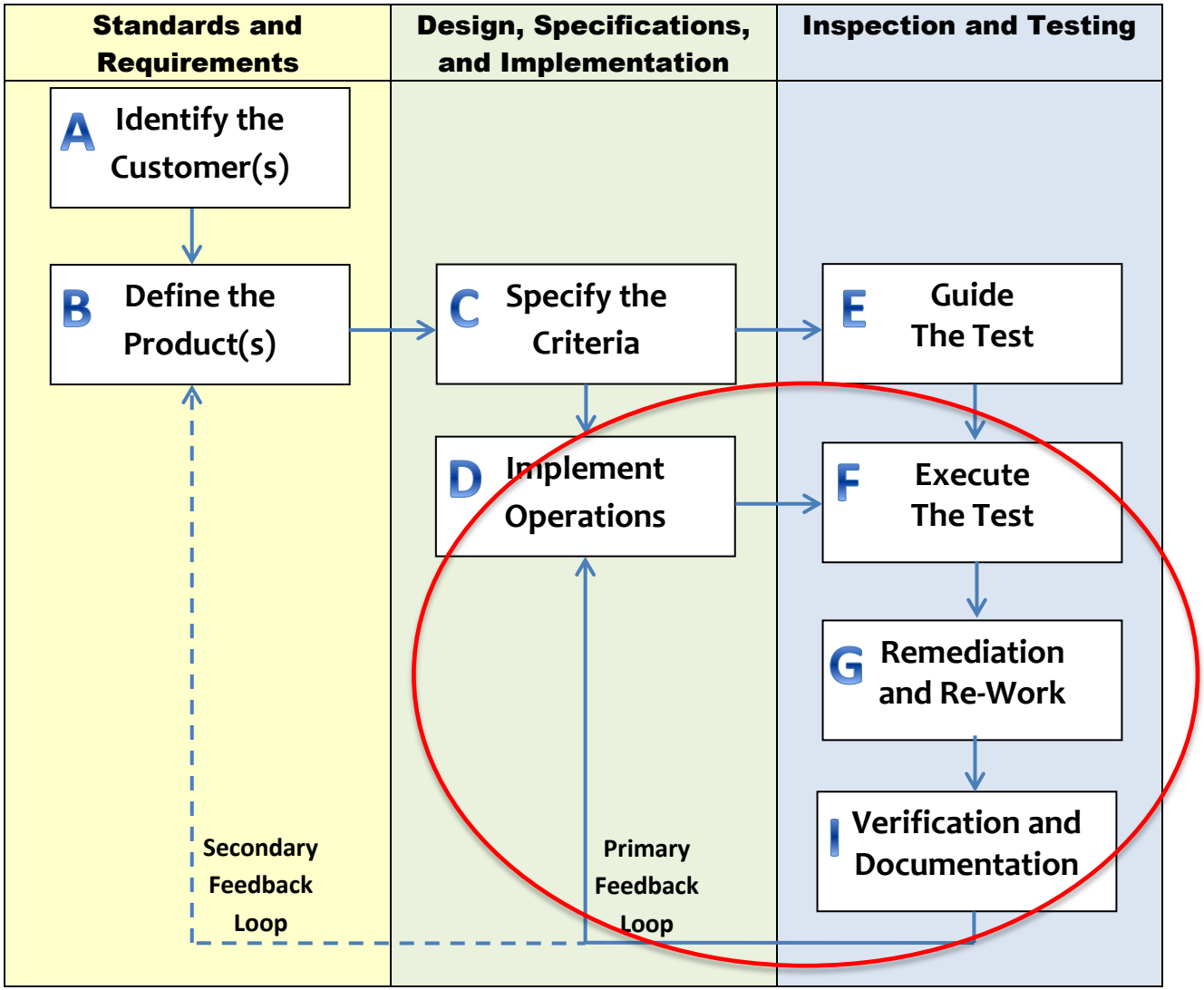
A Typical HP Program Approach to QA

- Third-Party (or maybe fourth-party) providers may offer:
  - Inspection services
  - Data tracking and reporting of deficiencies detected
  - Post-repair re-inspection
  - Grading of results (contractor scoring, whether results are within error tolerances, etc.)
  - Enforcement of remedial and/or punitive actions (for instance, suspending or revoking a contractor's status within the QA program)

Model Quality System for the HP Industry

- **Roles** – what are the key positions or individuals, by organization responsible for the functions within the quality system?
  - Specifications, Policies, Operational Procedures
  - Communications
  - Training
  - Auditing
- **Responsibilities** – for each role listed above, what are the responsibilities (and to whom) in context of the quality assurance system?
- **Costs/burdens** – identify the costs for implementation by stakeholder. Inequities as to burden versus benefit must be addressed.
- **Benefits** – who gains by implementation of a quality assurance system?

QC-Based Approach

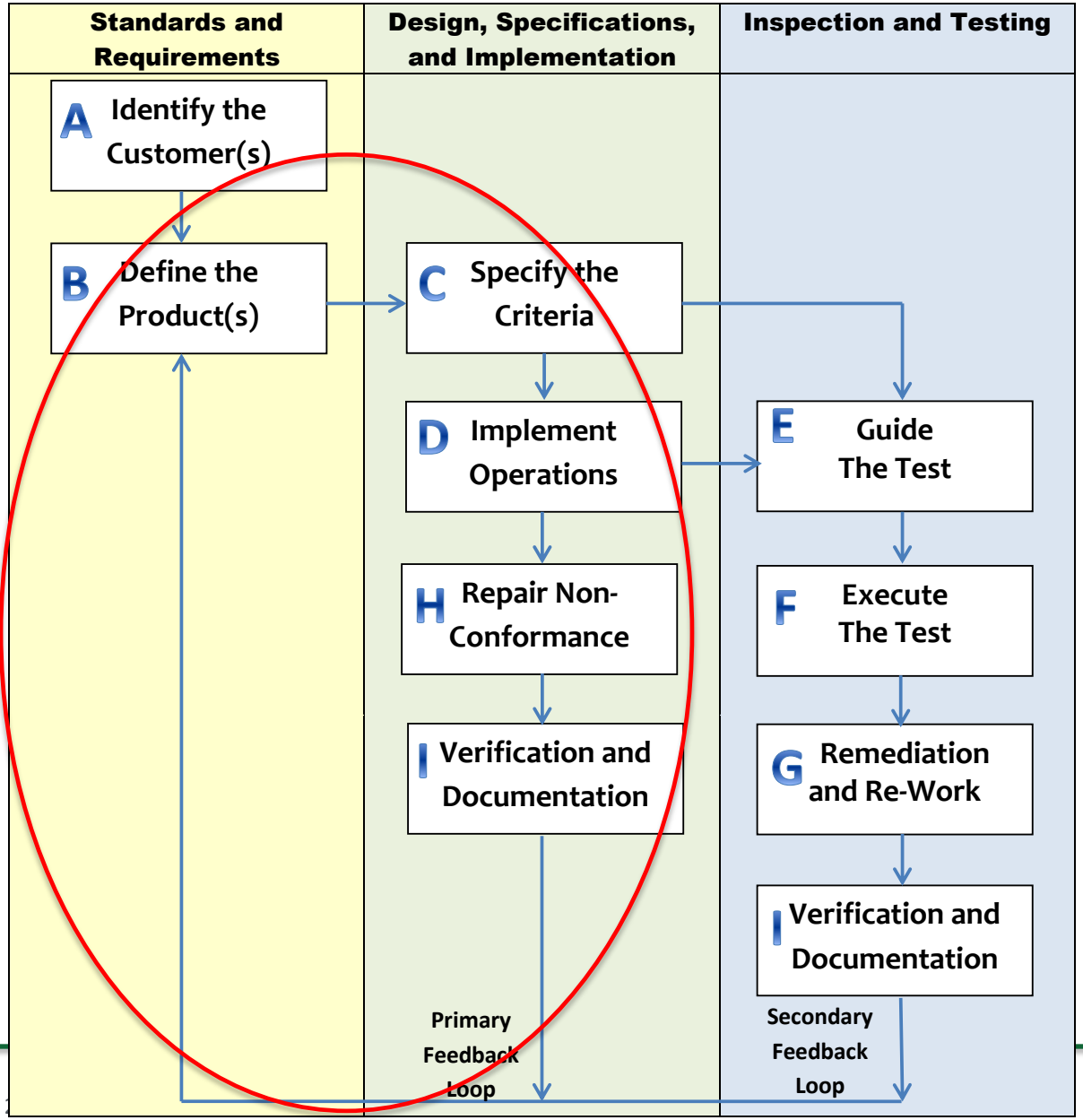


The primary QA feedback loop occurs within the red oval.

The majority of QA resources are spent within this loop.

The opportunity for QA results to impact overall process improvements is limited.

QMS-Based Approach



The primary QA feedback loop occurs within the red oval.

QA costs are distributed distributed to all supply chain actors.

Customer exposure to defects is minimized along with the need for inspection and testing.

QA feedback directly informs overall process improvements.

QC-Based QA System Pros and Cons

Option	Pro's	Con's
QC-Based	• Typical of what most programs are doing now • The majority of supply chain actors are minimally impacted so transition period is short once inspection staff is up and running • Fixed costs to the program are more easily compartmentalized and predictable	• Potentially high startup costs in planning, systems development, and training • Potentially high long-term fixed and variable costs in implementation, re-work, re-training, and remedial and punitive actions • Responsibility for quality lies primarily with the program Sponsor. Pass through to contractors is often limited to remedial and punitive actions. • Remediation and re-work become ingrained in the culture which can negatively impact morale

QMS-Based QA System Pros and Cons

Option	Pro's	Con's
QMS-Based	• Responsibility for quality is shared by all actors in the supply chain • Focus on prevention helps avoid customer exposure to defects • Zero-defect approach minimizes or eliminates the need for post-work remediation and re-work, resulting in reduced variable costs to the program in the long term • Offers a systematic approach to continuous improvement that becomes ingrained within the program culture	• Represents a paradigm shift for most programs • Potentially high startup costs in planning, systems development, and training • Requires buy-in at all levels of the supply chain from executive management to workers • Potentially long transition period

Challenges Facing Paradigm Change

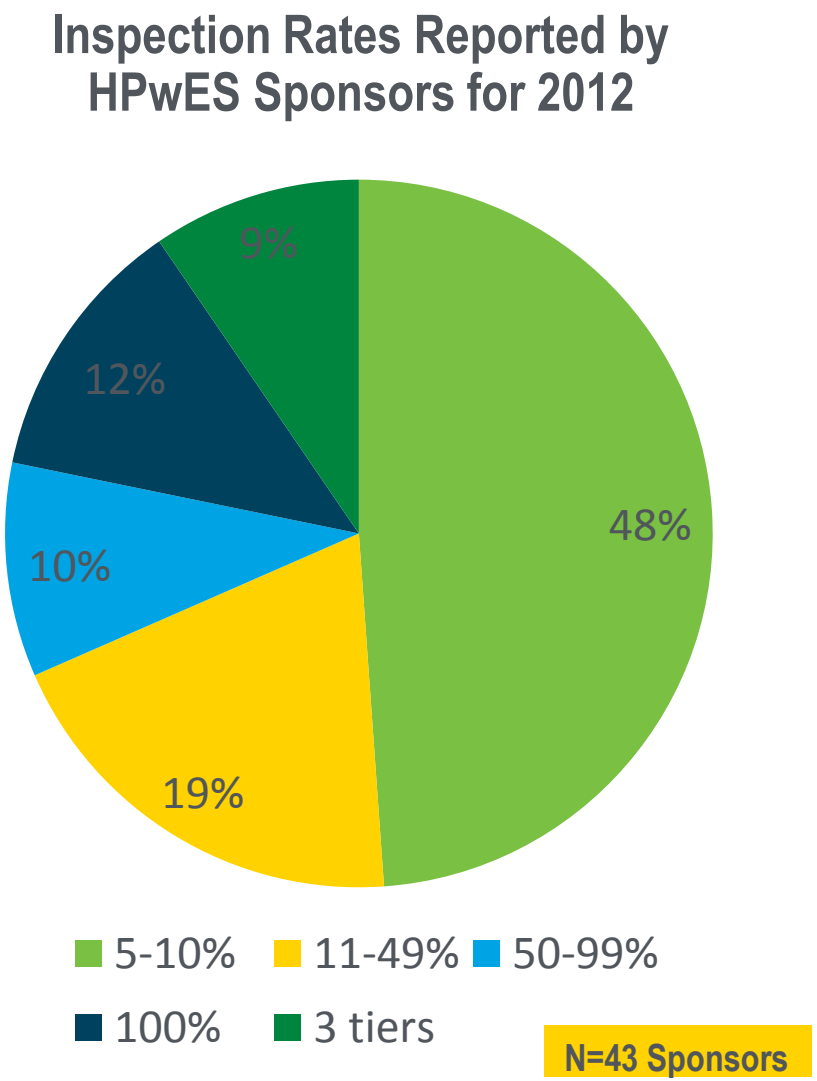
- Burdens/costs vs. who gains
  - Placing all burden on one sector typically not effective
  - True costs often disguised or not known
- Consistency vs. flexibility
  - Prescriptive approaches easiest but not always most efficient
  - Flexibility requires substantial planning and…
- Increased communication requirements
- Increased training requirements

"If you need a new process and don't install it, you pay for it without getting it."

-Ken Stork, *President of Customer Service*, **Citibank**

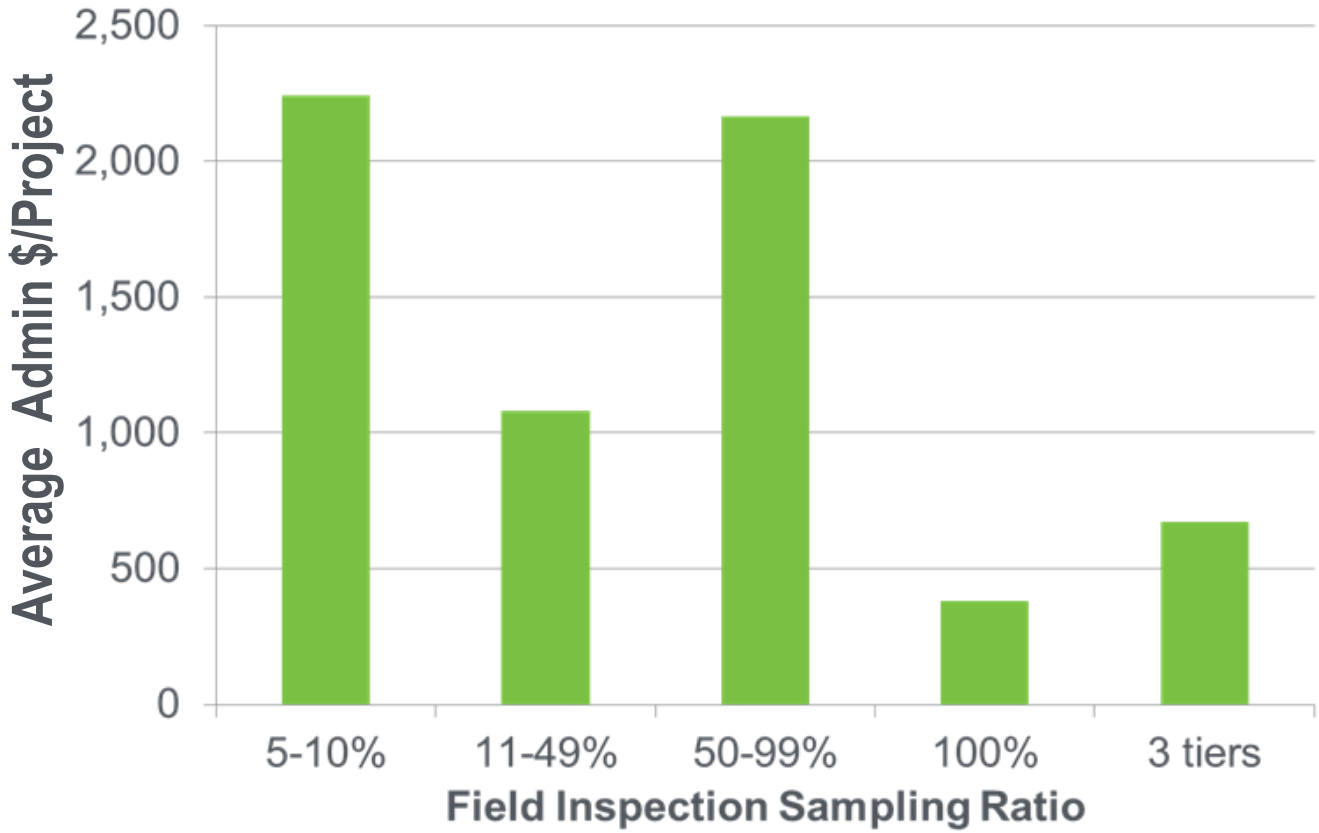
HPwES Data: Field Inspection Sampling Rates

- Not all programs can perform 100% inspection due to resource constraints
- Roughly 35% overall average inspection rate for all sponsors



Based on program data self-reported by HPwES Sponsors for 2012 production.

Avg Admin $/Project vs. Inspection Sampling Rates 2012



Preliminary data

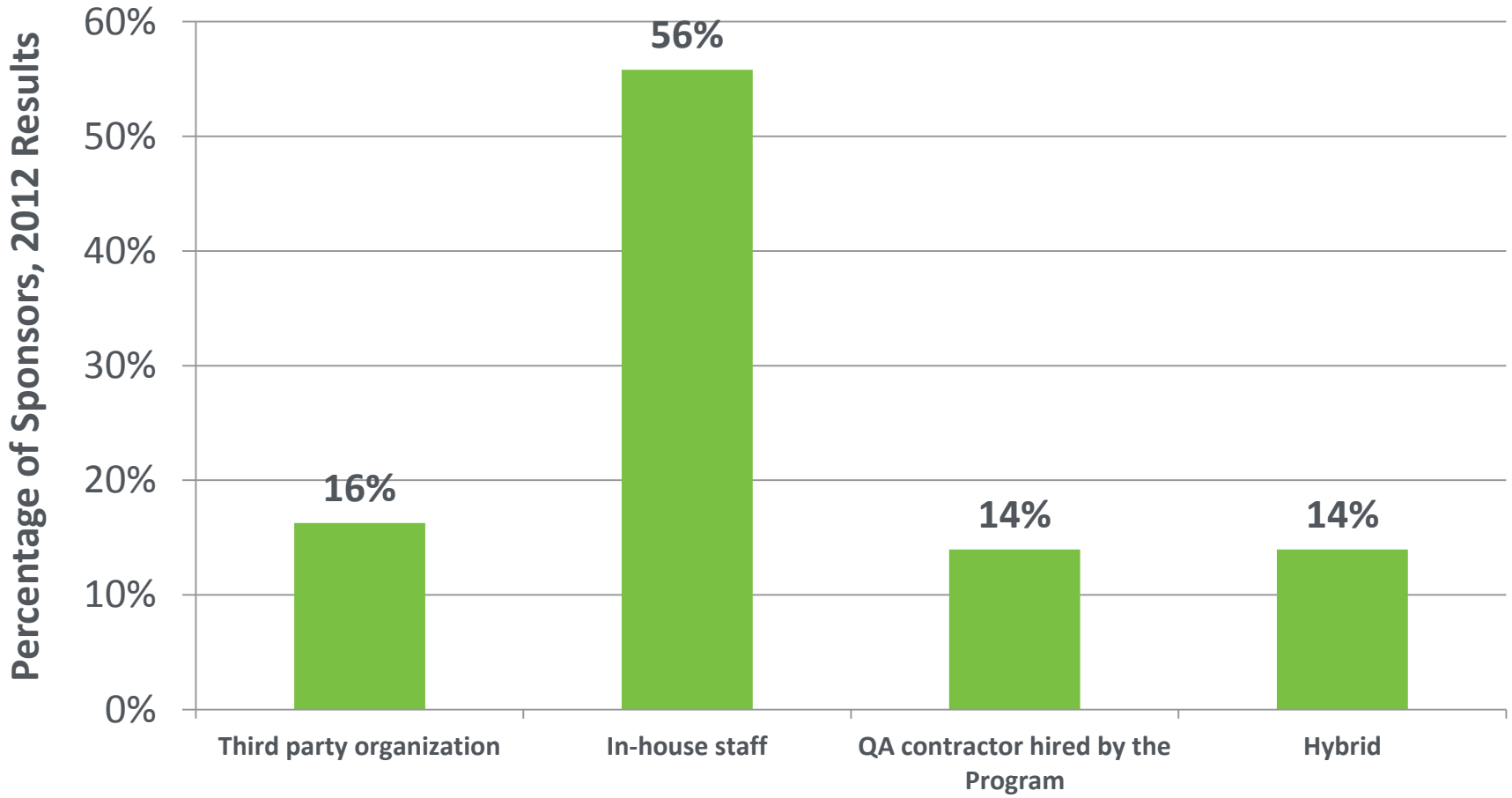
100% sampling rate represents a single Sponsor.

5-10% Sampling rate is representative of smaller programs in startup phase.

Based on total program administrative costs self-reported by HPwES Sponsors. May include marketing, administrative, QA and other costs.

N=43 Sponsors

Who Performs the Field Inspections? (2012 HPwES)



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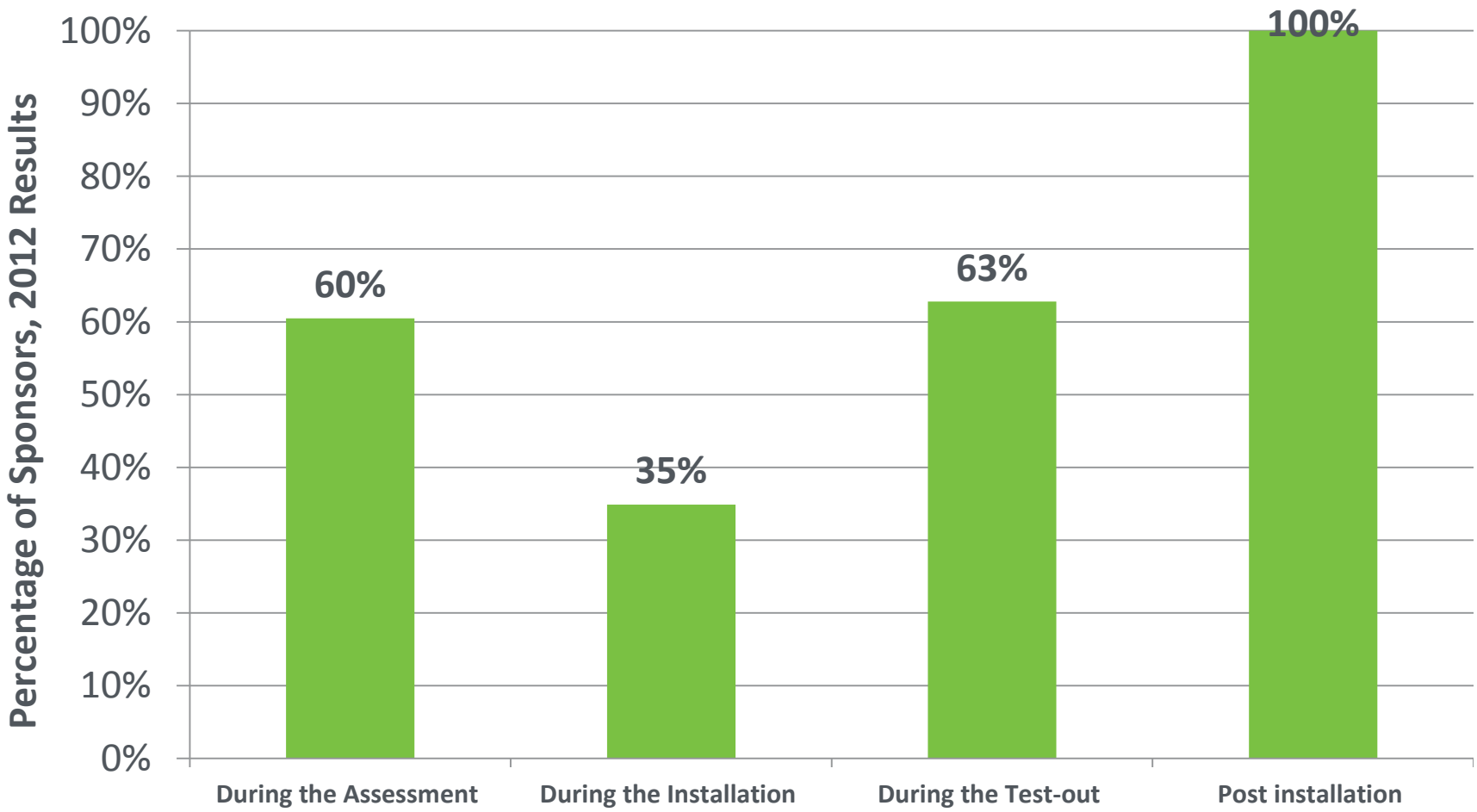
N=43 Sponsors

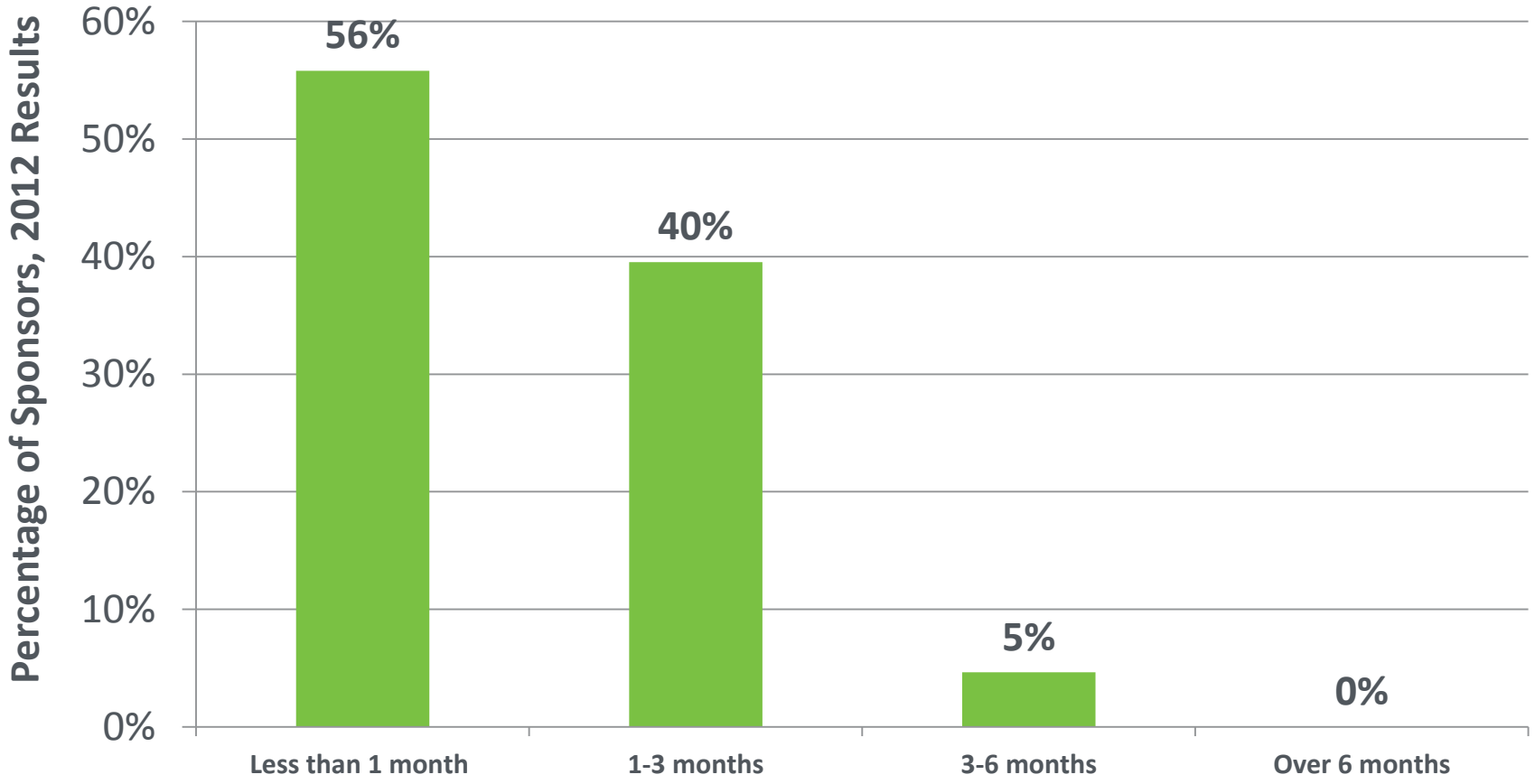
When Do Field Inspections Occur? (HPwES 2012)



Based on program data self-reported by HPwES Sponsors for 2012 production.

N=43 Sponsors

Timing of Post-Installation Field Inspections (HPwES 2012)



Based on program data self-reported by HPwES Sponsors for 2012 production.

N=43 Sponsors

DOE Steps

- Better defined processes and data requirements (HPwES v1.5)
- Define and describe baseline QMS elements
- Coordination with other internal/external programs (including EPA's HVAC QI)
- Stakeholder input
- Voluntary pilot projects with HPwES Sponsors
- Refine annual data collection tool for improved analysis of 2013 production year

For More Information

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