
2016 ECC CONFERENCE 48TH
TODAY
Tomorrow & Beyond
LEVERAGING LEADERSHIP, DIVERSITY AND INNOVATION
ECC

Strategic Issues Workshop
Improving Brownfield Projects

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Welcome

- Safety Moment
- Today’s Challenge
- Agenda Review

Safety Moment

Facility Safety Briefing

The Challenge:

- In today's capital constrained environment, Owners are looking for ways to leverage their assets with minimal capital investment. This has led to an increase in "Brownfield" Projects. However, Brownfield Projects involve issues and challenges not encountered on Greenfield Projects. At this year's ECC Conference, there is an added emphasis in identifying Best Practices in executing Brownfield Projects.

Background

- This workshop is an open forum providing a safe, non-commercial environment in which owners, engineering and construction contractors, and suppliers can freely exchange ideas and experiences to:
  - Improve mutual understanding
  - Debunk myths (perhaps) about Brownfield Projects
  - Identify shared experiences (good and bad) which have led to the development of Best Practices for executing Brownfield Projects

Agenda Review

- Brownfield Project Definition/Overview & Perceptions
- Improving BFPs
  - Project Charter & FEP Phases
  - Project Management Issues
  - Detailed Design & Technology Considerations
  - Construction Phase
  - Completion/Turnover Phase

Brownfield Projects Overview

Hunter Mayo

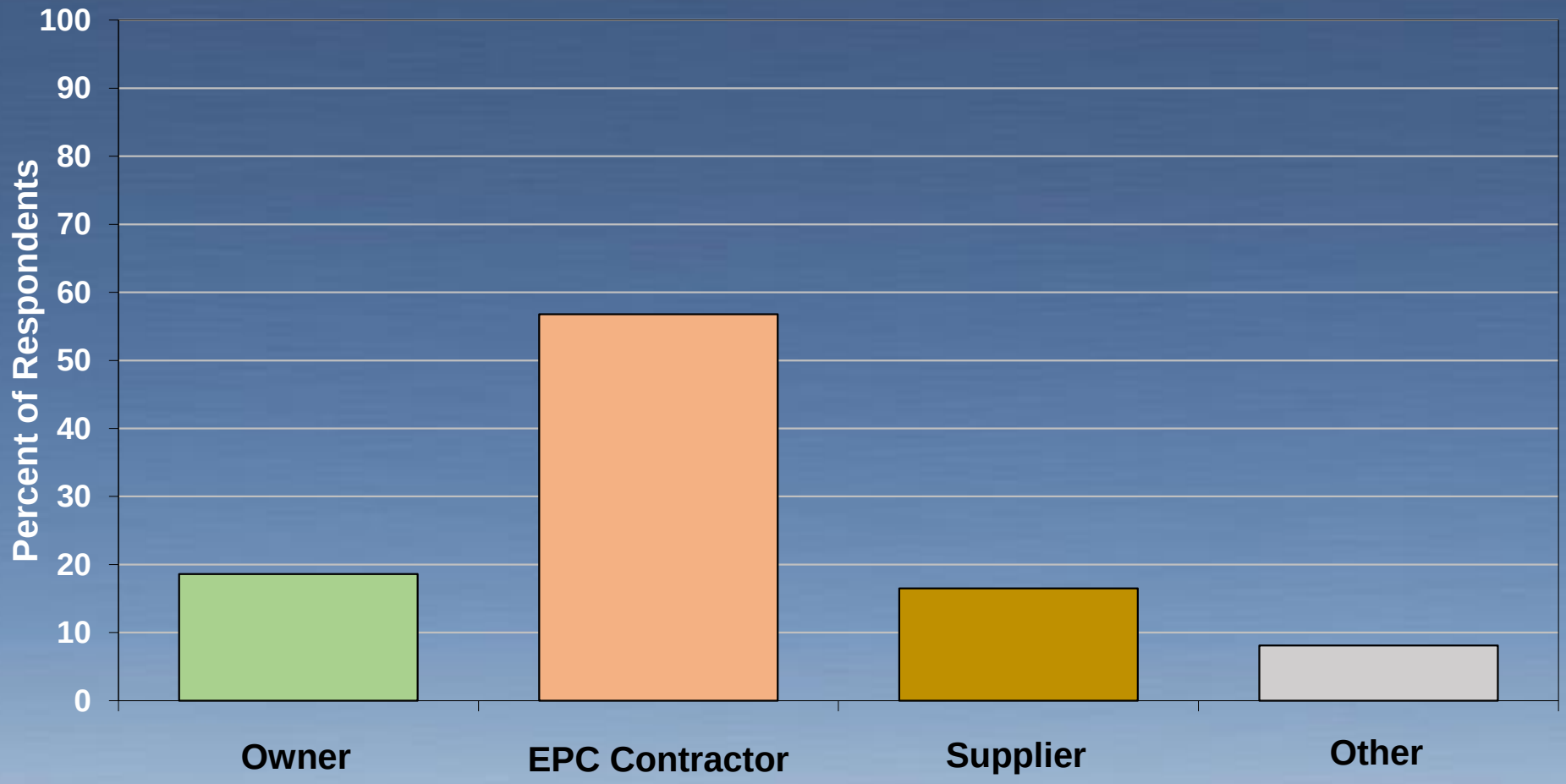
Brownfield Projects

- Definition
- Characteristics of Brownfield Projects
- Discussion Exercise – Brownfield Project Case Study

Defining a Brownfield Project

- Expanding or revamping an existing operating facility
- Stakeholders are often distracted by the existing facility
- Design and construction is constrained by the operating unit
  - Increased interfaces
  - Permitting issues
  - Outages (turnarounds)
  - Incorporating existing conditions

Survey: What is your industry segment?



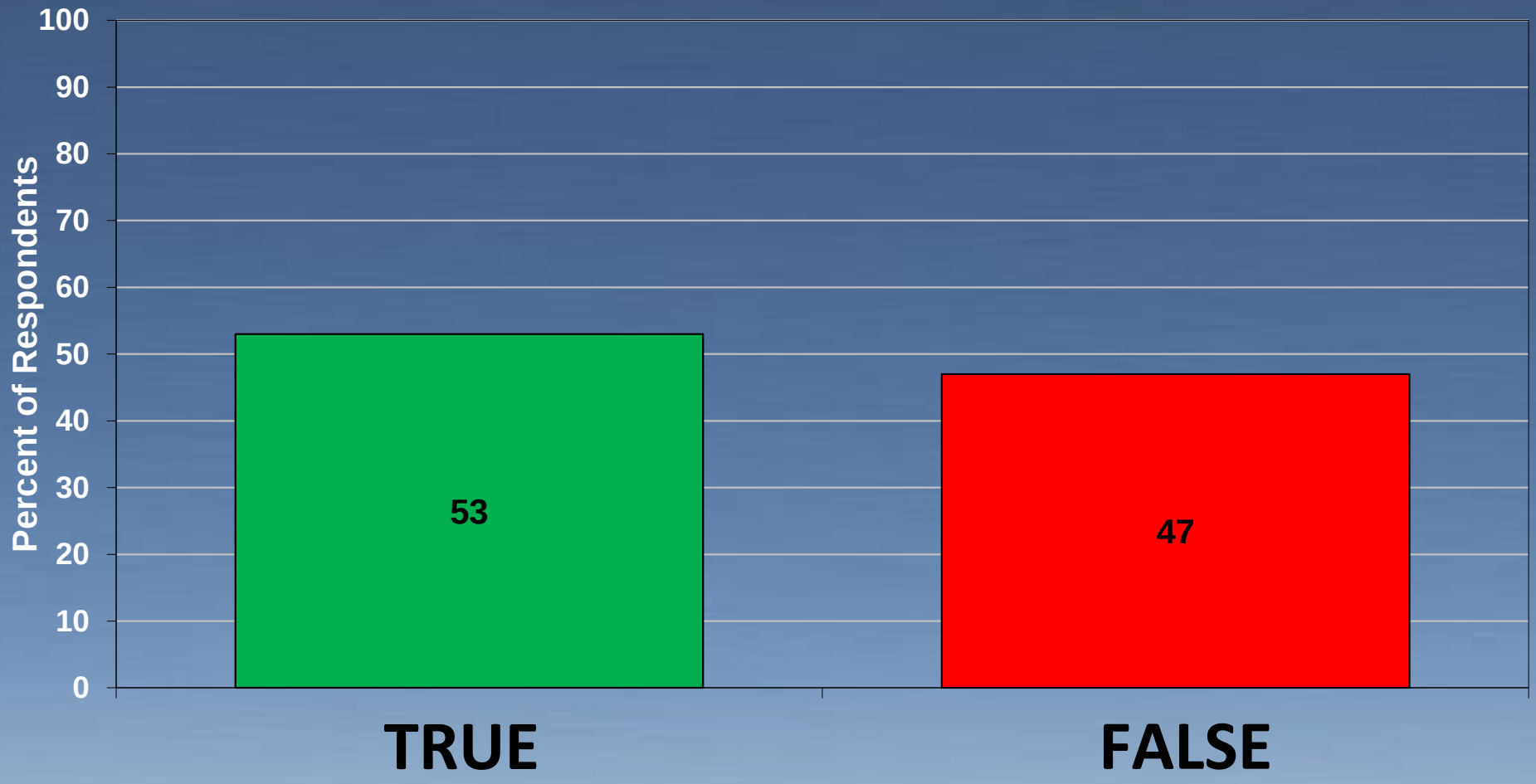
IPA's Large Brownfield Projects Database

Number of Projects	3,532
Median Project Cost *(2016 USGC$*)* *Range of Total Project Cost*	$58 million *$20 million to $992 million*
Median Authorization Year *Range of Authorization Year*	2005 *1986 to 2017*
Companies Represented	295
Construction in a Turnaround	73 percent of projects
Median Execution Duration (Authorization to Startup) *Range of Execution Duration*	20 months *7 months to 58 months*
Average Cost Growth *Range of Cost Growth*	3 percent *-36 percent to 88 percent*

* USGC = US Gulf Coast

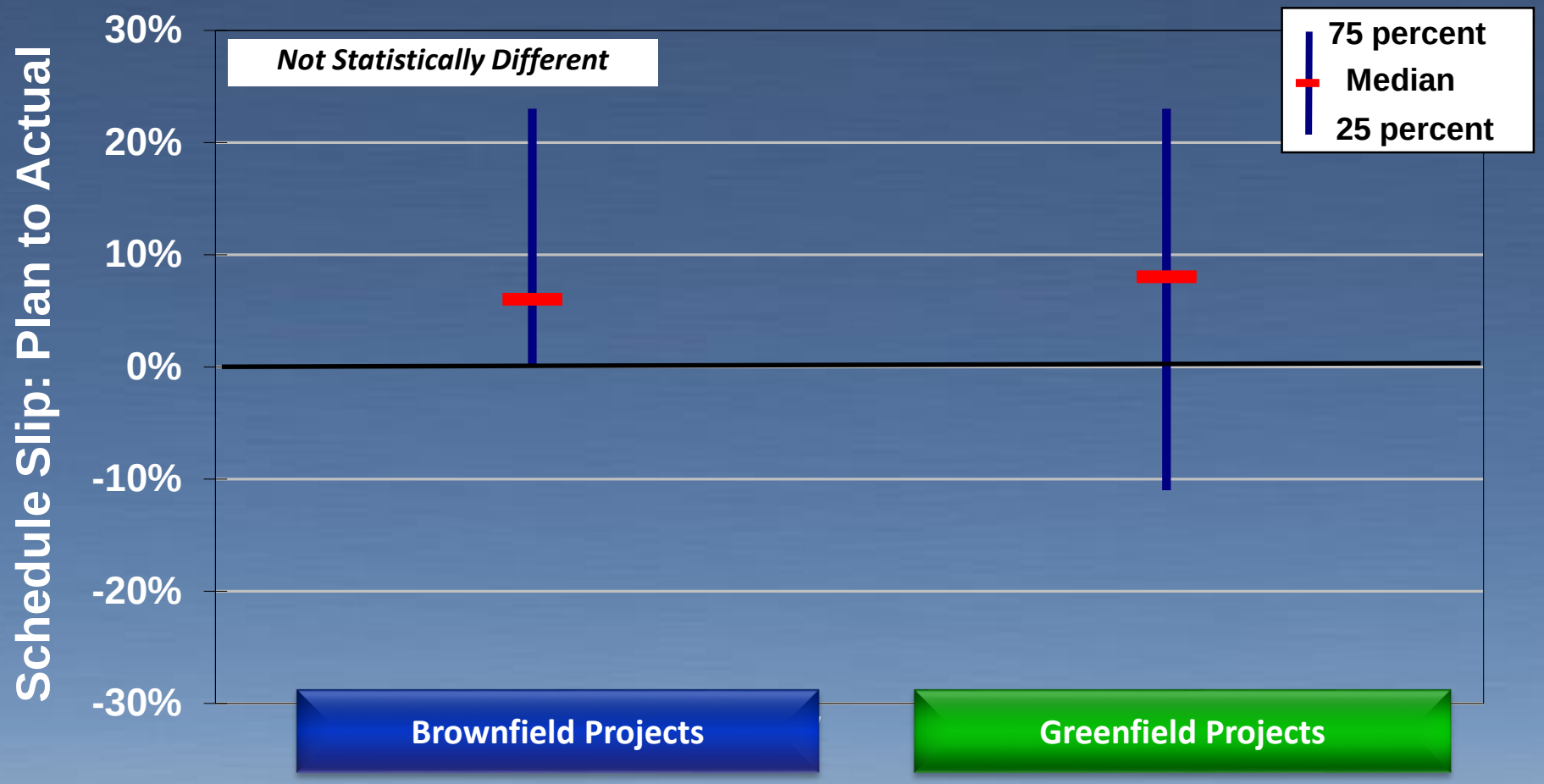
Source: IPA

Brownfield Projects Experience More Schedule Slip Than Greenfield Projects



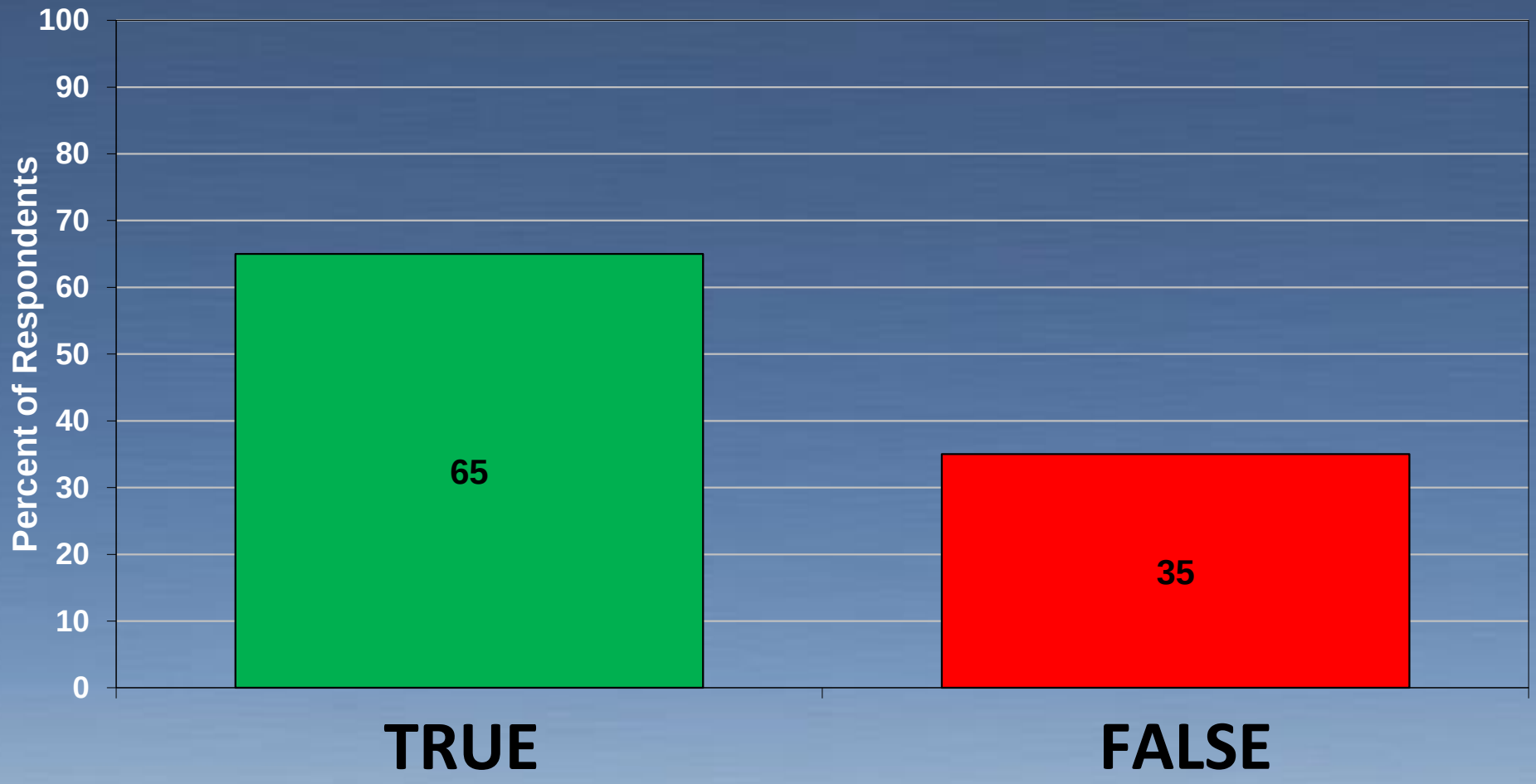
Schedule Slip

Greenfields are comparable to brownfields



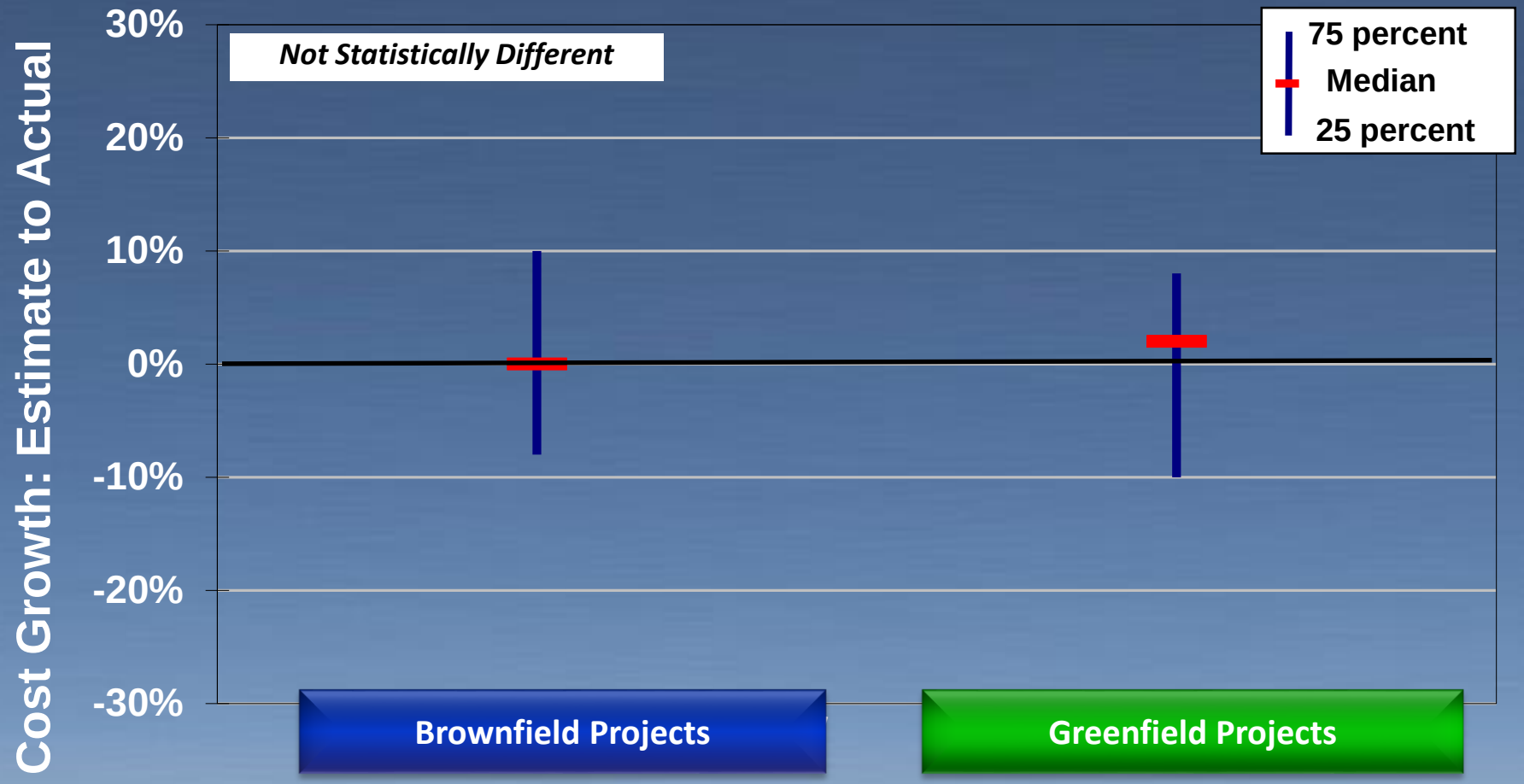
Projects Between $20 million and $1 billion

Brownfield Projects Experience More Cost Growth Than Greenfield Projects



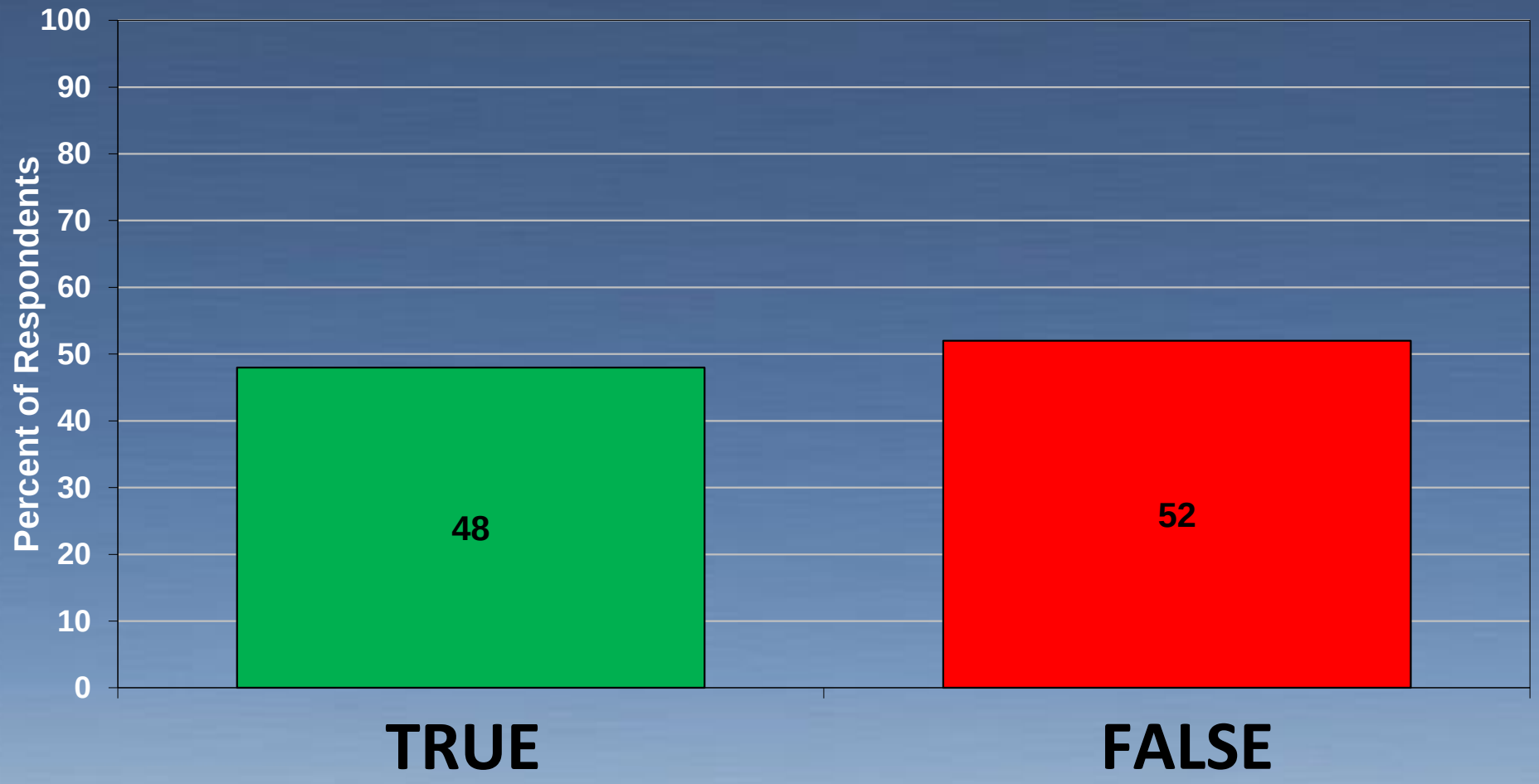
Cost Growth

Greenfields are comparable to Brownfields



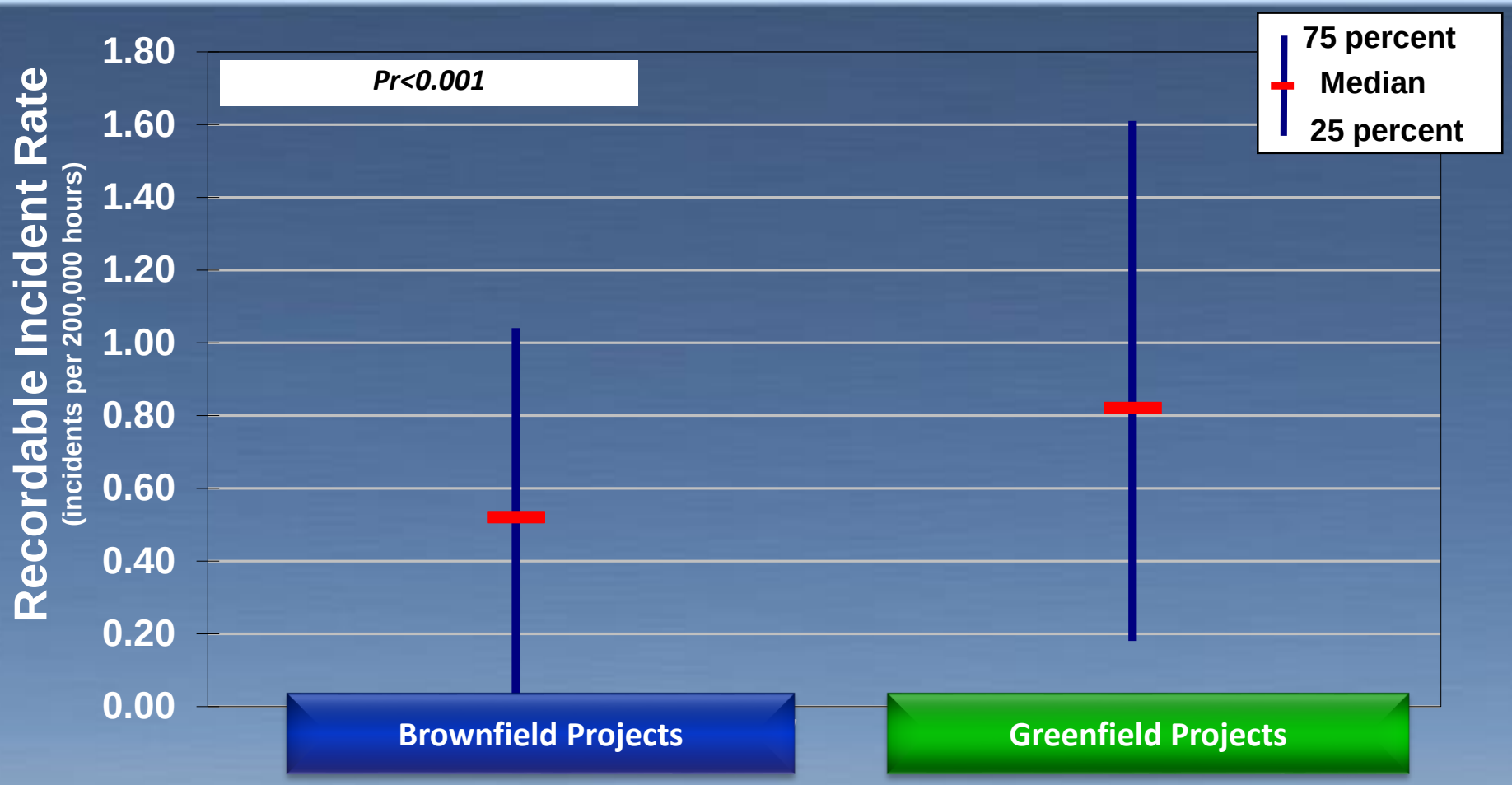
Projects Between $20 million and $1 billion

Greenfield Projects Have a Lower TRIR Than Brownfield Projects



Safety

Brownfield Projects Have Lower Total Recordable Rates



Projects With at Least 200,000 hours and in North America or Europe

Case Study – Brownfield Project

- Quick table introductions
- Read each section of the case study
  - Stop and discuss questions at the end of each section
- Facilitator
  - Keep the conversation going
  - Involve each member
  - Decide when to move to next question
- Scribe
  - Record important points, we will collect and distribute

Project Charters & FEP Phases

Pete Luan

Brownfield vs. Greenfield Challenges

Greenfield Project

- Project is 'ring fenced' and independent of other facilities
- New plant with design and condition fully know
- The project team manages scope rigorously
- Minimal impact from non-project team controlled projects
- Projects tend to be schedule centric
- Hydrocarbons introduced post mechanical completion
- Operations is an important stakeholder, but one of many

Brownfield Project

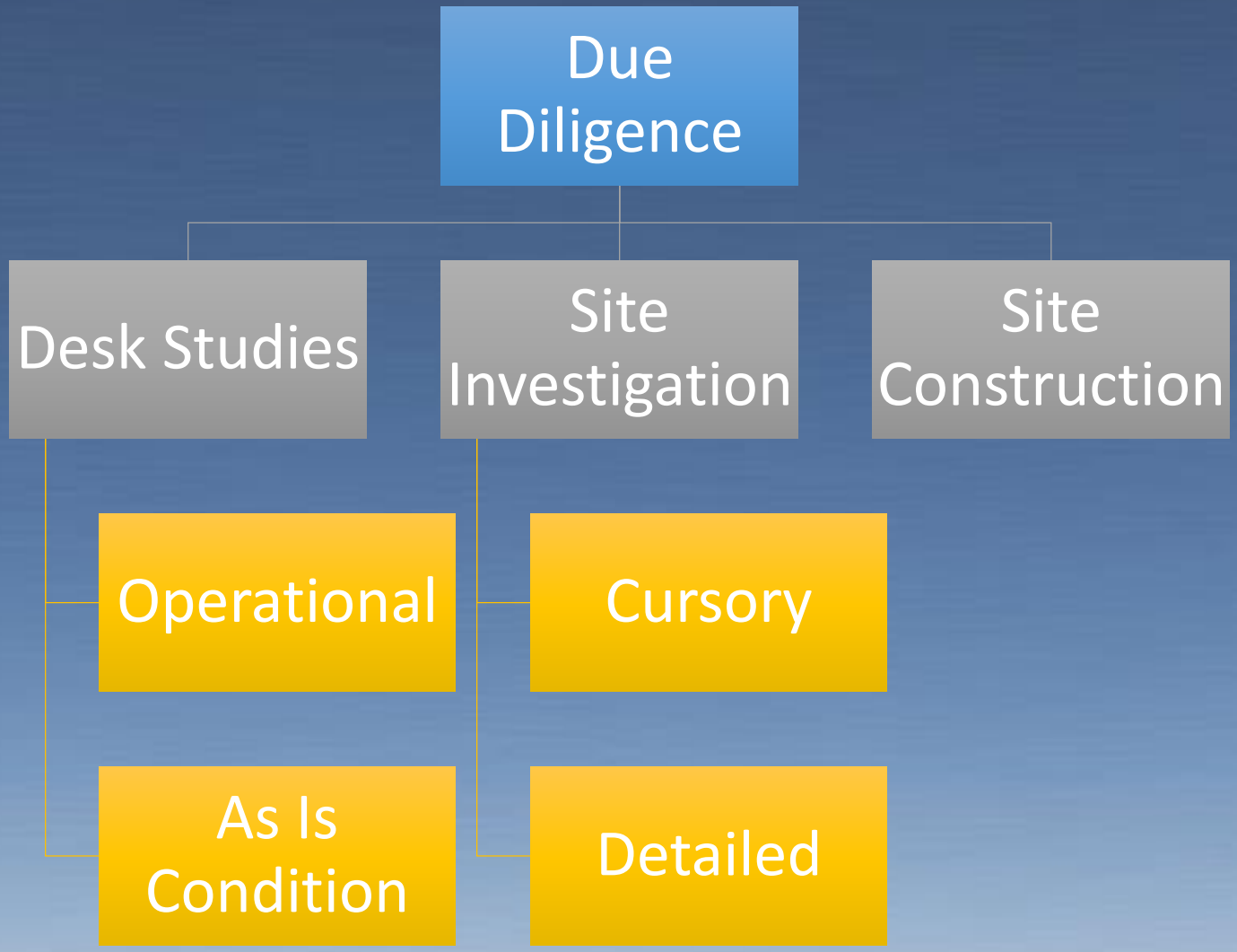
- Manage linkage between existing facilities / Operations organization and new plant
- Current plant condition unknown until shutdown and inspection
- Project scope will change based on Due Diligence and Post Shutdown discovery
- Must integrate project with Maintenance and Operations driven shutdown projects
- Projects are event centric due to plant discovery scope changes
- Safety issues with SIMOPS (simultaneous operations)
- Must effectively manage Operations interface

Brownfield Project Challenges

Brownfield Project Activity Stages

Appraise	Select	Define	Execute
Due Diligence	Integrate into Development Concept	Planning	Post Shutdown
• Data collection • As built drawings • Historical operating data • Inspection reports • Incidents & accidents • Historical maintenance • Pipeline locations • Underground issues • HSE permits and issues	• Integrate new scope with existing facility • Ensure existing facility systems can support new scope • Final design basis • Demolition scope • Finalize concept	• HAZOP • Decommissioning plan • Demolition plan • Remediation plan • Waste management plan • Air emissions • Facility effluent plan • SIMOPS plan	• Equipment purging, cleaning, & isolation • Formal handover to Projects from Operations • Equipment inspection to confirm assumptions • Project execution • Formal handover to Operations

Due Diligence Helps to Prevent Scope Surprises

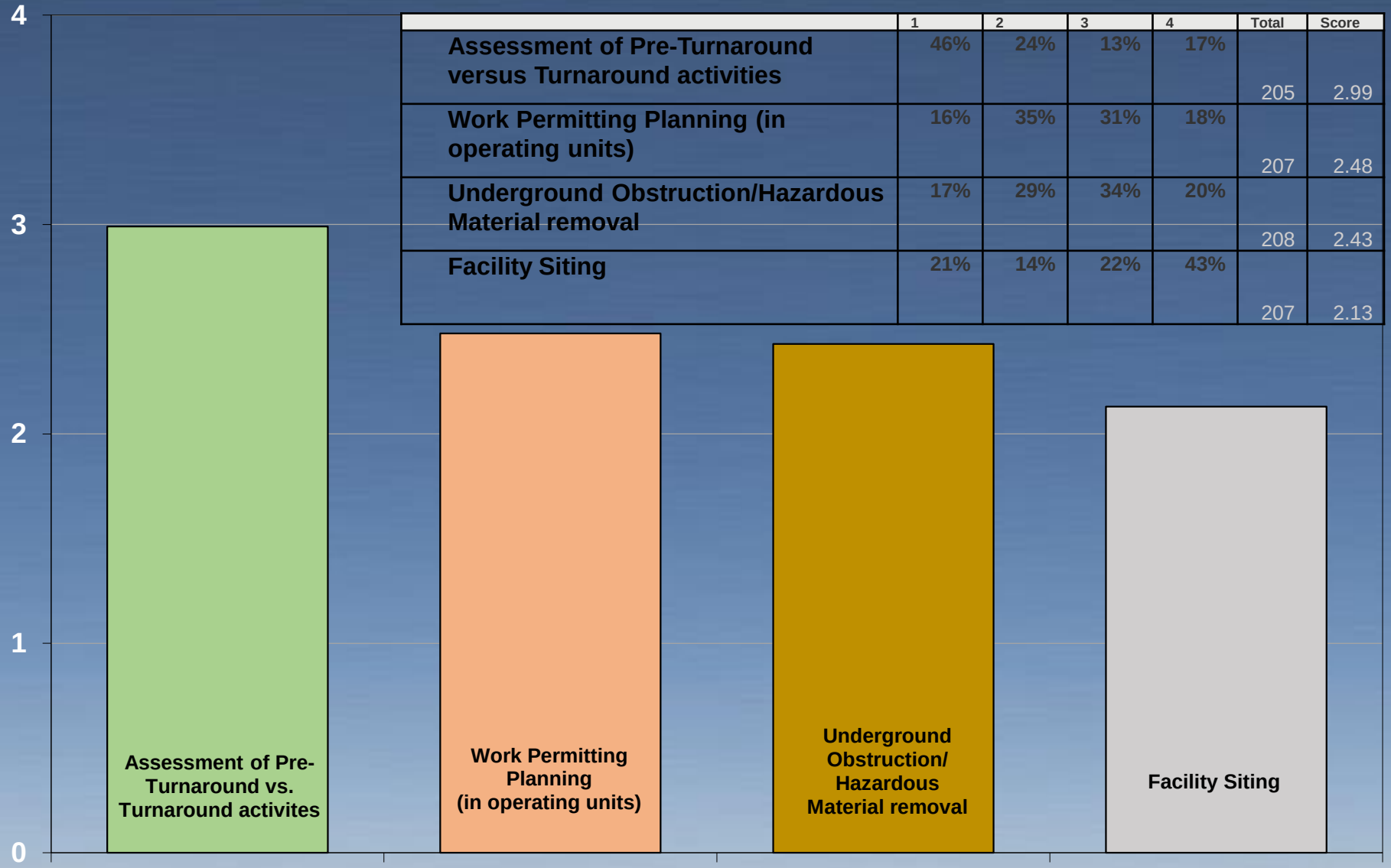


Discussion Topic

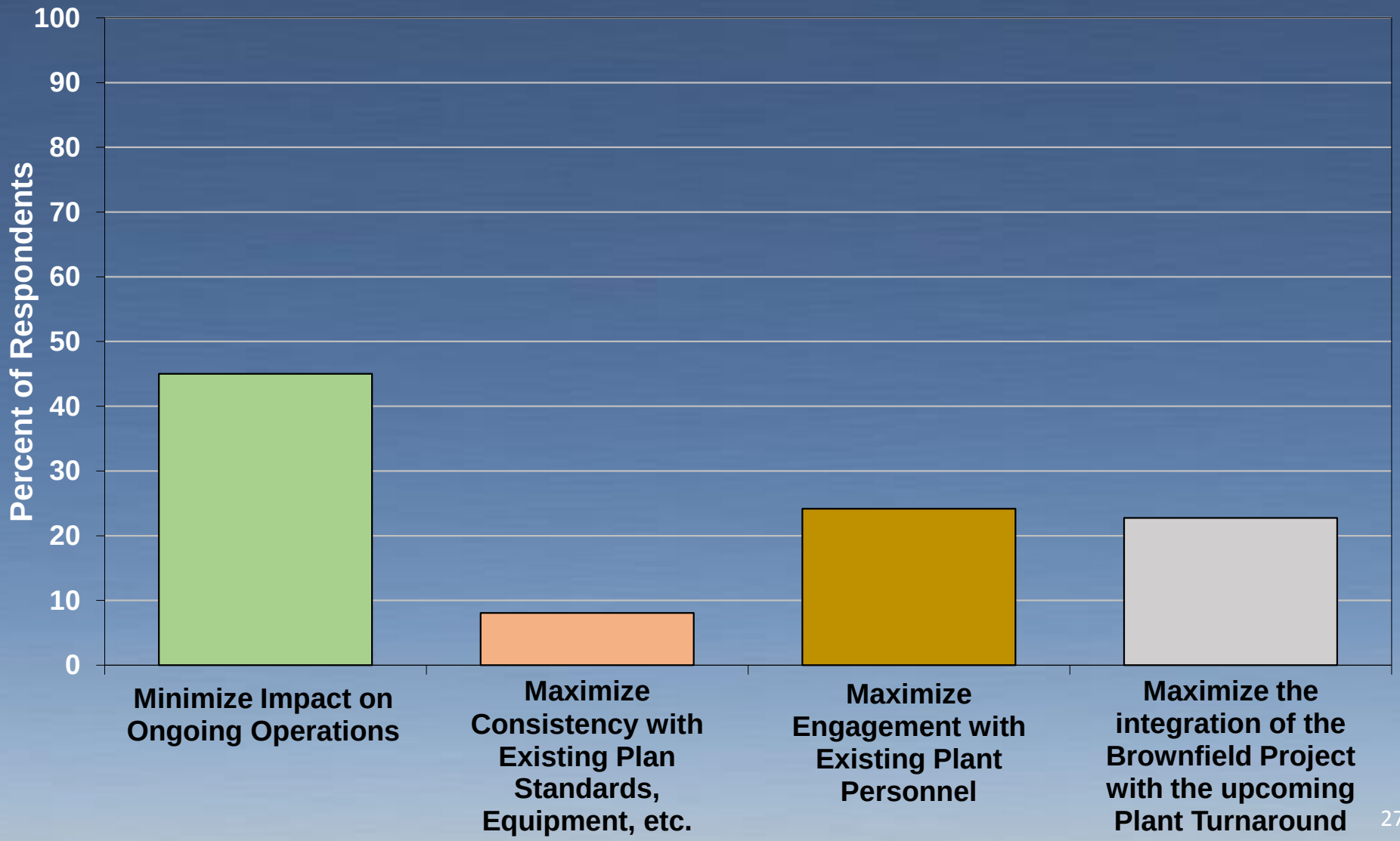
- Why do organizations have such a difficult time planning and delivering Brownfield Projects?
- What can we do during FEL 1 – FEL 3 to support meeting project objectives?
- What steps can we take to better integrate with turnaround activities and Operations activities?
- Why are we often surprised with emergent scope that occurs after the shutdown?

Survey: Rank the following FEP considerations/activities unique to Brownfield Projects in order of impact on project outcome (1=greatest impact to 4=least impact)

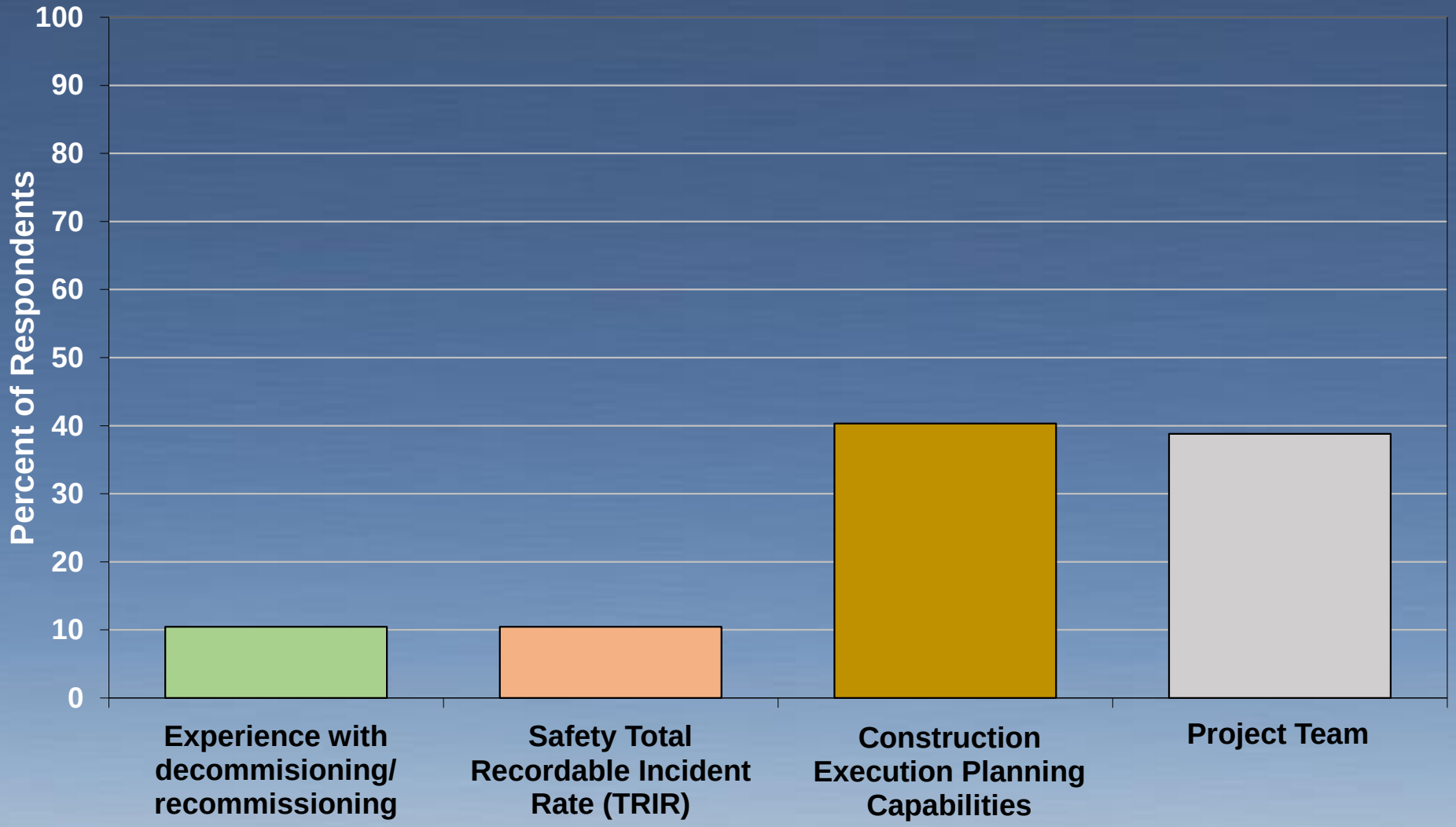
	1	2	3	4	Total	Score
Assessment of Pre-Turnaround versus Turnaround activities	46%	24%	13%	17%	205	2.99
Work Permitting Planning (in operating units)	16%	35%	31%	18%	207	2.48
Underground Obstruction/Hazardous Material removal	17%	29%	34%	20%	208	2.43
Facility Siting	21%	14%	22%	43%	207	2.13



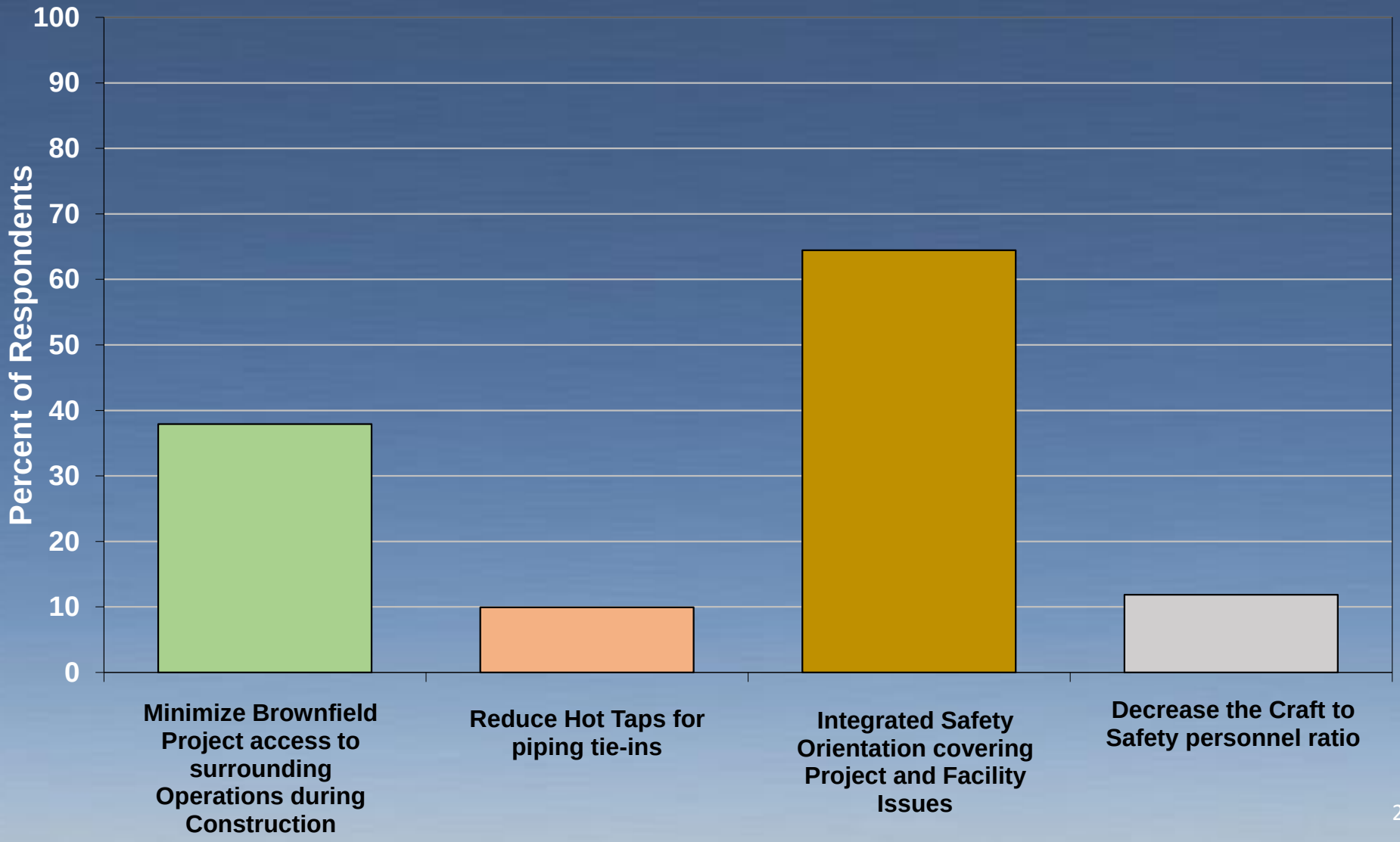
Survey: What is the most important key project tenet, unique to Brownfield Projects, which should be incorporated into the Project Charter/Project Objectives?



Survey: From an Owner's Perspective – what is the most important factor that you look for in an Engineering and/or Construction Contractor when executing a Brownfield Project?



Survey: Safe Project Execution is an overarching Objective in all Project Charters. Brownfield Projects typically have greater safety hazards than Greenfield projects. What are the most successful techniques for improving safety on Brownfield Projects?



Why Do Our Contractors Often Get Hurt During Capital Project Work on a TAR

Post Operational Activities	Preparation for Modifications	Demolition and Remediation	Execute Work Scope
• Mechanical isolation of plant • Plant hydrocarbon removal • Plant cleaning • Waste disposal • Permit to enter	• Equipment, vessel & plant inspection • Confirm current plant state • Emerging scope items • Final cleanout • **Handover to Projects Process**	• Permit to work • Execute detailed demolition work plan • Perform on site remediation work plan • Offsite waste management	• Permit to work • Integrate new works with demolition • Mechanical completion

Project Management

Warren Kennedy

Project Management

Project Management

Professional and conscientious project management is critical to a successful outcome!

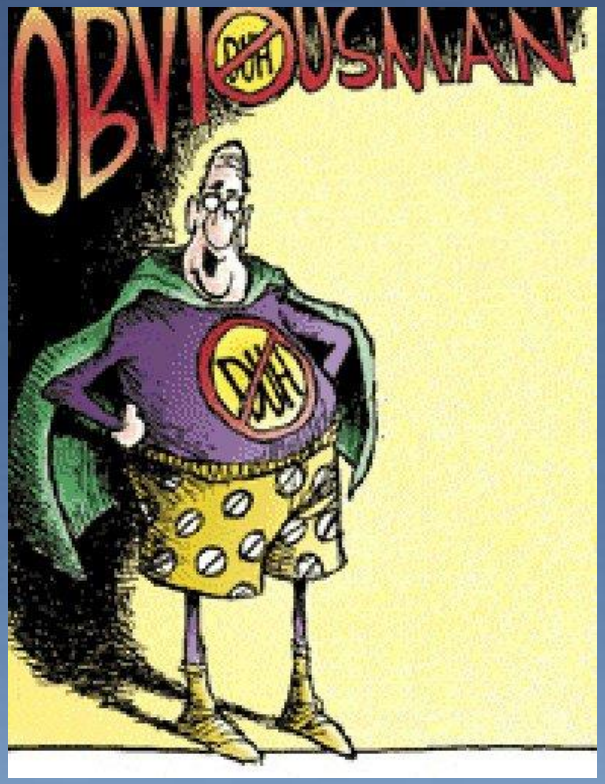
Project Management

Keys to Successful Project Management

or

…Duh?!?

Things you already know but let's review anyway



Steps to Successful Project Management

Project Management - Plan

- Identify all stakeholders up front!
- Develop the project plan before starting the project
- Establish communications protocols

Project Management - Plan

- Define your requirements (SOW) in detail
- Establish a speedy conflict resolution process
- Make contingency plans
- Use Interactive Planning meetings to establish a reasonable project schedule

Project Management - Lead

- Assign an experienced project manager
- Ensure strong, committed management support
- Connect the business goals to the project
- Be Proactive – problems only get worse with time

Project Management - Communicate

- Communicate objectives frequently
- Recognize different perspectives
- Check assumptions frequently

Project Management - Communicate

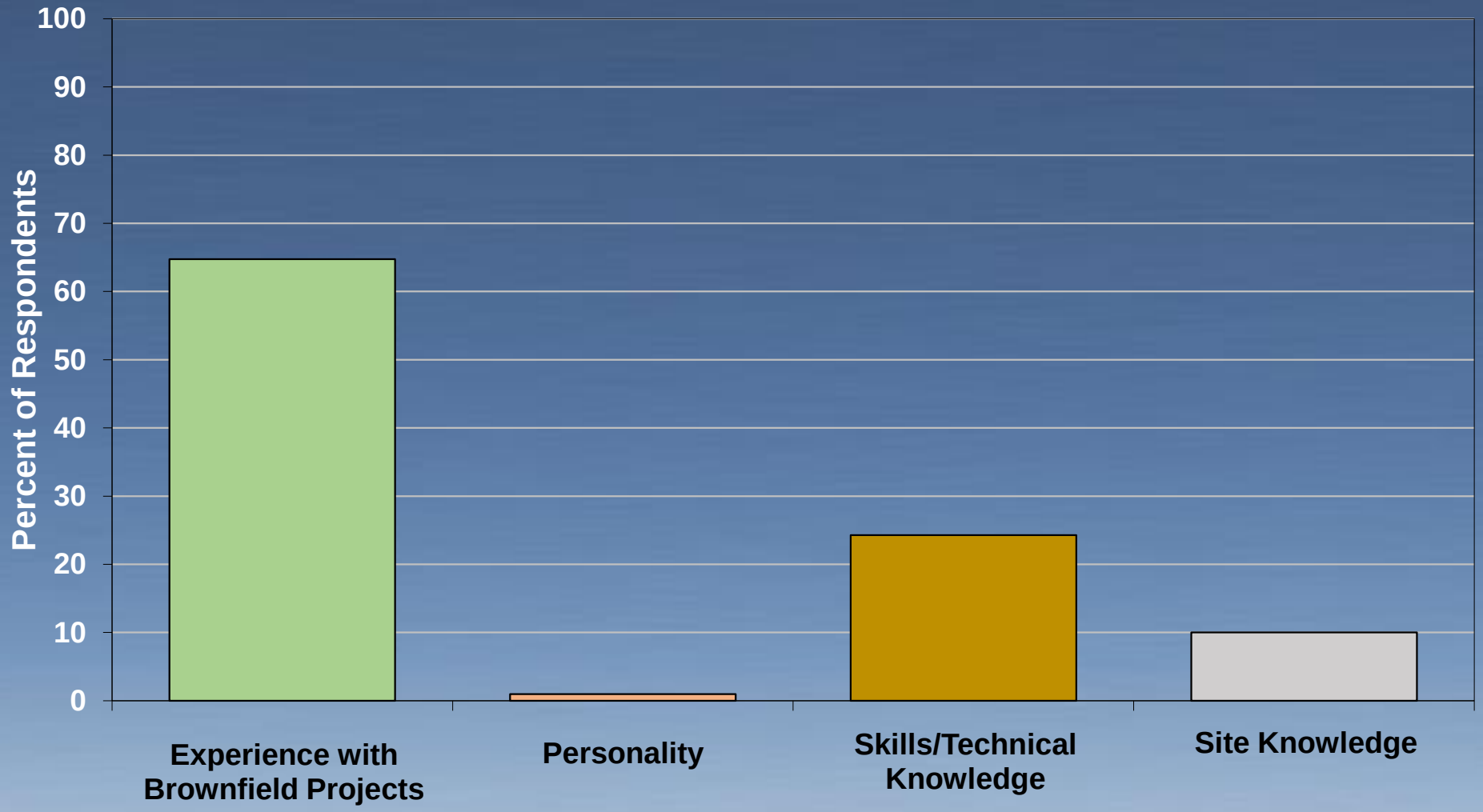
- Manage expectations
- Share success and broadcast achievements
- Invite feedback

Project Management - Manage

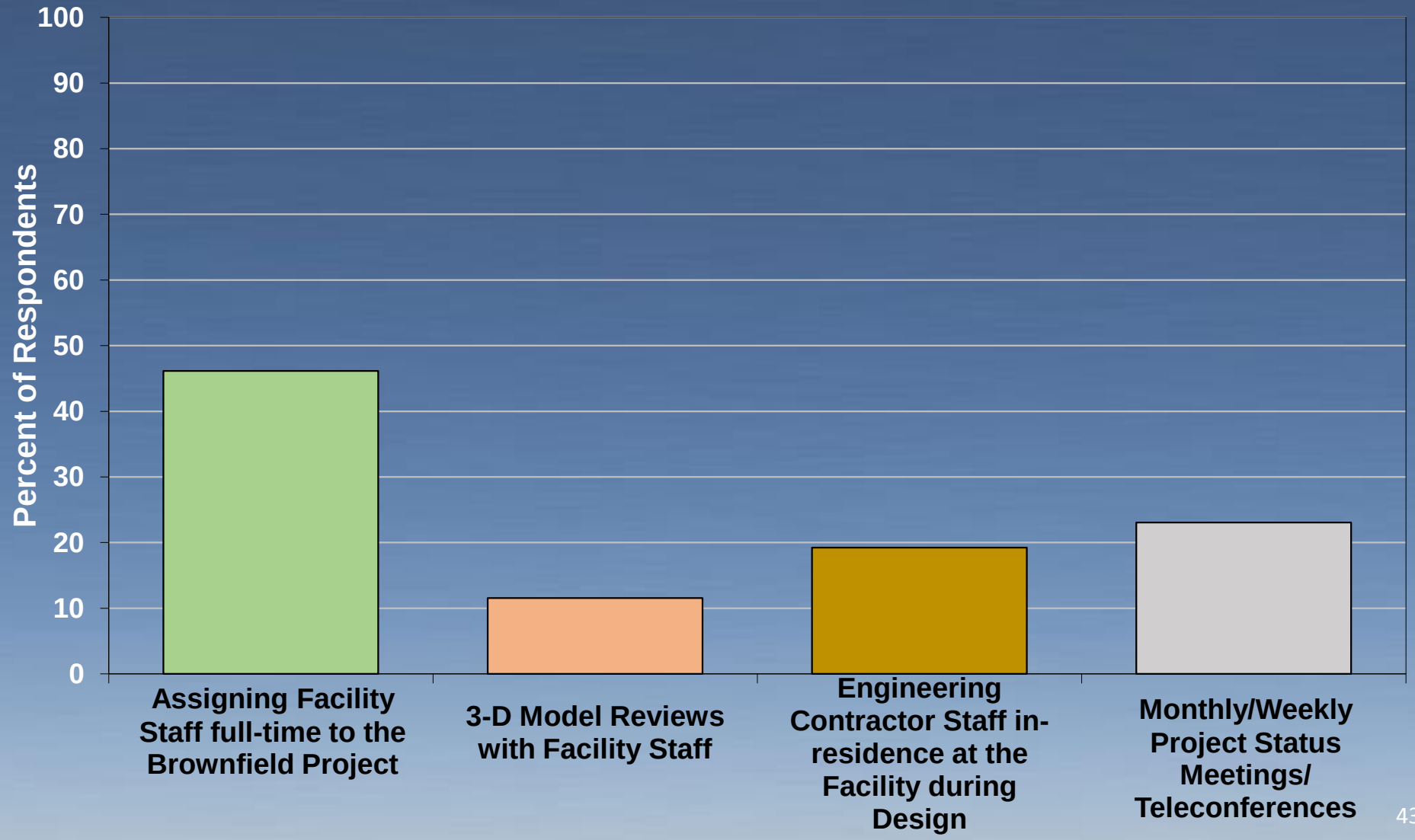
- Ensure the project design reflects the Project Charter and FEP Objectives

- Fight Urban Renewal while maintaining relationships with Operations

Survey: What is the most important attribute in selecting team members for a Brownfield Project?



Survey: Communicating Brownfield Project Issues and Decisions can be challenging as a key stakeholder is busy operating the facility. What is the most successful technique you have found useful in keeping all stakeholders aware and engaged in key project decisions?



Discussion Topics

Tables 1 & 2

Who are the key stakeholders within the Owner's organization for Brownfield Projects? What differences, if any, from the stakeholders in a Greenfield Project?

Tables 3 & 4

Does the fact that a project is a Brownfield project impact the selection criteria of team members for E/P/C, Turnover, or Start-up? If so, how?

Tables 5 & 6

Brownfield Projects require significant balancing of preferences and tradeoffs between constituencies. What are some successful techniques to aid project management in decision making?

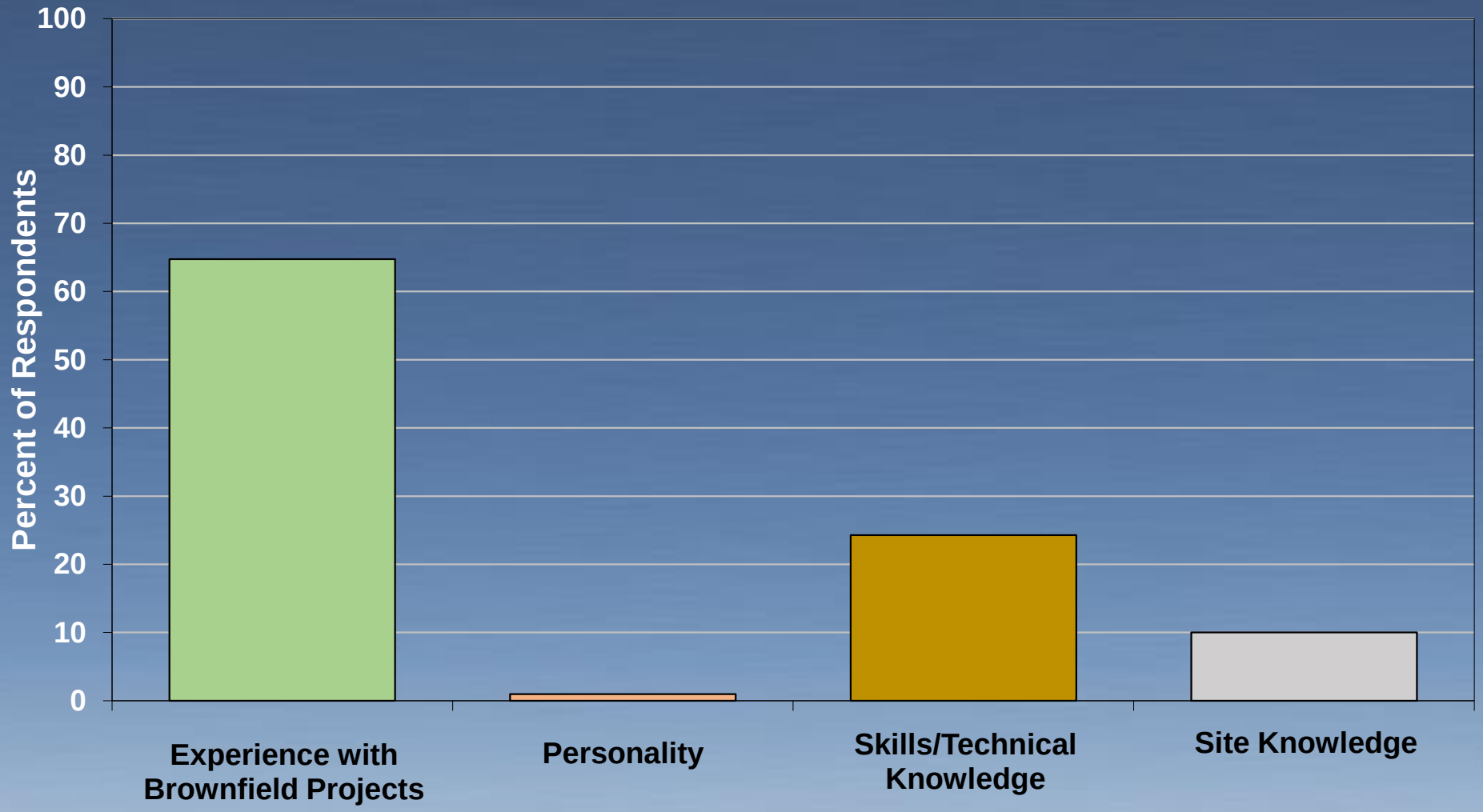
Tables 7 & 8

What are some of the key benchmarks, metrics, and/or KPIs for Brownfield Projects? Are there any unique to Brownfield Projects, if so what are they?

Detailed Design & Technology

David Holland

Survey: What is the most important attribute in selecting team members for a Brownfield Project?



Discussion Topic

The content and scope of detailed design drawings and their impact on construction sequence is critical in the project areas that interface with the existing plant.

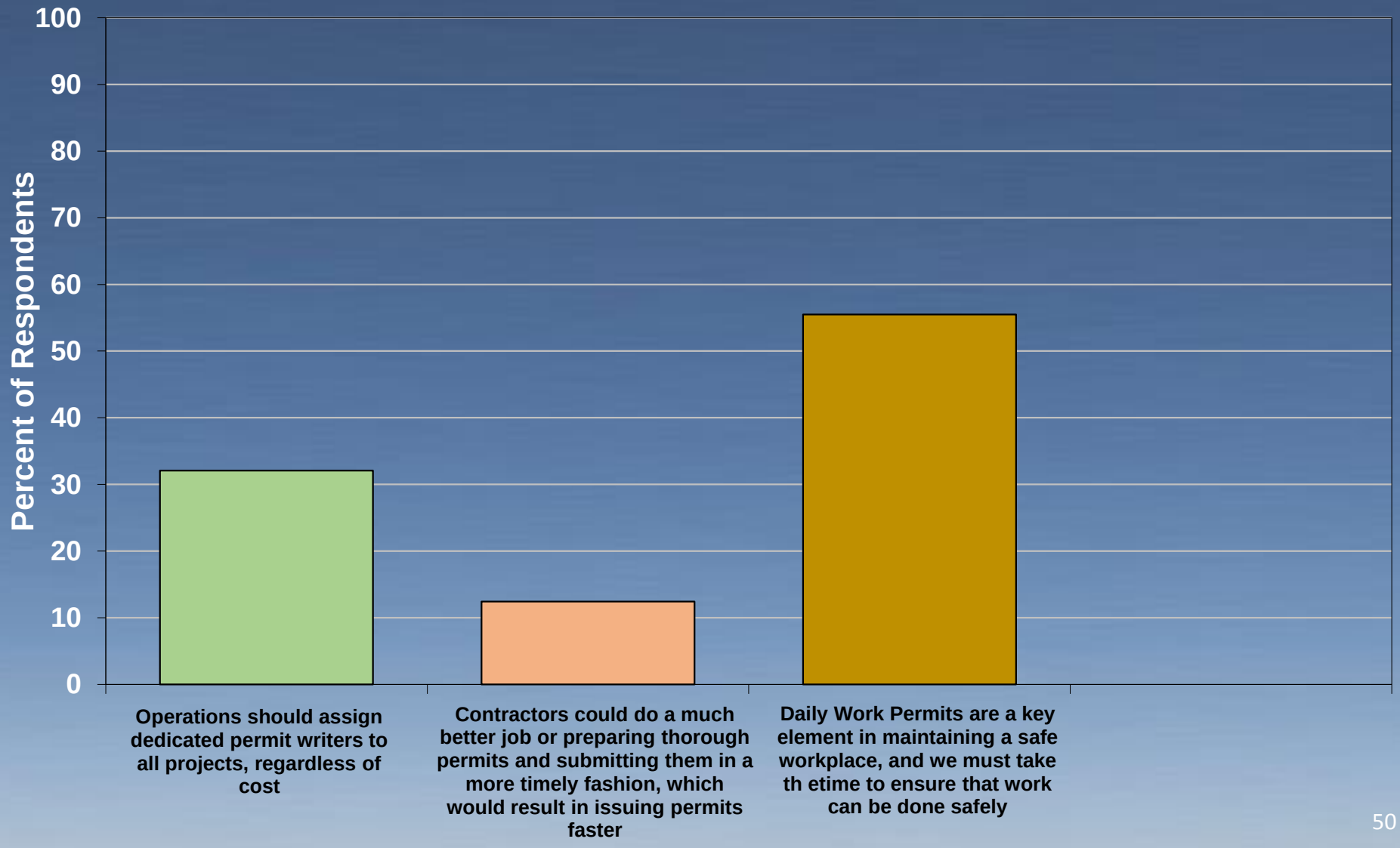
- What techniques are best to document existing conditions? Who is best to provide this information?
- Describe the best practice for preparing the following construction documents:
  - Equipment arrangement (demo and new construction)
  - Power and controls (demo, tie-in, and new construction)
  - Piping (demo, tie in and new construction)
  - Structural (steel and concrete)

Construction

Scott Brandenburg

Brownfield Project Construction

Survey: Daily Work Permitting can have significant impact on construction schedules within operating facilities. Brownfield Projects must balance safety considerations, operations resource availability, and construction needs when it comes to work permitting. Which of the following statements do you consider to be most true?



Work Permitting Techniques and Q&A's

- Who owns the Safe Work Permit program?
- Do electronic construction permits work?
  - Pros/cons/what could be better
- Does operations get overwhelmed during construction with permits?
  - When and why?
- What are the traps and pitfalls of permitting in a live facility or when in Turnaround mode?
  - Conflicts with on-going ops/maintenance activities
  - Conflicts with small site projects
  - Does the permit require both contractor and owner resources?

Work Permitting and Schedules

- What does an integrated schedule and associated permit plan mean to you?
  - For construction work during normal operations
  - For construction work during a Turnaround
- How do you handle test packages and turnover packages?
  - Construction
  - Punch List work
  - Pre-commissioning
  - Commissioning

Turnaround Planning

- Is an integrated schedule/plan that includes operations, maintenance, site projects, and the large Brownfield project important?
  - How early should this work start?
  - Who is responsible for leading this?
  - Do you believe this allows overall work to be optimized?
  - Any electronic tools that really work?
  - Does a Turnaround specific work permitting system really work?

Discussion Topic

Piping tie-ins are necessary, dangerous, and are significant construction activities in Brownfield Projects. What are some good techniques for coordinating all impacted constituencies for a safe and effective piping tie-in program?

Safe and Effective Piping Tie-ins
(existing documentation)

1. True or False, the P&ID's that the constructor received from the owner and engineer at the beginning of work are still accurate?

2. What is the confidence level of existing labelling of lines in the plant by "someone"?

3. Sometimes lines are used for startup or purging or bypassing, when the plant is in a certain stage of shutdown/startup/product change over? How can you make this clear for the work?

4. What do you do different for Hot Taps? Does the plant have a more stringent or less stringent program than you?

Safe and Effective Piping Tie-ins
(pipe service index)

1. Even though it may be the same Complex, Did you consider that each section may have a different Pipe Service Index based on who and when it was built?

2. How clear are the notes/comments section of the Pipe Service Index?

3. Is the Pipe Service Index that you received at the start of the job the same as what the control room has now?

4. What is the best way to coordinate and maintain the running plant P&ID's and PSI with the Projects version?

Project Completion/Turnover

Warren Kennedy

Project Completion/Turnover

- Unique Brownfield Completion Challenges
  - Project is frequently completed in a Turnaround
  - Turnover Systems may contain existing equipment/scope intermingled with new construction
  - Owner must balance completion/start-up with ongoing operations at the site
  - Others???

Project Completion/Turnover

- Detailed Turnover Plan & Responsibility Matrix
  - Organizational Chart & Team Assignments
  - Systems Approach
  - Procedures
  - ‘Tasks’ (Mechanical, Electrical, I/C)
  - Pre-Commissioning & Commissioning

Discussion Topic

Significant Owner resources are required to interface with the Construction Contractor at this phase of a Brownfield Project. How can the multiple constituencies (including specialty contractors and maintenance) best integrate, and avoid ‘surprises’?

Workshop Review/Wrap Up

Warren Kennedy