Application No: A.16-09-005
Exhibit No:
Witness: R. Phillips

Application of Southern California Gas Company (U 904 G) and San Diego Gas & Electric Company (U 902 G) to Recover Costs Recorded in the Pipeline Safety and Reliability Memorandum Accounts, the Safety Enhancement Expense Balancing Accounts, and the Safety Enhancement Capital Cost Balancing Accounts	Application 16-09-005

CHAPTER II

DIRECT TESTIMONY OF

RICK PHILLIPS

ON BEHALF OF

SOUTHERN CALIFORNIA GAS COMPANY

AND

SAN DIEGO GAS & ELECTRIC COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

September 2, 2016

Amended: November 20, 2017

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I. PURPOSE AND OVERVIEW OF TESTIMONY

The purpose of my testimony is to describe the prudent project execution and proactive cost management measures taken by Southern California Gas Company (SoCalGas) and San Diego Gas & Electric Company (SDG&E) (collectively "Utilities") in the development and execution of SoCalGas and SDG&E's Pipeline Safety Enhancement Plan (PSEP).

First and foremost, the execution of the Utilities' PSEP exemplifies their approach to safety. As fully set forth in the testimony of David Buczkowski (Chapter 1), the Utilities undertook these efforts expeditiously, almost two years before receiving formal guidance from the Commission. The Utilities did so because they had received notice from the Commission that this important safety work should be done "as soon as practicable." That's what SoCalGas and SDG&E did – prioritized work in highly populated areas and began testing and replacing as they believed to be prudent at the time, based on their experience and knowledge of their own systems. As fully set forth throughout my testimony, this commitment to safety has not wavered. The Utilities' commitment to safety, their expeditious approach to testing and replacing pipelines as required by the Commission and the Legislature, and their prudence in doing so should be acknowledged by the Commission. As such, the Utilities should receive full rate recovery – minus acknowledged disallowances – for this important safety work.

PSEP's successful execution not only complies with Commission orders and California Public Utilities Code Section 958, but, by efficiently enhancing the safety of our transmission pipeline system, PSEP has provided and will continue to provide value to customers for decades to come. In my testimony, I will describe how SoCalGas and SDG&E:

- Have created a PSEP organization to safely, prudently, and expeditiously execute PSEP to enhance the safety of the Utilities' transmission systems.

- Are diligent in looking for ways to avoid costs. For example, the overall Phase 1A scope has been reduced by approximately 260 Category 4[1] miles at an estimated avoided cost of over $500 million.

- Follow a least cost approach – given the conditions encountered for each project – to plan, engineer, and complete the individual pipeline and valve projects.

- Obtain market-based rates for material and services through competitive sourcing efforts.

- Despite their best efforts to manage costs, encountered common challenges that drive project costs and explain why the challenges encountered by the Utilities are similar to challenges experienced in other large, complex construction programs.

The Utilities' PSEP undertaking is the largest natural gas infrastructure safety enhancement in SoCalGas and SDG&E's history. Phase 1A is currently expected to include approximately 168 pipeline and valve projects and involves over 500 SoCalGas and SDG&E dedicated employees and contractor personnel.[2] [3] As fully set forth below, where there have been opportunities to control costs – such as through competitive sourcing, the development of the Performance Partnership Program, and scope validation – PSEP has been successful in doing so. For example, by using internal expertise and critical assessments of each project, the Utilities estimate that they have avoided several hundred million dollars in project costs which would have otherwise been borne by customers. When challenges have been encountered – such as delayed construction, traffic control or environmental permits and land acquisition delays – they have been addressed as expeditiously and cost effectively as possible. Pressure test projects were completed prudently without pipeline failures and served to validate the safety of our existing pipelines. Replacement projects were completed successfully, prudently, and served to

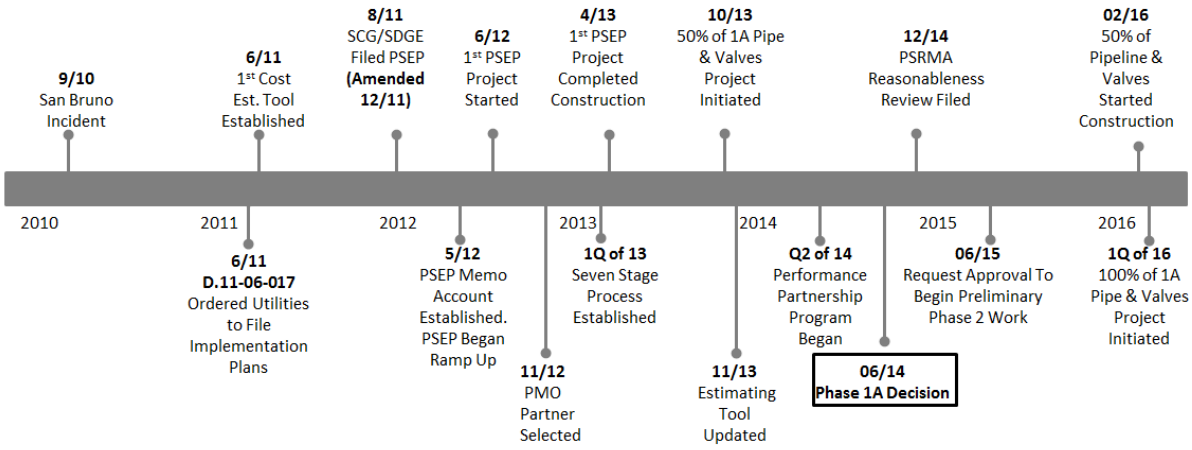
[1] Category 4 includes pipelines that lack sufficient documentation of a post-construction strength test to 1.25xMAOP.
[2] Figures as of April 2016.
[3] Contractor figures do not include construction contractor personnel.

update our system to include more pipelines that were manufactured and installed using modern standards for safety.

This application demonstrates the prudence with which SoCalGas and SDG&E have executed PSEP and the reasonableness of the costs presented for review and recovery. Our actions have enhanced safety; mitigated customer impacts; and avoided and reduced costs. SoCalGas and SDG&E have implemented PSEP prudently, at reasonable costs, behaved as reasonable managers of PSEP given the information that was known at the time, and should receive full cost recovery of the revenue requirement requested in this application.

II. PSEP TIMELINE OF EVENTS

Consistent with Commission directives to begin PSEP work as soon as practicable, SoCalGas and SDG&E began implementing PSEP prior to the Commission issuing D.14-06-007 – which approved the PSEP – in June of 2014 (hereafter the "PSEP Decision"). SoCalGas and SDG&E created the PSEP organization, began developing the necessary PSEP programs and processes, and began PSEP work in 2012. In fact, the 41 pipeline and valve projects included in this application were initiated prior to receiving the PSEP Decision. The processes and programs that were created to accomplish the safety enhancement efforts continue to evolve and grow as PSEP continues, but are guided by the Utilities stated PSEP mission to: (1) enhance public safety; (2) comply with the Commission's directives; (3) minimize customer impacts; and (4) maximize the cost-effectiveness of safety investment. The following timeline depicts milestones in developing and executing PSEP:



Notably, two years transpired between the beginning of the first PSEP project in June, 2012 and the issuance of the PSEP Decision, which provided guidance regarding the after-the-fact cost recovery through reasonableness reviews. Therefore, because of instructions to begin work "as soon as practicable," by the time the decision was issued, PSEP's foundation had been set and the work was well underway.

Phase 1A, the first phase of PSEP, was designed to address the most densely populated areas. The total scope of Phase 1A is currently anticipated to be approximately 175 miles (of which 95 miles are Category 4[4]), a valve enhancement program to augment existing automatic shutoff and remote control valves to minimize the amount of time required to stop the flow of gas in the event of a pipeline rupture, and technology enhancements such as the installation of methane monitoring devices to enable quicker leak detection. The scope currently encompasses approximately 112 individually planned and constructed pipeline projects and 56 individually planned and constructed valve bundle projects. These projects and activities span the Utilities'

[4] The remaining non-Category 4 miles are incidental or accelerated miles included to realize efficiencies or improve constructability.

entire service territory, which stretches from the Mexican border to Central California and serves approximately 24 million customers. As of the filing of this application, approximately 105 miles have been pressure tested or replaced, 35 valve bundle projects have been completed, and 25 methane detectors have been installed along with associated monitoring systems.

III. PSEP IS BEING IMPLEMENTED WITH SAFETY AND COST EFFECTIVENESS IN MIND

A. The PSEP Organization Is Designed to Promote Prudent PSEP Implementation

The work scheduled for the Utilities' PSEP is extensive, both in terms of the volume of projects and time necessary to complete each project. The PSEP organization was created to manage not only a large volume of work safely and cost-effectively, but also manage both employees and contractors. The PSEP organization oversees PSEP project execution, provides project and process controls during the project life cycle, allows SoCalGas and SDG&E to assess each project's budget and schedule, and communicates PSEP progress to stakeholders.

The first step in creating the PSEP organization was the formation of separate PSEP departments with PSEP-focused roles and responsibilities to effectively and efficiently manage safety enhancement. The separate roles and responsibilities within the PSEP organization provide for functional guidance on the various aspects of project design and construction and project oversight. While all departments and personnel associated with the implementation of the SoCalGas and SDG&E PSEP are important in accomplishing the PSEP objectives, there are nine specific groups that oversee critical aspects of the PSEP functions: (1) the Program Management Office (PMO); (2) Construction; (3) Engineering; (4) Environmental; (5) Supply Management; (6) Gas Control; (7) Non-PMO General Administration; (8) Communication and

Outreach; and (9) Training. Depending on their function, these groups support and/or execute PSEP projects.[5]

B. The PSEP Organization Is Subject to Prudent Governance and Oversight

PSEP is a large and complex program that requires appropriate governance and management to achieve its goal of cost effectively enhancing safety. The PSEP governance and management strategy is to comply with applicable regulatory requirements, continuously improve, and establish proper controls and management across PSEP functional areas to verify that design, material procurement, construction, and closeout is performed correctly and consistently.

To accomplish the above goals, PSEP-specific governance and management efforts were undertaken. The PSEP project management office (PMO) was established. The PMO provides oversight at the organizational level, helps develop PSEP policies to promote oversight and accountability, and develops reporting metrics to keep SoCalGas and SDG&E management apprised of PSEP progress. As acknowledged by the Safety and Enforcement Division (SED) (formerly known as the Consumer Protection and Safety Division) in their 2012 Technical Report on the SoCalGas and SDG&E PSEP, this oversight and management function is prudently placed with one central department: "CPSD believes the Companies are approaching the need to manage the PSEP in a reasonable manner and that the PMO will be critical to the proper execution of PSEP."[6] SED's assessment has proven to be true. The following are key PMO functions:

[5] PSEP support groups and costs are discussed further in Chapter VII (Mejia) and VIII (Tran).
[6] Technical Report of the Consumer Protection and Safety Division Regarding the Southern California Gas Company and San Diego Gas and Electric Company Pipeline Safety Enhancement Plan dated January 17, 2012, at page 22.

First, the PMO collaborates, coordinates, and provides functional guidance on project design and construction to cost effectively meet or exceed compliance requirements and follow, as appropriate, industry best practices. The PMO, and the governance and management structure, is designed to promote safety and efficiency by providing structure, guidance, and oversight. In addition to its safety focus, the PMO also oversees implementation, provides checks and balances during the project life cycle, and allows SoCalGas and SDG&E to assess whether projects are within budget, on schedule, and meet schedule, cost, quality, customer impact, and compliance goals.

Second, the PMO develops standards and procedures for the Utilities' PSEP that enables PSEP to be executed in a consistent manner across projects. These standards and procedures, besides including PSEP-specific information to improve safety and efficiency, also incorporate SoCalGas and SDG&E's existing requirements for design, material acquisition, construction, construction inspection, documentation, and environmental compliance.

Third, the PMO develops reports and Key Performance Indicators (KPIs) at both the granular project level and the overall PSEP level. SoCalGas and SDG&E management, on a monthly basis, review the KPIs to monitor PSEP. Included in the KPIs are financial metrics, pressure testing and replacement progress metrics (e.g., number of projects that have entered construction and placed into service), valve metrics (e.g., number of valves that have entered construction and been placed into service), safety metrics, environmental compliance metrics, material availability metrics, Diverse Business Enterprise goals, and headcount. Qualitative data is reviewed by the PSEP PMO and SoCalGas and SDG&E Management including a summary of key accomplishments, constraints, and opportunities for improvement.

C. The PSEP is Subject to Prudent Decision Making Processes

It is important to assess how various PSEP project options and approaches may impact SoCalGas and SDG&E's system. As explained in Chapter III (Phillips), SoCalGas and SDG&E continue to use the Decision Tree and concepts approved by the Commission in D.14-06-007 during Stage 2 (Test or Replace Analysis) of the Seven Stage Review Process (see below). In addition, as described in Chapter IV (Bermel), a detailed process is used to determine the scope of work of the Valve Enhancement Plan.

An integral part of the analysis that results in prudent decision making is the collaboration by PSEP with other knowledgeable groups (e.g. Region Operations, Engineering, Gas Transmission Planning, Gas Control, Marketing, Public Affairs, etc.) to route, design, and schedule pipeline and valve work to minimize costs and accommodate capacity impacts or restrictions. For example, these groups provide information to guide project specific decisions including (1) the feasibility of shut-ins and alternate feeds to regulator stations or customers; (2) customer and community impacts; and (3) environmental requirements, right-of-way, and permitting needs. All of this information is used to help determine the scope and constructability of the project.[7]

D. The PSEP Seven Stage Review Process Promotes Efficient Project Execution

The Seven Stage Review Process sequences and schedules PSEP project workflow deliverables.[8] The Seven Stage Review Process consists of seven stages with specific objectives for each stage and an evaluation at the end of each stage to verify that objectives have been met

[7] Please see Chapter IV (Bermel) for a discussion of the Valve Enhancement Plan scoping process.
[8] The Seven Stage Review Process was implemented by the PSEP organization beginning in the First Quarter of 2013. Thus, PSEP projects that were initiated prior to that time did not follow this formalized process. A similar, but less formal, project execution methodology was employed in those instances.

before proceeding to the next stage.[9] During the Seven Stage Review Process there are numerous notable activities, but the decisions most affecting project scope is the decision to test or replace, divide segments, and include accelerated and/or incidental mileage.[10] The following is a description of each of the seven stages:

Stage 1 (Project Initiation) is where the Work Order Authorization (WOA) is initiated. The initial WOA is used to track costs for the early stage investigation and validation of Category 4 Criteria mileage and present a project recommendation and package for approval to Stage 2. The Project Initiation Stage is where mileage originally included for remediation may be decreased due to scope validation efforts, reduction in Maximum Allowable Operating Pressure (MAOP), or abandonment of lines that were no longer required from a gas operating system perspective.

Stage 2 (Test or Replace Analysis) is where SoCalGas and SDG&E analyze data for selection of testing or replacement. Project execution options are presented and considered prior to proceeding to the next stage.

Stage 3 (Begin Detailed Planning) is where a project execution plan is finalized, baseline schedules are developed, funding estimates are developed, and project funding is obtained.

Stage 4 (Detailed Design/Procurement) is where design and construction documents are completed, necessary permits and authorizations are attained, a construction contractor is selected, and pipeline materials are purchased, received, and prepared for turnover to contractors.

[9] Evaluations are gate reviews or completion check lists. Certain stages are condensed or combined for valve and small pipeline projects.

[10] Accelerated miles are miles that would otherwise be addressed in a later phase of PSEP under the approved prioritization process, but are being advanced to Phase 1A to realize operating and cost efficiencies. Incidental miles are miles not scheduled to be addressed in PSEP, but are included where their inclusion is determined to improve cost and program efficiency, address implementation constraints, or facilitate continuity of testing.

Stage 5 (Construction) is where construction contractors are mobilized and monitored to: (1) document progress and compliance; (2) conduct testing; and (3) maintain project scope quality, budget, and schedule.

Stage 6 (Place into Service) is where commissioning and operating activities are performed to achieve completion certification for the project.

Stage 7 (Closeout) is where regulatory, contractual, archival activities are performed to close the project in an orderly manner and issue acceptance certificates.

E. Scope Validation Efforts Have Identified Cost Avoidance Opportunities

A key first step in project execution is the scope validation efforts conducted in Stage 1 (Project Initiation). SoCalGas and SDG&E do not proceed with the projects identified in the initial PSEP Application[11] without first performing due diligence to verify the project scope through scope validation. From the initial phase of a PSEP project, the PSEP management team identifies the potential for cost avoidance when studying the proposed project. To do this, data from the initial PSEP application and internal databases are reviewed by the project team to validate project mileage. Through this scope validation step, mileage reduction may be accomplished through the critical assessment of records, reduction in Maximum Allowable Operation Pressure (MAOP), or abandonment of lines that that were no longer required from an overall gas operating system perspective.[12]

There has been verifiable cost avoidance due to the proactive nature of the Utilities' PSEP scope validation. The scope of Phase 1A in the initial PSEP Application was 355

[11] SoCalGas and SDG&E's PSEP was original filed in R.11-02-019.
[12] Lines are only abandoned after a thorough review of the ability of adjoining lines to meet current and future load requirements and to verify there will be no customer impact or system constraints.

Category 4 miles.[13] Through scope validation, the current Phase 1A mileage is approximately 95 miles of Category 4 – an approximately 260-mile reduction.[14] [15] 32 Phase 1A projects, totaling 36 Category 4 miles have been completely eliminated from PSEP due to scope validation efforts. As a result, SoCalGas and SDG&E have avoided an estimated project–to–date cost of over $500 million. These efforts exemplify the Utilities prudent management of PSEP.

The PSEP team plans to continue its proactive scope validation and to mitigate costs when possible and appropriate. For example, initial scope validation is underway to validate the Phase 1B[16] mileage identified in the initial PSEP Application. Through the initial Project Initiation stage review, it was determined that three pipelines totaling 15 miles of pipe could be abandoned, eliminating the need to replace these segments. Additionally, for another Phase 1B pipeline with 27 miles initially in scope, the project team undertook a segment by segment review, taking into consideration system capacity and customer requirements. The results of the review resulted in 9 miles being abandoned and 11 miles lowered in pressure, thereby avoiding the replacement of 20 miles. The scope validation efforts have and continue to result in avoided costs for our customers.

F. PSEP has Implemented Prudent Community Outreach Efforts

Phase 1A projects are located in populated areas. As such, a proactive community outreach effort is an integral part of keeping customers, elected officials, and government entities informed about PSEP projects taking place in their communities. Approximately 6,000 customer notification letters and 4,000 door hangers were delivered to customers along the route of the 41

[13] Excludes Line 1600, which is the subject of a separate application: A.15-09-013.
[14] Mileage figures do not include accelerated or incidental miles as defined in Chapter III (Phillips).
[15] As directed in D.14-06-007, a reconciliation of the mileage contained in the original PSEP Application to the mileage of the projects included in this application is contained in Chapter III (Phillips).
[16] For the purposes of discussion here, Phase 1B refers to pre-1946 non-piggable pipe.

PSEP projects included in this application. Numerous meetings were held with elected officials and municipal agencies to provide advance notice and ongoing updates regarding PSEP projects. Additionally, PSEP established a web page providing background information, construction activities, and project status to give customers and stakeholders easier access to information. Through media and public service announcements placed in the SoCalGas and SDG&E service territory, views to the websites increased by 65% between the First and Second Quarters of 2015. These outreach efforts were instrumental in avoiding project delays and, in some instances, resulted in less onerous permit conditions being imposed on SoCalGas and SDG&E. For example, ongoing communications with the city of Arroyo Grande on the Line 36-9-09 North Section 6A project, helped ensure permits were issued on schedule. In addition, SoCalGas and SDG&E successfully mitigated a list of permit conditions that would have resulted in higher project costs. The city, in response to an inquiry by an inspector from the SED, praised SoCalGas for their proactive outreach efforts. An inquiry from a local television station regarding the project resulted in a positive story on the 36-9-09 North Section 6A project.[17]

IV. THE UTILITIES' PSEP USES INTERNAL AND CPUC OVERSIGHT TO PRUDENTLY MANAGE THE PROGRAM

PSEP complies with SoCalGas and SDG&E's Gas Standards, applicable laws and regulations, and involves SED oversight to prudently and lawfully manage the safety enhancement work.

SoCalGas and SDG&E's Gas Standards comprise the policy and procedures that govern the design, construction, operations, and maintenance of the transmission and distribution systems. For each project, the Gas Standards and other internal standards and practices are

[17] See: http://www.keyt.com/news/arroyo-grande-gas-pipes-pass-inspection/32677812

employed to govern the design analysis,[18] materials purchased,[19] and construction practices.[20] The Gas Standards have dual objectives: to comply with relevant and current applicable laws and regulations and promote safety and operational efficiency.

Gas Standards are updated by the Utilities as necessary. The SED regularly reviews the natural gas transmission and distribution functions for each utility providing natural gas in the state. The SED compares the functions of transmission and distribution with requirements set out by General Order (GO) 112-E,[21] which incorporate federal standards. Through these reviews SED evaluates and provides input on the Gas Standards to promote compliance with GO 112-E and referenced provisions of Title 49 of the Code of Federal Regulations (49 CFR).

In addition to SoCalGas and SDG&E's own internal oversight efforts, SED has closely interacted with SoCalGas and SDG&E in the successful execution of PSEP projects. As ordered by D.14-06-007,[22] SED provides oversight on various aspects of PSEP with emphasis on

[18] PSEP design standards and practices address materials to be used and proper design in accordance with GO 112-E and applicable federal laws and regulations. PSEP design standards and practices enable: (1) the development of specific engineering requirements for materials used in PSEP projects; (2) preparation of designs that comply with applicable laws, permits, SoCalGas/SDG&E, and industry standards; (3) utilization of applicable engineering and design standards developed for PSEP; (4) consistent design and material requirements for the various engineering design firms contract to assist with design development; and (5) the development of a project-specific design basis for each PSEP project.

[19] Once the PSEP project has been scoped, designed, and approved, materials are ordered that comply with SoCalGas and SDG&E's Materials Specifications for Gas Operations (MSPs). Unless otherwise specified, API 5L pipe, with the specific approved grades and wall thicknesses, are used.

[20] Construction is subject to extensive standards, practices, and guidelines. SoCalGas and SDG&E have implemented comprehensive standards that address, among other areas, excavation, coating application and inspection, welding, welding inspection, trenching, cover, and pressure testing. Prior to starting work, as a part of the agreement with the contractor, contractors are provided an index of standards, practices, guidelines, and requirements; as applicable, contractors are provided updates when issued. SoCalGas and SDG&E monitor and document compliance with applicable standards, laws, and requirements.

[21] In R.11-02-019, the Commission approved revisions to General Order 112 (*see* D.15-06-044). New General Order 112-F is not mandatorily effective until January 1, 2017 (*see* D.15-06-044, mimeo., at 15).

[22] D.14-06-007, mimeo., at 29 ("Specific to SDG&E and SoCalGas's Safety Enhancement we delegate to Safety Div. the specific authority to directly observe and inspect the testing, maintenance and construction, and all other technical aspects of Safety Enhancement to ensure public safety both during

construction activities and recordkeeping. SED personnel are routinely onsite at PSEP construction projects and monitor compliance with applicable regulations.

PSEP also has had an outstanding safety record with an Occupational and Safety Health Administration (OSHA) incident rate of 0.47, well below the industry average of 1.2. All Company employees and contractors are held to the same safety procedures and are thoroughly trained prior to the beginning of projects.

Finally, in addition to PSEP's success from a safety perspective, environmental considerations are effectively considered and managed when implementing the program. The 41 projects included in this application had no violations or fines issued by any agencies. The PSEP Environmental Group works closely with the project teams to identify potential environmental issues early in the planning process and to develop mitigation strategies. For example, SoCalGas and SDG&E shared and transferred water used in pressure testing for reuse among multiple projects. This effort reduced the dependency on potable water (of particular importance with the drought conditions in Southern California) and also minimized waste.

V. PSEP HAS PRUDENTLY MANAGED RESOURCES CONSISTENT WITH THE VOLUME OF PSEP PROJECTS

A. PSEP Personnel

Through PSEP, SoCalGas and SDG&E have been tasked with expeditiously implementing the largest natural gas infrastructure enhancement plan in their history. There were no idle existing employees available to transition to PSEP without impacting

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the immediate maintenance or construction activity and to ensure that the pipeline system and related equipment will be able to operate safely and efficiently for their service lives.")

our ability to safely and reliably maintain our pipeline system and remain in compliance with state and federal regulations.[23]

SoCalGas and SDG&E knew it would be difficult (if not impossible) to cost-effectively hire exclusively Company personnel in a timely manner to meet the Commission's directive that work be completed as soon as practicable. Furthermore, because PSEP is not a permanent program and will not become an ongoing part of how SoCalGas and SDG&E safely and reliably operate their system, eventually PSEP-dedicated Company personnel will need to be transitioned to other positions within SoCalGas and SDG&E.[24] As such, it was determined that the best method to implement PSEP was to augment SoCalGas and SDG&E's resources by engaging contractors, some with specialized skills working on large infrastructure projects, who could be quickly added or removed from PSEP depending on the needs of the organization. Table 1 below depicts the number of internal and external resources directly supporting PSEP at various points in time:

[23] SoCalGas and SDG&E normal operational staffing levels are established based on the expected annual amount of pipeline work – a level far below the level of work required to implement PSEP. Therefore, there was not additional resource capacity that could be utilized for PSEP. In addition, SoCalGas and SDG&E were concerned that drawing too many experienced employees from other SoCalGas and SDG&E departments would impact our ability to continue to safely and reliably maintain our pipeline system and maintain compliance with state and federal regulations.

[24] Nor were there a large pool of highly qualified engineers available to hire. The most expeditious, and in the long run, most cost effective choice was to hire contractors to perform the PSEP work.

Table 1

PSEP Resource Mix

	Internal Resources	External Resources[25]	Total	% Internal
6/14	216	275	491	44%
6/15	275	536	811	34%
12/15	287	490	777	37%
4/16	286	382	668	43%

In addition to augmenting internal resources with contractors, SoCalGas and SDG&E have actively pursued hiring additional internal resources for both engineering and non-engineering positions. SoCalGas and SDG&E's objective in staffing PSEP is to acquire personnel with the necessary skills and expertise to efficiently plan, execute, and oversee PSEP work while maintaining safe and reliable service to customers. The PSEP organization has retained SoCalGas, SDG&E, and external personnel needed to perform a wide range of project work activities including: project management, planning, engineering, logistics, purchasing, contracting, project cost and schedule controls, environmental monitoring, land rights acquisition, contractor oversight, quality assurance/quality control, and document management. SoCalGas and SDG&E continue to work to acquire experienced personnel from all sources: transferring and developing internal Company personnel, hiring external personnel, and engaging contractors. This is all being done in anticipation of internal Company personnel taking a more prominent role as PSEP matures. As of April 1, 2016, a total of 307 SoCalGas and SDG&E

[25] Does not include construction contractors.

PSEP positions have been hired into either new or replacement PSEP positions. Table 2 summarizes the results of these efforts:

Table 2

SoCalGas and SDG&E PSEP Hiring

	2012		2013		2014		2015		YTD 2016[26]		Total	
	New	Repl.	New	Repl.	New	Repl.	New	Repl.	New	Repl.	New	Repl.
Engineering (Eng.)	3	0	16	1	16	2	9	4	2	1	46	8
Eng. Ext. Hires	5	0	2	0	21	1	6	1	1	2	35	4
Non-Engineering (N/E)	15	0	33	0	62	10	17	7	1	5	128	22
N/E Ext. Hires	0	0	9	0	22	1	20	7	4	1	55	9
Total	23	0	60	1	121	14	52	19	8	9	264	43

While SoCalGas and SDG&E continue their efforts to hire internal resources, a program the size of PSEP will always require external resources to effectively execute.

In addition to those in the PSEP organization, SoCalGas and SDG&E personnel outside of the PSEP organization also provide support on an as-needed basis. Employees in the Transmission and Distribution Regions and Gas Engineering organizations provide project-specific support in areas such as customer impact analysis, engineering drawing review, tie-in operations, and construction.[27] Company resources in Human Resources, Pipeline Safety and Compliance, Customer Engagement, Media and Employee Relations, and Facilities also provide programmatic support for the PSEP PMO. Management positions authorized to charge to PSEP are approved by both PSEP and the appropriate operating department's leadership. As part of

[26] First Quarter 2016.

[27] In addition to support, SoCalGas and SDG&E employees do assist with project execution as appropriate. In order to meet the Commission's directive to complete PSEP "as soon as practicable," Region Operations initially managed a group of small projects before the PSEP group was fully established. Four of these projects are included in the application. Region Operations have the option to retain this work on a project-by-project basis with PSEP approval and oversight. However, the current plan is for SoCalGas and SDG&E to continue to transition these small projects to the PSEP organization in order to complete Phase 1A in 2018.

the approval process, an estimated roll-off date is agreed upon when the resources will no longer be required to support PSEP. These estimated dates are validated on an annual basis and updated as appropriate. On a monthly basis, each management employee is required to account for hours charged to PSEP by documenting the nature of the charges. The justification and the time charged are reviewed by PSEP and discrepancies are reconciled.

The resource recruitment and management processes described above have resulted in a PSEP organization that was prudently developed to execute PSEP and enhance system safety cost effectively and expeditiously.

B. PSEP's Ongoing Efforts to Minimize Project Execution Costs

i. PSEP has Implemented Efforts to Promote Reasonable and Market-Based Costs to Customers

Procurement of services (construction contractors, engineering providers, inspectors, surveyors, etc.) and materials is the largest individual category of PSEP expenditures. Approximately 75% of PSEP costs are for purchased services and materials. As such, an important aspect of PSEP is retaining capable vendors and contractors at reasonable rates. To promote the reasonableness of these costs, PSEP relies heavily on supply management techniques and practices to acquire materials and services at market rates. To provide safety enhancement to customers at reasonable and market-based costs, SoCalGas and SDG&E use reasonable selection processes, create reasonable incentives, and impose cost controls. PSEP maintains guidelines for the preparation, solicitation, evaluation, award and administration of contracts and subcontracts that supply PSEP with qualified and best value contractors, subcontractors, and vendors.

SoCalGas and SDG&E's sourcing objective is to utilize competition to achieve market-based rates. As such, the majority of PSEP agreements entered into for materials and services

have been either competitively bid or were set at market-based rates stemming from previous competitive solicitations. In other words, in addition to individual bidding events, as appropriate, PSEP executes agreements by leveraging terms and conditions and rates from existing SoCalGas or SDG&E agreements; this avoids administrative costs, uses previously negotiated rates, and furthers the completion of work as soon as practicable. The above typically occurs through releases from a Master Service Agreement (MSA).[28] Releases from a MSA are used to authorize services and memorialize any commercial and technical terms for a specific scope of work, compensation schedule, and delivery/performance schedule in accordance with the terms and conditions of the MSA. For tracking purposes, these MSAs and releases are considered to be single sourced because a separate individual bidding event did not occur. Although tracked as single source, releases from MSA's that were implemented using market-based rates further promote cost reduction by avoiding logistical costs associated with separate bidding events. In these instances, SoCalGas and SDG&E are using previous efforts to competitively bid, vet, and negotiate contracts; promoting market-based rates, leveraging earlier efforts to competitively source vendors and contractors, and promoting cost effectiveness and expeditious execution of PSEP.

Approximately 98% of PSEP agreements with contractors and suppliers are either competitively bid or are through agreements that use market-based rates based on a recent competitive sourcing event.[29] This includes costs incurred to directly execute a PSEP project

[28] A Master Services Agreement is a contractual arrangement with a contractor/supplier that typically defines the broad terms, conditions, rates, and fees that are agreed to by both parties and governs all the work that will authorized under the MSA. Although an MSA contains general terms, typically there is a "release" that is more detailed to the task at hand, and that is executed for each project under each MSA.
[29] This figure was calculated through a review of PSEP agreements executed up to January of 2016.

and project support costs incurred to support PSEP execution more generally (as discussed in Chapter VII (Mejia) and VIII (Tran)).

Despite the benefits associated with competitively bidding contracts, there are circumstances when it is not possible or prudent to do so. In such instances, single or sole sourcing can be reasonable contracting options that help realize efficiencies, reduce administrative costs, and promote the completion of PSEP as soon as practicable. For example, because the duration of a typical competitive sourcing event is between 12 to 18 weeks depending on contract value and complexity, in order to get projects to construction in the early stages of PSEP as soon as practicable, construction support activities (e.g., inspection) were single sourced. In this instance, the inspection firm single sourced had the resource capability to meet our immediate need for this service.

ii. The Performance Partnership Program Further Enhances Construction Contractor Cost Effectiveness

As the volume of PSEP Phase 1A work increased, SoCalGas and SDG&E determined that it would be best to competitively bid bundles of construction work. Therefore, contract bundles, by area, were competitively bid, negotiated, and awarded through the Performance Partnership Program.[30]

The Performance Partner Program allows Performance Partners to enter into competitive bidding for batches of projects, as opposed to one at a time. This provides numerous benefits for SoCalGas and SDG&E: providing competitive market prices, avoiding administrative costs for successive individual bids, engaging construction contractors in longer term agreements for

[30] Work was split into different construction regions (Central Coast / North Coast, LA Basin, Desert, San Diego, and San Joaquin Valley). Four regions (Central Coast / North Coast, LA Basin, San Diego, and San Joaquin Valley) use a performance partner. One region (Desert) continues to competitively bid PSEP construction work.

numerous projects (which lowers costs by hiring a sustained workforce with less downtime and allowing contractors to work with the same internal engineering teams for a more collaborative effort),[31] and providing contractors an incentive to competitively bid for the work and agree to additional cost control mechanisms (since the winning bidder is awarded more than just one project). Although PSEP has been using Performance Partners, the PSEP organization retains the discretion to conduct competitive solicitations or to single source work to acquire contractors for any PSEP projects where it is determined that it may beneficial.[32]

Under the Performance Partner Program, each project worked on by a Performance Partner is subject to a target pricing risk/reward mechanism. This mechanism is based on establishing a target price agreed to by SoCalGas and SDG&E and the Performance Partner. Using this target price, the Performance Partner has a cost incentive to efficiently perform the project because it shares in both reduced and excess costs. The Performance Partner is not, however, entitled to any profits when costs exceed 20% of the target price.

SoCalGas and SDG&E, by virtue of the sharing mechanism, realize cost savings that would not exist under traditional competitively bid contracts. For the 17 projects included for cost recovery in this filing that were awarded to a construction contractor under the Performance Partner Program, a $3.9 million cost avoidance was realized when taking into account the difference between the negotiated target price and the final actual cost to SoCalGas and SDG&E.

[31] These efforts also mitigate the risk of insufficient trade labor and supervisory resources (leading to direct cost savings through efficient dispersal and logistics of regional work) and better enable construction personnel to provide valuable engineering and design recommendations.

[32] For example, (1) in order to diversify the assignment of work (instead of limiting it to four construction partners); (2) as a separate tool to validate costs incurred by the performance partners (providing yet another rate by which to compare performance partner performance); and (3) allow other construction contractors who were not selected as performance partners the opportunity to bid on projects, which helps sustain their viability in the SoCalGas and SDG&E service territory.

The complete results of the sharing mechanism for the 17 projects included in this application are included in Attachment A.

In addition to the risk-reward mechanism, SoCalGas and SDG&E were also able to negotiate other incentive mechanisms to reduce costs to customers. These include: (1) overall caps on Performance Partner overheads; (2) individual project profit caps under the sharing mechanism; (3) negotiated annual profit caps based on total work completed (this resulted in an approximate $950,000 rebate after the first year of the contracts); (4) caps on the mark-up from third party subcontractors used by the performance partner; and (5) the ability to audit Performance Partner costs.

SoCalGas and SDG&E engaged KMPG to evaluate the results of the Performance Partnership Program and analyze the profit paid to a pipeline contractor using lump sum contracts awarded by competitive solicitation and the profit paid to the same contractor under the Performance Partner Program.[33] The Utilities asked this analysis to be performed to determine if there were verifiable cost savings and whether to continue with this approach. KPMG concluded that the Performance Partnership Program can result in greater customer benefits through reduced costs.

iii. Materials

PSEP materials are acquired in a manner designed to minimize costs and maximize timely delivery. Materials and equipment are procured according to PSEP standards and practices. In an effort to provide the lowest reasonable cost, each specific project may have different execution strategies. Generally, materials and equipment are purchased by an agent for SoCalGas or SDG&E, with payment made through the existing SoCalGas or SDG&E systems.

[33] *See* PSEP Pipeline Construction Contractor Profit Analysis (Attachment B).

Further, to take advantage of previous efforts to vet and engage vendors, SoCalGas and SDG&E's Approved Manufacturers List (AML) is utilized.[34]

Where possible, PSEP acquires materials by aggregating material needs from multiple projects thereby making periodic buys for larger quantities of materials. These efforts better enable SoCalGas and SDG&E to obtain favorable pricing. Project-specific buys are also done to account for specific design parameters. Generally, for project-specific buys, multiple buys are executed at each major design phase to address time constraints and reduce costs. For example, long lead time items are identified early for sourcing. As appropriate, items may be transferred between projects to reduce last minute buys and shipping costs. Regardless of the type of order, material bids are designed to obtain multiple quotes for the best pricing options, promoting work with select firms for efficiency of process, and encourage the development of local resources and sourcing.

Due to the sheer volume of projects, PSEP requires a high amount of warehouse space to store materials. Two separate material yards were established in Fontana[35] and Bakersfield. These locations provide centralized hubs to serve as receipt points for material shipments and staging areas for project materials. The PSEP Supply Management team accumulates individual project material requirements and, where possible, executes bulk purchases through a competitive solicitation process. This provides better pricing through economies of scale and avoids multiple purchases with duplicative transactional steps. Once received, the bulk material is staged by project for delivery to the job site.

[34] Sourcing new suppliers is considered when the current AML providers cannot support the project needs or it is determined that additional competition would be cost advantageous.
[35] The Fontana location was closed in March of 2016 as PSEP work is becoming more concentrated in the Northern portion of the SoCalGas Service Territory.

iv. PSEP's Ongoing Efforts to Maintain Market-Based Costs

As market conditions change (e.g., slowdown in statewide and nationwide construction activity) or as PSEP develops new market strategies (e.g., not-to-exceed bids for certain categories of work) PSEP has gone back out to the market to negotiate lower costs. Within the last year, PSEP has re-bid or renegotiated contracts with providers of the following functions: inspectors, engineering design, survey, environmental services, warehousing. For these services, it was our opinion that the decrease in the price of oil had decreased the market for these services. In other words, since the demand for their services has likely decreased, there was an opportunity to calibrate costs to current (less expensive) market conditions. These efforts have resulted in cost reductions.

v. Other Cost Avoidance Efforts

In addition to the successful efforts to avoid costs through project scope validation, the PSEP project teams also look for ways to avoid costs in the design and construction phases. The teams exercise diligence (1) during the planning and detailed design phases to find the least cost approach to design the pressure test, replacement, or valve work; (2) by negotiating with permit agencies and land owners to avoid costly permit conditions or unreasonable land acquisition costs; and (3) by minimizing the cost impact of design conflicts and scope changes when unforeseen conditions arise during construction.

Finally, the cost savings efforts for the PSEP program were not limited to contracting for traditional materials and services. For example, by placing PSEP Professional Liability insurance ourselves, we were able to reduce the Professional Liability insurance placement by nearly $2 million (when compared to our project management firm placing it).[36] Services such

[36] Costs for Professional Liability insurance is collected through the PSEP insurance overhead.

as engineering, design, and agency construction management exposures were covered as a result of this placement, providing important protections to customers and increasing competition for services being rendered. Additionally, after we reduced the mileage through records review by more than half, we further reduced the insurance premium by arguing that the insurance carrier's risk was reduced.

C. PSEP's Cost Tracking, Controls, and Management Practices Prudently Manage Project Costs

As part of the cost management effort, it is important to track and categorize the PSEP costs that have been incurred. Generally, project-specific costs are charged to their respective project accounts. Costs that cannot be attributed to a specific PSEP project are charged to a non-project specific account, based on the related activity and support function.[37] Through cost tracking and categorization, SoCalGas and SDG&E document that costs are appropriately categorized and that the recorded costs were incurred to directly contribute to PSEP implementation and execution.

SoCalGas and SDG&E track costs by Work Order Authorization (WOA). The general function of a WOA is to track costs associated with planning and execution of a specific project. To properly track costs to the appropriate category and project, projects and cost categories are assigned a unique internal order number that is used to track costs associated with that project or activity to a WOA. Additionally, SoCalGas and SDG&E implemented procedures to verify the accuracy of costs. This includes verifying that billing rates are correct, reviewing time sheets for hours worked, and reviewing other supporting documentation for accuracy. Once the information on invoices is verified, the invoice reviewer forwards the invoices to the project

[37] *See* Chapter VIII (Tran).

managers to confirm that the correct labor hours were worked on the project and the billed labor rates, and any additional expenses, are within the terms of the contract.

VI. PSEP ENCOUNTERS EXTERNAL OBSTACLES THAT DRIVE COSTS INCREASES

Pipeline and valve projects are complex and require detailed orchestration. Many things have to line up to begin construction. Many of the factors that determine when SoCalGas and SDG&E can begin construction are not in the direct control of SoCalGas and SDG&E. Restrictions on when construction can occur must be determined and adhered to (cities may have moratoriums during heavy traffic periods; we may need to work around a large customer's planned outage or low usage period; or Gas Control may have restrictions of when the pipeline can be taken out of service). Permits, land rights, and materials have to be acquired. Availability of construction contractors, inspectors, specialty equipment, construction oversight personnel, and regional operations personnel must be considered. As a result, it is not uncommon for Project Teams to be engaged in hurried efforts to acquire a permit or land right or material, or to reschedule the construction start date due to the planned construction crew being delayed from the completing another project.

Despite SoCalGas and SDG&E's reasonable efforts to avoid and reduce costs, external factors can impact project scope, cost, and schedule. As a result, early project estimates based on preliminary project planning and engineering design usually will not reflect the reasonable costs ultimately incurred to complete the work. The following is a description of the key external factors impacting projects.

A. Permitting and Temporary Land Rights Acquisition

In the area of construction, there is a significant difference between projects that are completely or mostly completed on private land ("behind the fence") and those that are "linear

projects" where the owner doesn't own the land. In the latter, since the owner does not own the land, various permits and rights must be obtained for construction to occur. PSEP pipeline and valve projects are primarily linear projects located in franchised rights of way (streets) but are also located on private and federal land. PSEP projects are also located in all areas of the SoCalGas and SDG&E service territory, which leads to a wide array of geographical diversity and challenges. These varying locations results in the need to acquire numerous permits and negotiate with private landowners. Each of the various types of permits or individual landowners brings various challenges to projects but generally the issues have centered on the time to obtain permits, the increasing stringency of permit requirements, and cost and time to negotiate temporary or permanent land rights. Some projects do not require extensive permitting if located within existing SoCalGas and SDG&E facilities. Others, depending on the location of the projects, may require multiple additional permits, from environmental (water, wildlife, cultural, Caltrans, etc.).[38] At a minimum, PSEP projects require a permit from the municipal agency where the replacement or hydrotest is being executed before a project can commence construction. To illustrate, approximately 140 permits and 90 land use agreements were obtained for the 41 projects included in this application.

When working in the streets different types of permits are needed. Typically, an excavation permit is needed from the local jurisdiction the purpose of which is to establish work times, allowable length of the project, dates of when work may not be performed during heavy traffic conditions ("holiday moratoriums"), etc. Permits are also needed for traffic control to

[38] Environmental and cultural permitting is also challenging in various project locations. Some projects require species, cultural or other types of monitors to excavate and perform construction work. Each of these monitors adds cost and potential schedule delays to each project. Fish and Wildlife or other Federal land permits are required in addition for some projects. These permit groups have long lead times and can restrict projects to certain schedules.

determine arrow boards, delineation, number of lanes that may be closed, etc. Further, projects may transgress more than one jurisdiction – city streets, county streets, Caltrans jurisdiction on freeway underpass/crossing. The different agencies all require permits and each has their own preferences. For instance, in a few cases one agency required night work while the other required work only during the day, which causes issues where the two jurisdictions meet. They may have differing preferences on how to handle environmental and cultural resources issues that may arise from disturbing the soil under the pavement.

In addition to the number of permits, agency staffing levels have not increased at a commensurate level to the volume of permits being requested. Therefore, the length of time required to obtain even the most rudimentary permit has increased. For example, depending on the complexity of the permit and the permitting municipality or agency, encroachment and traffic control permits can take anywhere from two weeks to nine months to obtain. Additionally, smaller cities are typically not staffed adequately to review the large design packages produced by PSEP for larger projects within their borders, which adds to the review time. Although SoCalGas and SDG&E factor in anticipated permit processing time in their project planning process, unanticipated delays occur, especially when there are resource constraints at the agencies.

Permitting agencies are also placing greater restrictions and additional requirements on SoCalGas and SDG&E on issued permits. One example of this is seen in the limitation on work hours. For example, some permits only allow street work to begin at 9:00 am and be complete prior to 3:30 pm. This results in only four to five hours of productive work for crews. It takes a part of each day to setup traffic control and remove road plates before the day's construction activities can commence. At the end of the day, time is needed to plate the excavations and

remove traffic control. Compared to crews with approved 10-hour work windows, these shortened work days can double the time for construction of a project. Another example of permitting restrictions is the time of year for project construction. Some of the pipe segments are located in resort areas, where PSEP work is severely restricted or forbidden during the peak season. Many municipalities also limit or prohibit construction activities along major thoroughfares over holiday seasons, with moratoriums between Thanksgiving and New Year's Day common.

The length of active construction activity allowed can also impact productivity. Some agencies restrict this length to only 500 feet at a time. This means the activities are taking place very close to each other in a congested workspace which reduces productivity as the length of time required to complete a given task increases. When agencies allow lengths nearer 1,000 feet, concurrent construction activities are not as congested.

Permitting agencies' requirements can also change project scope which may cause a redesign or other drawing revision. This results in delays and added cost. Pavement repairs are often extended to full lane repairs or overlays. These add to the paving costs. Specialized pavement types, such as rubberized asphalt have been required for repairs, again raising restoration costs.

Finally, the design of some pipeline and valve projects may require the acquisition of permanent rights from private landowners. Almost all PSEP projects require some temporary space needs for the storage of equipment and material as well as office space.[39] Temporary and permanent land rights are acquired from the owners. These landowners may not be local and can

[39] To support the construction in the streets, temporary land is needed for the construction yard – place to store equipment, materials, traffic plates, trailers, etc. for the duration of the project. Additionally, space is needed for temporary storage of water tanks, pumps and filtration equipment which must be acquired.

be difficult to reach. Some owners initially demand large fees for easements or temporary use agreements and it takes longer to negotiate. Some commercial or industrial property owners may even impose their own work restrictions or requirements. Private land negotiations can be challenging and may impact project schedule.

In an attempt to avoid delays, the PSEP Land Services Team, a dedicated team for permitting and land right acquisition, was formed in mid-2014 to assist with these efforts. The team is an important asset to the program to monitor permit activities and assist with land negotiations. One of the early initiatives of the team was to improve the quality of the permit package submissions. This leads to less rejections of the initial application by the permitting agencies and reduced overall processing time. The PSEP Land Services Team works closely with SoCalGas and SDG&E Regional Public Affairs and the PSEP Community Outreach Teams. These efforts have assisted in resolving lingering issues that delay the issuance of permits and promote the issuance of permits in a timely manner. For example, permit review with a city in which PSEP had multiple projects was taking over nine months due to backlogs and lack of resources. The issue was elevated to city leadership and a new process was developed to ensure that one team is responsible for the review of utility plan submittals.

B. Construction Unknowns

Despite efforts in the planning and engineering design phase, unforeseen factors encountered during construction may increase the complexity of projects and cause projects to take longer than planned. For example, it is not uncommon to discover substructures that were not on maps or in records during excavation. This is particularly true for older areas because requirements for substructure recordation were not as stringent as today. Additionally, governmental records may have been lost over the years. Unidentified substructures usually result in pipeline routing changes. Unanticipated soil changes (i.e. loose sandy soil rather than

more cohesive soil) may require a change in the excavation or shoring method. Finally, coordination with other utilities can sometimes delay project schedules. For example, for some valve projects, new communications and electricity lines are required when a valve is automated and despite scheduling in advance, delays are often encountered by electric and communication utilities in the completion of their portion of the project.

C. Material Availability

Given the unprecedented level of pipeline work, not only at SoCalGas and SDG&E but at other California utilities, material availability has been an issue that has impacted cost and schedule. SoCalGas and SDG&E have purchased, when appropriate, bulk quantities of commonly used pipe fittings and pipe in order to have adequate material available for projects. Bulk purchases result in better pricing as opposed to purchasing material on a project-specific basis. However, there are certain materials that are not bought "off the shelf" but must be made to order or modified to fit conditions. Examples are valves with extensions, vaults to house equipment underground, and instrument cabinets. Manufacturing delays occur due to capacity limitations caused by increased demand for pipeline material at a regional and national level. To determine whether ordered materials meet company specifications many items require inspection. Items that do not meet specifications need to be repaired or new items acquired. This causes extra time that at times can be the cause of a delay of construction start.

D. Capacity Impacts

Although customer and capacity impacts are vetted during Stage 3 of the Seven Stage Review process described earlier in my testimony, unanticipated system or customer issues may be encountered that could potentially delay a project. For example, if a project as planned requires a pipeline segment to be taken out of service for a period of time, and a different pipeline previously assumed to be available to serve customers is taken out of service, a project

may be delayed or a previously unplanned provision of an alternate supply (CNG/LNG) to serve customers may be required.

E. The Regulatory Process

Reasonableness reviews require additional steps to document costs not normally required. In addition to the compliance related documentation required of SoCalGas and SDG&E pipeline work, the extensive supporting details contained in the workpapers associated with this application is not normally generated to the level of detail presented here. This application encompasses twelve chapters and dozens of workpapers. The detail is intended to provide the Commission with a description of activities undertaken and decisions made at each stage of the Seven Stage Review process as well as an explanation of the reasonableness of the costs incurred. This level of detail is included based on feedback received from parties in A.14-12-06 and the desire of SoCalGas and SDG&E to be responsive to that feedback and promote expeditiously resolution of PSEP after-the-fact reasonableness reviews. The information and its creation, however, is time intensive and costly.

VII. PSEP HAS BEEN MANAGED REASONABLY AND PRUDENTLY AND COSTS SHOULD BE JUDGED BASED ON SOCALGAS AND SDG&E'S ACTIONS AND RESULTS

In assessing the reasonableness of the incurred costs, the Commission must determine whether SoCalGas and SDG&E incurred the costs necessary to enhance system safety reasonably and consistent with a reasonable manager. To meet this standard, "[t]he act of the utility should comport with what a reasonable manager of sufficient education, training, experience and skills using the tools and knowledge at his disposal would do when faced with a need to make a decision and act."[40] In approving SoCalGas and SDG&E's PSEP, the

[40] D.90-09-088, mimeo., at 16.

Commission noted: "This is not a perfection standard: it is a standard of care that demonstrates all actions were well planned, properly supervised, and all necessary records are retained."[41] In other words, SoCalGas and SDG&E's must demonstrate that their safety enhancement actions and associated costs were reasonable based on the facts and circumstances that were known or should have been known when the decision was made or action taken. As explained at length in this application, the answer is clearly yes.

As discussed above, PSEP projects may experience numerous unknowns: permit approval times; land acquisition times; permit approval conditions (that can greatly affect productivity and cause much higher costs); material delays; and subsurface facilities or conditions that cannot be estimated or known until after construction is underway. As a result of these and other conditions discussed in workpapers, there have been cost variances experienced during construction.

The cost variances encountered in the execution of PSEP are in line with other public and private global organizations that manage large construction projects. The 2015 KPMG Global Construction Survey (Attachment C) interviewed executives from over 100 organizations on a wide range of project related topics, including planning and financial forecasting, risk and project management, and contractor management among others. The survey indicated:

- "Looking back over the past 3 years, fewer than one-third of all respondents projects managed to come within 10 percent of the planned budget, with the energy and natural resources, and especially the public sector, performing considerably worse than other industries."[42]

[41] D.14-06-007, mimeo., at 12.
[42] KPMG Global Construction Survey 2015, pg. 17 (Attachment C).

- "…just a quarter of construction projects come within 10% of their original deadlines…"[43]
- "…owners are heavily dependent upon capable project management teams that understand engineering and construction, project management principles and practices…."[44]
- "44% of respondents struggle to attract qualified craft labor and 45% cite a lack of planners and project managers."[45]

Consistent with our peers and other reasonable managers, SoCalGas and SDG&E have experienced similar variances and constraints in executing PSEP.

Furthermore, consistent with the reasonable manager standard, the Commission should be cognizant of what SoCalGas and SDG&E knew during the initiation of these projects. As mentioned, all of the projects presented for review and recovery in this Application were initiated prior to the issuance of D.14-06-007. Prior to D.14-06-007, the extent of the after-the-fact review process was unclear and as such our focus was on executing safety enhancement work reasonably, prudently, and as soon as practicable – not engaging in detailed estimating efforts or attempting to estimate or forecast multiple variations. Doing so would have slowed down PSEP work. The purpose of our preliminary estimates was to guide decision making and to implement PSEP as soon as practicable. That being noted, ongoing enhancements of the cost estimating tool used by SoCalGas and SDG&E PSEP have taken place and will lead to more refined estimates. A dedicated cost estimating team has been established and experienced cost estimating professionals were hired. While these process improvements should yield more accurate estimates, scope changes beyond our control will continue to result in cost variances. As such, the Commission should look to the reasonableness of SoCalGas and SDG&E's efforts

[43] KMPG Global Construction Survey, 2015, pg. 18 (Attachment C).
[44] KMPG Global Construction Survey 2015, pg. 8 (Attachment C).
[45] KMPG Global Construction Survey 2015, pg. 9 (Attachment C).

to avoid and control costs, while enhancing system safety, not the accuracy of a preliminary estimate.

VIII. CONCLUSION

SoCalGas and SDG&E should be authorized to fully recover the costs presented in this application minus disallowances acknowledged in Chapter III (Phillips) and Chapter V (Mejia). The costs were incurred to complete work that was mandated by the Commission and State law, SoCalGas and SDG&E activities comply with Commission decisions and guidance, and SoCalGas and SDG&E acted as reasonable managers in executing PSEP work. In so doing, SoCalGas and SDG&E have been executing PSEP consistent with its stated objectives:

- Enhance public safety: PSEP projects have been completed successfully and consistent with applicable rules, regulations, laws, and SoCalGas and SDG&E's internal policies and procedures.
- Comply with the Commission's directives: PSEP efforts have been consistent with Commission instructions to proceed "as soon as practicable" and have worked with the SED pursuant to their oversight role.
- Minimize customer impacts: Projects were completed while maintaining service to core customers and with minimal planned outages for commercial and industrial customers.
- Maximize the cost-effectiveness of safety investment: SoCalGas and SDG&E reasonably avoid costs, obtain market-based contractor and material rates, use a prudent amount of internal and external resources, and prudently design, engineer, and execute PSEP projects.

The Commission should find that SoCalGas and SDG&E have executed PSEP prudently and have implemented and executed PSEP consistent with the requirements of D.14-06-007. The costs presented for review and recovery in this application are reasonable and the associated revenue requirements submitted for recovery should be fully recovered in rates.

This concludes my prepared Direct Testimony.

IX. WITNESS QUALIFICATIONS

My name is Richard D. Phillips. I have been employed by SoCalGas since 1978. I have held Director level positions in Engineering, Supply Management, Gas Distribution, Electric Distribution, Customer Services, IT, and Storage as well as a manager position in gas transmission pipeline services.

My current position is Senior Director, Pipeline Safety Enhancement Program.

I have a Bachelor's degree in Engineering from University of California, Irvine, cum laude. I am a registered Professional Engineer in California. I have a certificate in Executive Management from the University of Michigan and a certificate in Finance for Executives from the University of Chicago. I was a member of the Pipeline Research Council International.

I have previously testified before this Commission.

ATTACHMENT A

PERFORMANCE PARTNER COST AVOIDANCE SUMMARY

ATTACHMENT A
PERFORMANCE PARTNER COST AVOIDANCE SUMMARY

Line	Cost W/O Performance Partner Program	Cost Under Performance Partner Program	Cost Avoidance
1005	$ 1,986,714	$ 1,759,646	$ (227,068)
1011	$ 844,783	$ 776,933	$ (67,850)
1015 North	$ 1,193,705	$ 1,046,800	$ (146,905)
1015 South	$ 993,898	$ 978,833	$ (15,065)
2000W Sec 1	$ 3,013,207	$ 2,774,114	$ (239,093)
2000W Sec 2	$ 2,722,022	$ 2,419,047	$ (302,975)
2000W Sec 3	$ 3,624,991	$ 3,244,648	$ (380,343)
2003 Sec 1	$ 1,172,862	$ 1,157,402	$ (15,460)
2003 Sec 3	$ 1,600,268	$ 1,591,796	$ (8,472)
2003 Sec 4	$ 716,814	$ 460,442	$ (256,372)
33-120 Section 2	$ 3,377,997	$ 3,256,275	$ (121,722)
36-9-09 North Sec 2B	$ 1,225,184	$ 1,216,340	$ (8,844)
36-9-09 North Sec 6A	$ 1,337,590	$ 1,013,014	$ (324,576)
406 Secs 2,2A	$ 1,210,426	$ 1,166,142	$ (44,284)
406 Sec 1	$ 1,291,027	$ 1,287,930	$ (3,097)
406 Sec 5	$ 662,139	$ 596,967	$ (65,172)
38-539	$ 8,001,504	$ 7,925,347	$ (76,157)
PDR Storage Phase 5	$ 3,654,962	$ 2,364,057	$ (1,290,905)
Pixley Valve	$ 194,836	$ 172,077	$ (22,759)
49-14	$ 1,656,966	$ 1,635,965	$ (21,001)
TOTAL	**$ 40,481,895**	**$ 36,843,774**	**$ (3,638,121)**
Note: Cost w/o Perf Partner Program signifies what the cost would have been absent the Perf Partner sharing mechanism.			
- The Final Total Cost exceeded the Final Target Price for the following projects, the amount of the risk payment paid by the Contractor			
representing their share of the overage is shown as a cost avoidance.			
			Cost Avoidance
2001W-B Sec 10			$ (99,655)
2001W-B Sec 11			$ (90,299)
2001W-B Sec 14			$ (8,132)
407 South			$ (2,295)
SGV Valve			$ (100,843)
Victoria Valve			$ (1,649)
TOTAL RISK PAYMENTS			**$ (302,873)**
GRAND TOTAL COST AVOIDANCE FOR PERFORMANCE PARTNER PROJECTS INCLUDED IN THIS FILING			**$ (3,940,994)**
Additional Cost Avoidance - Rebate paid by Contractor based on total spend*			**$ (949,137)**
*Note - rebate is based on all projects work by Contractor, including some not included in this Application.			
Rebate is applied as an offset to Construction General Management and Administrative costs (GMA)			
not on a project level.			

ATTACHMENT B

SOUTHERN CALIFORNIA GAS COMPANY
PSEP PIPELINE CONSTRUCTION
CONTRACTOR PROFIT ANALYSIS
AUGUST 11, 2015

KPMG

cutting through complexity

Southern California Gas Company

PSEP Pipeline Construction Contractor Profit Analysis

August 11, 2015

Contents

1. Executive Summary

KPMG LLP (KPMG, we, or our) was retained by Southern California Gas Company (SoCalGas) to perform a Pipeline Safetey Enhancement Program (PSEP) Pipeline Contractor Profit Analysis in order to assist SoCalGas' counsel with the assessment and comparison of profit paid to a pipeline contractor using lump sum (LS) contracts and cost based PSEP Performance Partnership Construction Services Agreement (Performance Partner) contracts. SoCalGas judgementally selected a PSEP contractor to be assessed.

KPMG performed project profit analysis at the selected contrator's office from June 22, 2015 through June 25, 2015.

Based on the terms and conditions of the PSEP cost based Performance Partner contracts and our analysis of profit paid to the selected contractor (Contractor) for lump sum contracts, it appears that the Contractor's lump sum projects are more profitable on average than PSEP cost based Performance Partner contracts. The contractor provided KPMG a list of 54 lump sum projects that were either completed & closed or were 95% percent complete for our analysis. KPMG judgmentally selected a sample of six lump sum projects including both gas transmission and distribution projects. Table 1 below summarizes the six projects assessed and reflects the Contractor's profit for each.

Table 1: Summary of six 2013-2014 Lump Sum Projects

Selection #	Final Contract Price	Final Job Cost Amount	Contractor's Profit Calculation	Adjusted Profit Calculation[1]
1	$ 22,983,351	$ 17,003,705	26.0%	21.9%
2	$ 1,091,680	$ 1,027,698	5.9%	1.3%
3	$ 9,953,474	$ 8,815,077	11.4%	6.1%
4	$ 2,723,002	$ 1,228,844	54.9%	52.6%
5	$ 7,049,162	$ 6,379,647	9.5%	5.6%
6	$ 2,776,522	$ 1,782,555	35.8%	32.7%
Total	**$46,577,191**	**$36,237,526**	**23.9%**	**20.0%**

[1]The adjusted profit calculation column includes project costs that were either increased or decreased in order to align with actual labor burden or overhead costs from the Contractor's PSEP cost based Performance Partner contract.

KPMG then adjusted the profit calculations for all six samples and applied the results to all 54 projects to obtain an adjusted average profit. Upon applying the adjusted profit calculation to all 54 projects, the average profit calculated was 23.3%. The results of the profit analysis are displayed below in Table 2.

Table 2: Average Profit Analysis Results

Based on 54 Projects	Contractor Average Profit Calculation	Adjusted Average Profit Calculation	PSEP Max Profit	LS Profit Greater PSEP Profit?
Average	**27.2%**	**23.3%**	**7%**	**Yes**

Based on our review and comparison of job cost accounting for the Contractor's lump sum and cost based Performance Partner contracts, we did not find any material differences between the

cost tracking reports. We were also able to verify that all six lump sum projects were competitively bid and accounted for in a similar manner to the PSEP projects.

2. Scope of Work

KPMG is currently under contract with SoCalGas to perform routine contract cost compliance assessments on their PSEP cost based Performance Partner contracts with each of their vendors and has also been retained by SoCalGas to perform this analysis which includes an assessment and comparison of the selected contractor's profit on a sample of lump sum projects. The following is a summary of the approach for our analysis:

I. Judgmentally select a sample of 6 lump sum projects (out of 54 lump sum projects delivered by the Contractor). Request project cost reports, final payment application and payment ledger from the Contractor.

II. Reconcile the cost reports to the terms of the PSEP cost based Performance Partner contracts.

III. After reconciling adjustments are made to the job costs, calculate the realized profit on the sampled projects.

IV. Using the reconciling adjustment factors for the sampled projects, apply the applicable adjustments to the remaining 48 projects. Calculate the average profit for the 54 projects.

V. Summarize work performed, reconciling adjustments, and comparison of profitability of PSEP cost based Performance Partner contracts to lump sum contracts.

3. Summary of Analysis

3.1 Lump Sum (LS) vs PSEP Cost Tracking

LS project costs were tracked identically to PSEP project costs. The six sampled projects had the same cost types as the PSEP cost based Performance Partner projects tracked in their job cost reports. Table 3 below summarizes the definition of each cost type.

Table 3: Contractor's Cost Type Definitions

Cost Type	General Description	Detailed Description	Rolls Up
1	Labor	Labor Wages (Includes Admin paid time off) and craft subsistence)	Labor
2	Burden	Burden Labor (Craft fringes benefits plus burdens on Contractor's taxable labor costs)	Labor
3	Per Diem	Non-collective bargaining agreement allowances paid to craft employees or Admin employees through expense checks.	Labor
4	Subcontracts	Subcontracts that run through Contracts Administration group.	Subs
5	Contract Labor, Continuing Services Agreement, and Operated Equipment	Contract labor is labor performed on a project by a third party, CSA allows for third parties to perform labor not considered to be part of the permanent work. Operated equipment is any third party that provides Owner/Operated labor and equipment on site.	Subs
6	Materials	Permanent Plant Materials purchased for the project.	Materials
7	Sales Tax	Sales or Use Tax on materials or rental equipment purchased for the project. Does not include sales tax on receipts included in expense reports.	Materials
8	Miscellaneous	Consumables or materials that will not remain at site.	Other
9	Rented Equipment	Third party rented equipment that requires fuel.	Equipment
10	Rented Equipment (Non-Fueled)	Third party rented equipment that does not require fuel.	Equipment
11	Contractor Equipment	Contractor Owned Equipment.	Equipment

3.2 Lump Sum (LS), PSEP and KPMG Calculated Burdens & Overhead

Upon review of burden in the LS job costs, the percentages utilized to obtain the burden costs were 41% for both Union and Non-Union labor; however these burden costs were not the Contractor's actual burden. Similar to the PSEP contracts, the burden percentages comprised of payroll taxes, insurance, consumables, supervision and miscellaneous. KPMG calculated the Contractor's actual burden based on a 2013 program and obtained 28.71% direct union burden,

20.55% indirect non-union burden. The actual calculated burden percentages have been utilized to adjust the Contractor's job costs for the six samples selected. Since the calculated actual burden rates are lower than the burdens utilized by the Contractor in the job costs, the adjusted job cost amounts are lower.
The Final Job Cost Amount for the 54 projects the Contractor provided do not include overhead costs. KPMG calculated the Contractor's actual overhead based on a 2013 program and obtained an 8.99% overhead percentage. KPMG utilized the actual overhead percentage of 8.99% in its calculations.

3.3 Lump Sum Job Costs Reconciliations

To reconcile the costs of the sampled reports to the PSEP cost based Performance Partner contracts (KPMG's calculated actual burden and overhead percentage), KPMG isolated Labor Cost and discounted Burden amounts from Burden Cost. Next, KPMG calculated the 28.71% direct union burden and 20.55% indirect non-union burden from the Labor Cost amounts, accordingly. Lastly, the 8.99% overhead was added to the subtotal job cost amount to then obtain the adjusted profit for the project. Once these steps were completed for all six projects independently, the profit percentages were averaged and compared to the Contractor's profit calculation [Table 4]. The difference of 3.88% was then applied to all 54 projects to obtain their adjusted profit calculation and then averaged once more to obtain the adjusted average profit calculation.

Table 4: Profit Calculations from Sampled six Lump Sum Contractor's Projects

Selection #	Final Contract Price	Final Job Cost Amount	Contractor Profit Calculation	Adjusted Profit Calculation
1	$ 22,983,351	$ 17,003,705	26.0%	21.9%
2	$ 1,091,680	$ 1,027,698	5.9%	1.3%
3	$ 9,953,474	$ 8,815,077	11.4%	6.1%
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5	$ 7,049,162	$ 6,379,647	9.5%	5.6%
6	$ 2,776,522	$ 1,782,555	35.8%	32.7%
Total	**$46,577,191**	**$36,237,526**	**23.9%**	**20.0%**
Profit Difference between the Contractor and KPMG			0%	3.88%

3.4 Summary of Results

Upon applying the adjusted profit calculation to all 54 projects, the average profit calculated was 23.3%. This average profit of 23.3% is greater than the maximum 7% profit permitted to the Contractor per year from the PSEP Schedule A; hence it appears that lump sum projects result in greater construction contractor profits, on average, than PSEP cost based Performance Partner contracts. The results of the profit analysis are displayed below in Table 5.

Table 5: Average Profit Analysis Results

Based on 54 Projects	Contractor Average Profit Calculation	Adjusted Average Profit Calculation	PSEP Max Profit	LS Profit Greater PSEP Profit?
Average	**27.2%**	**23.3%**	**7%**	**Yes**

ATTACHMENT C

KPMG
CLIMBING THE CURVE
2015 Global Construction Project Owner's Survey

KPMG

cutting through complexity

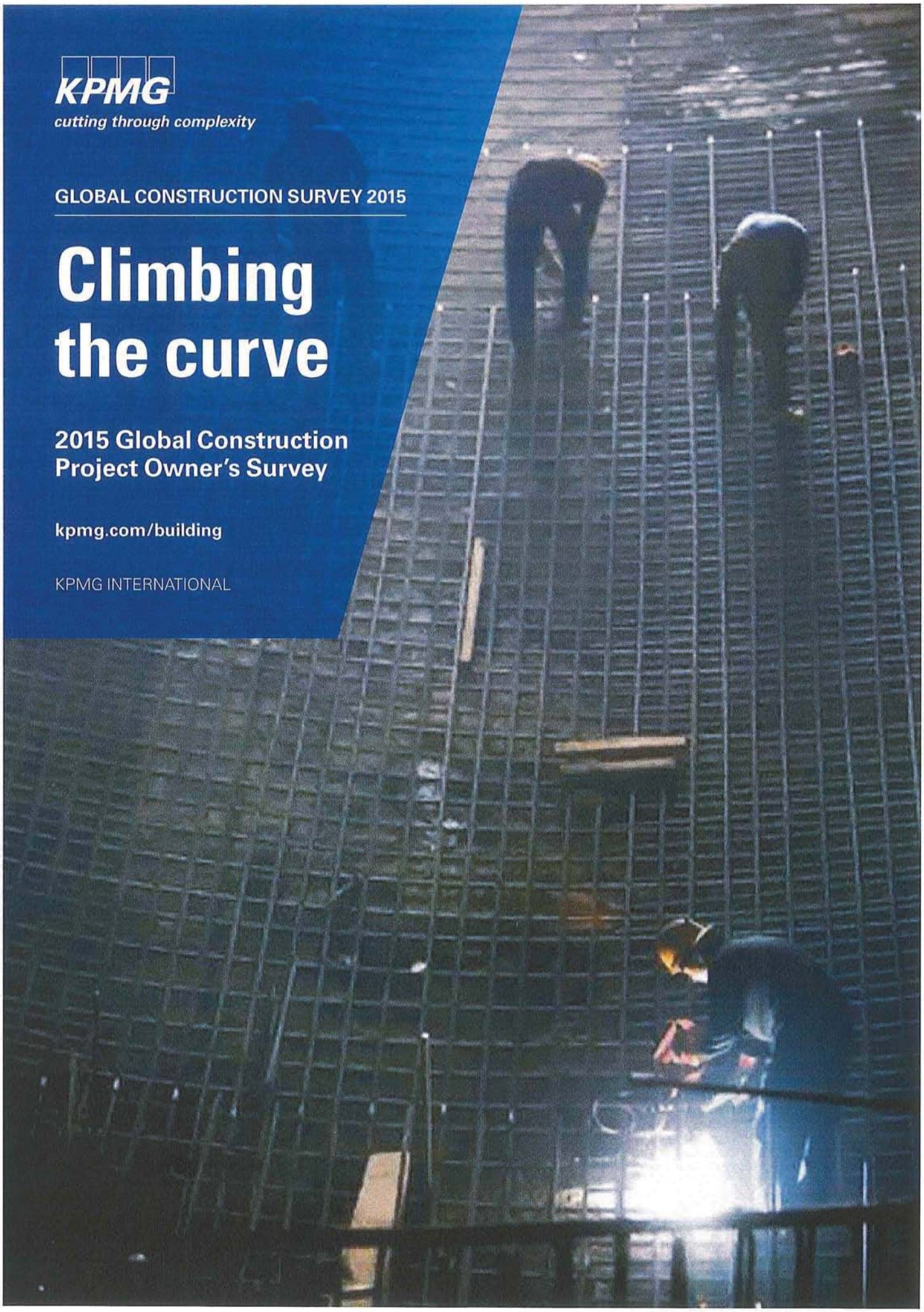
GLOBAL CONSTRUCTION SURVEY 2015

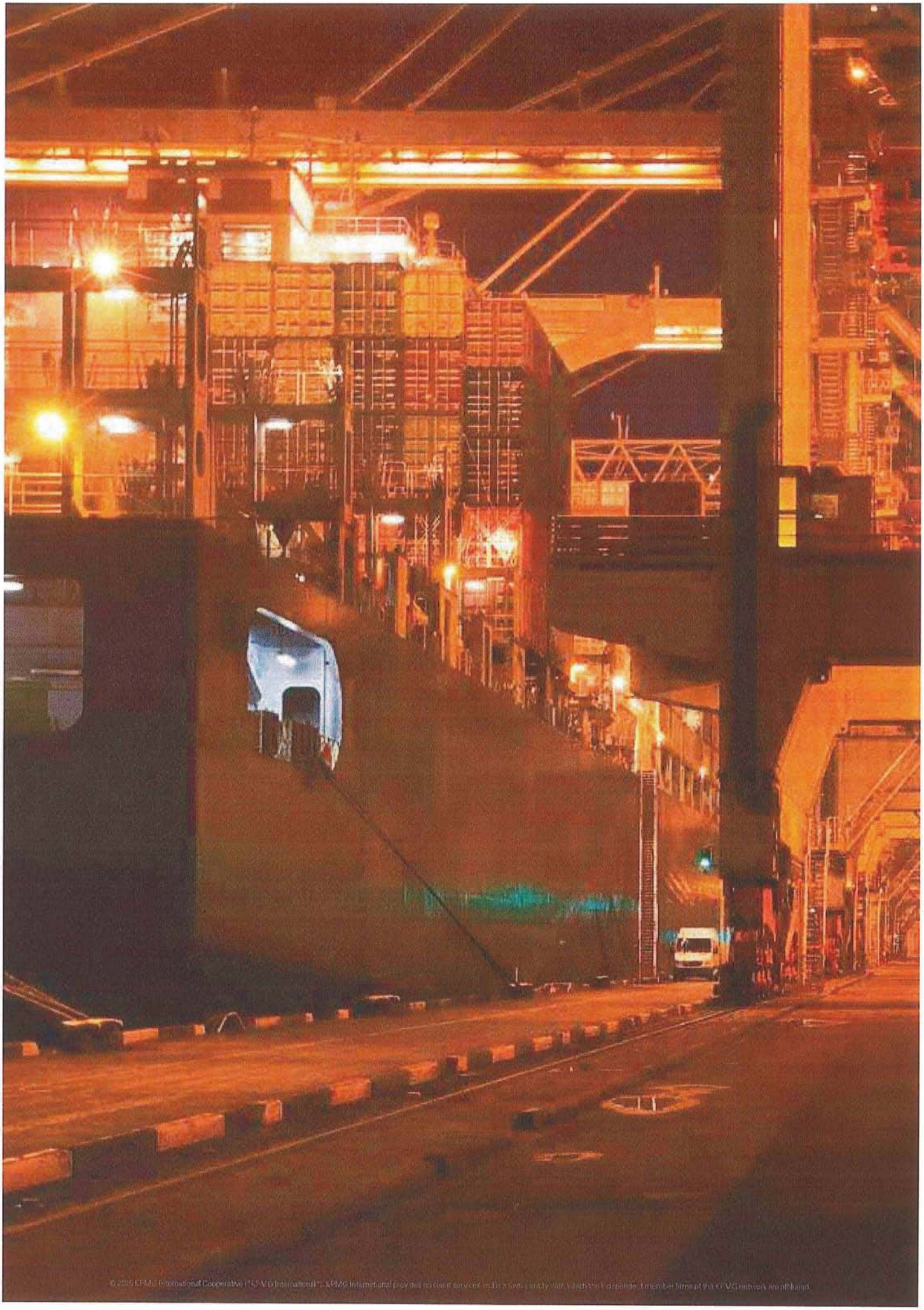
Climbing the curve

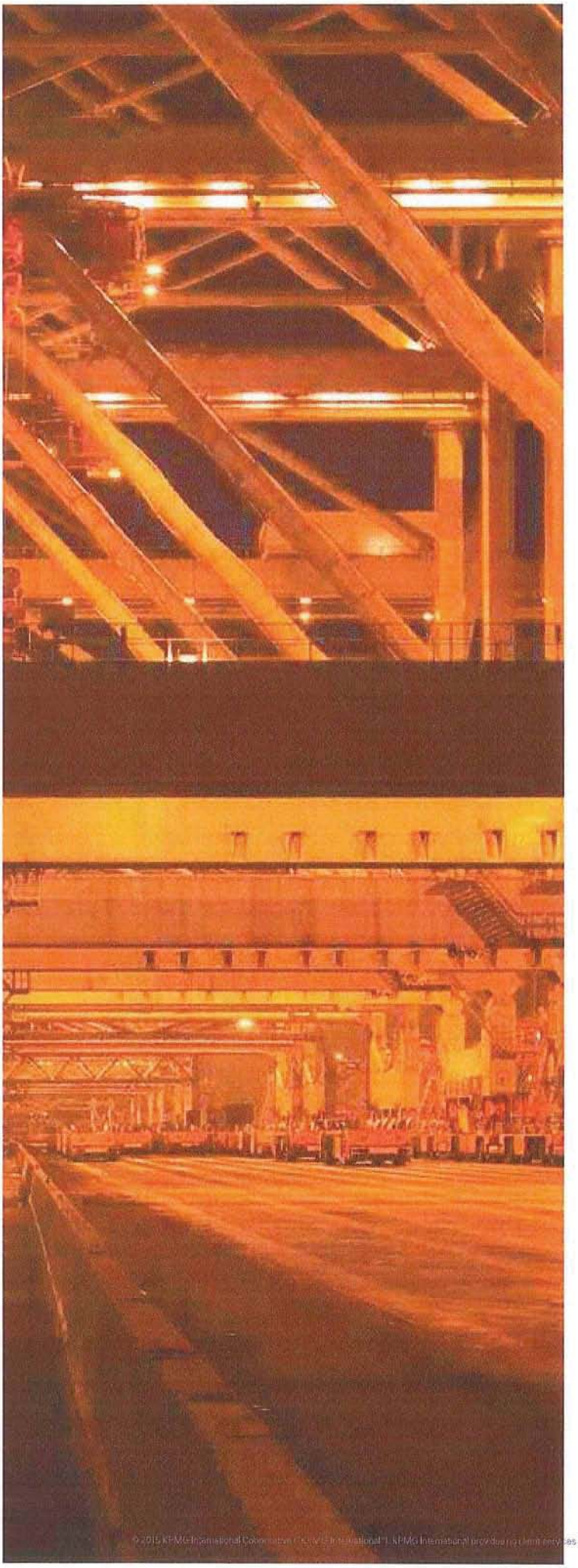
2015 Global Construction Project Owner's Survey

kpmg.com/building

KPMG INTERNATIONAL







Introduction

As construction projects continue to evolve, grow larger and more complex, have organizations gained more confidence in their ability to hit schedule, budget and quality targets?

Project owners are continually striving for a balance between power, responsibility and control. They have the power that comes from control over the budget, yet are ultimately responsible to their corporate Boards and Chief Executive Officers. They bear the responsibility for huge projects worth billions of dollars, along with the associated commercial and reputational costs of failure. Yet, project owners have to cede much of the project execution risk and control to industry experienced engineers and contractors.

Managing these dynamics requires maturity. Maturity in planning and financial forecasting; maturity in hiring and developing the right talent; maturity in ongoing risk and project management; maturity in contingency management to cope with the inevitable setbacks that accompany major construction projects; and maturity to build positive and effective working relationships with contractors that bring out the best in all parties.

In the ninth edition of KPMG's Global Construction Survey we focus on the challenges facing owners as they seek to climb the maturity curve and feature the views of over 100 senior executives from both private and public organizations whose annual capital expenditure ranges from a few million US dollars (US$) to well over 5 billion US dollars.

The results, augmented with commentary from KPMG's Major Projects Advisory specialists and external industry experts, should enable project owners globally to chart their own levels of project delivery maturity.

I would like to thank all survey participants who gave their valuable time to participate in the report.

Geno Armstrong
International Sector Leader
Engineering & Construction
KPMG in the US

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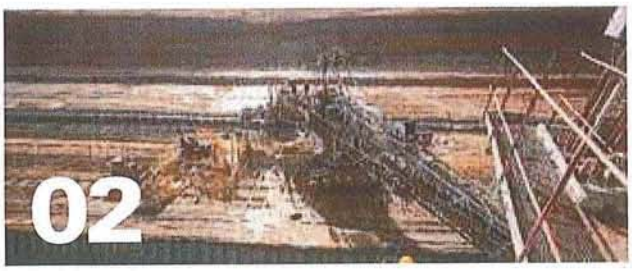
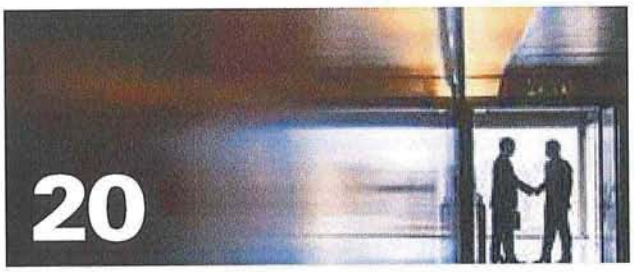




» Executive summary

How are project owners performing on the maturity curve?

In late 2014, KPMG interviewed executives from over 100 private and public organizations around the world that carry out significant capital construction activity. The respondents' annual revenue varied in size from US$250 million to more than US$5 billion, covering a wide range of sectors including energy and natural resources, technology and healthcare. More than a quarter of the respondents worked for government agencies.

Maturity in preparation

Planning and prioritizing appear to be rigorous

- 30% of respondents say their organization uses the design-bid-build approach and 32% favor engineer-procure-construct (EPC)
- 74% complete a formal project delivery and contract strategy analysis, prior to approval
- 84% utilize financial and risk analysis to screen projects
- 80% say the majority of capital projects are planned

Talent shortages remain a challenge

- 44% struggle to attract qualified craft labor and 45% lack planners and project managers
- Organizations with fewer full-time project staff spend more on capital expenditures per employee
- 69% hire external resources equivalent to more than 5% of the total workforce on a per project basis

Maturity in risk, controls and governance

Owners express confidence in their project controls

- 64% say their management controls are either 'optimized' or 'monitored'
- 55% are 'satisfied' or 'mostly satisfied' with their investment in project management
- 74% feel investment in controls and governance has reduced costs
- 73% are comfortable with the accuracy and timeliness of project level reports

Project management information systems (PMIS) not yet ubiquitous

- 50% use PMIS; of those that don't, 41% plan to introduce this within 2 years
- 32% of those that use PMIS have yet to integrate it with their accounting and procurement software

Maturity in performance

Owners continue to experience project failures

- 53% suffered one or more underperforming projects in the previous year. For energy and natural resources and public sector respondents the figures were 71% and 90% respectively.
- Only 31% of all respondents' projects came within 10% of budget in the past 3 years
- Just 25% of projects came within 10% of their original deadlines in the past 3 years

A mixed approach to contingency planning

- 30% perform quantitative risk analysis to calculate contingencies
- 49% use both a project-level contingency *and* a management reserve
- 30% draw down from a single pool of contingency based upon project risks

Maturity in relationships

The push towards contractor collaboration may need more impetus

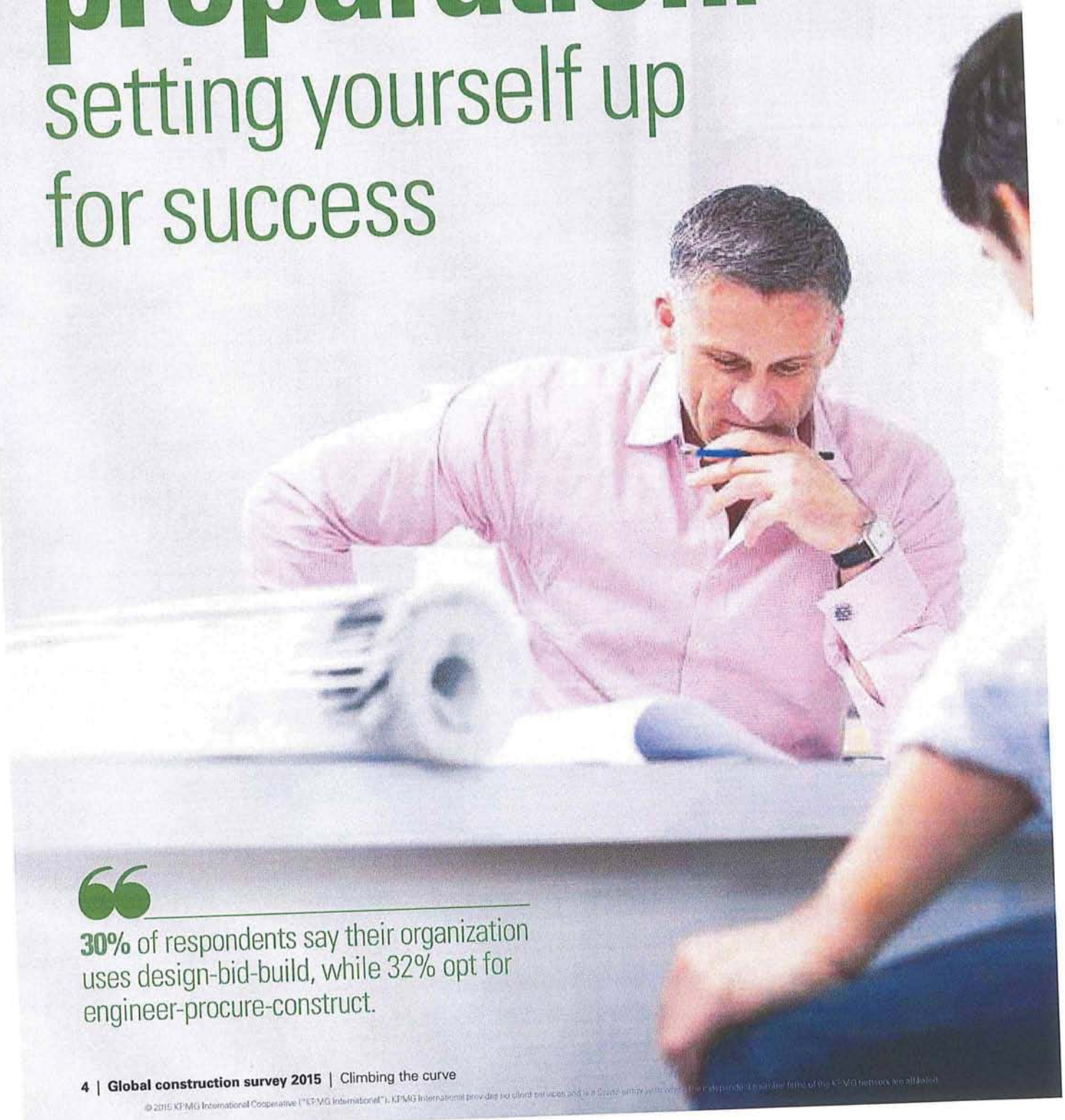
- 82% expect greater owner/contractor collaboration over the next 5 years
- Just 32% have a high level of trust in their contractors
- 69% say poor contractor performance is the single biggest reason for project underperformance

Contracts continue to emphasize the divide between contractors and owners

- 58% are lump sum (fixed price) contracts
- 72% hold full competitive tenders when awarding contracts
- 48% expect to have more negotiating strength vis-à-vis contractors

Maturity in preparation:

setting yourself up for success



30% of respondents say their organization uses design-bid-build, while 32% opt for engineer-procure-construct.

Most of the owners in the survey use formal screening, prioritizing and approval processes for projects, including financial and risk analysis

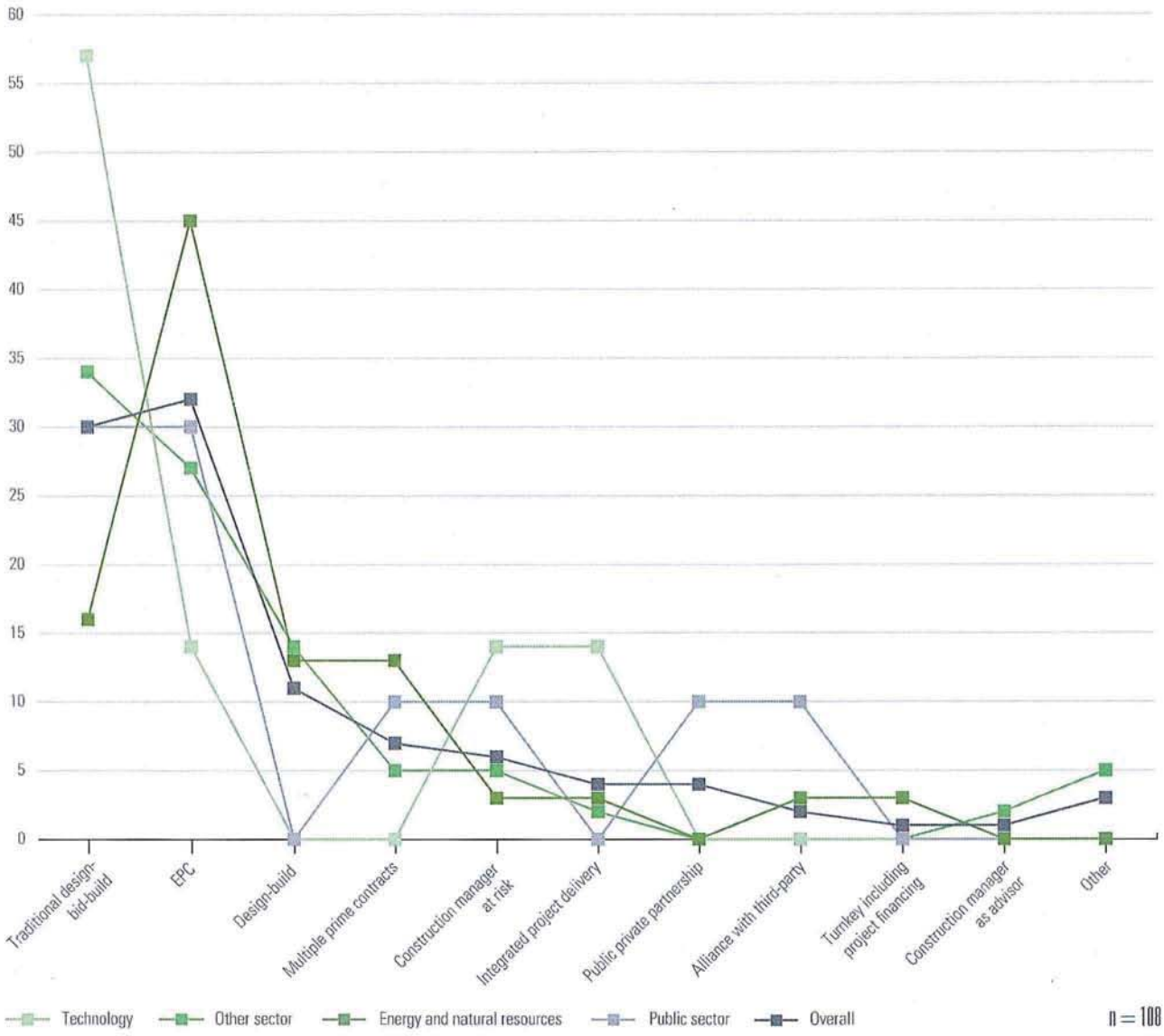
Despite some concerns about a lack of flexibility, the traditional design-bid-build approach remains one of the two most popular project delivery strategies, enabling the owner to work with various suppliers for different aspects of the project. Sharing the top spot is engineer, procure, construct (EPC), which leaves the contractor in control of design, procurement and construction, giving the owner a single point of contact from start to finish. Both these delivery strategies shift the project risk firmly into the hands of the contractor and suggest either a high level of trust in contractors – or a desire by construction owners to defer the risk and responsibility of project execution to contractors.

Almost half of the respondents are concerned about the lack of key skills in-house and augment their teams with external specialists

Respondents from companies in the energy and natural resources sector are the most likely to favor EPC, while technology businesses, and organizations with a turnover of US$1 billion to US$5 billion, are more likely to favor design-build.

There is significant evidence of a mature and structured approach to planning, prioritizing and approving projects. Three-quarters of the executives taking part in the survey say that their organization completes a formal project delivery and contract strategy analysis prior to senior management's authorization of projects. Construction activity is also carefully vetted in advance, with a large majority (84 percent) reporting the use of financial and risk analysis to screen projects.

Most popular project delivery strategy



Source: KPMG International, 2015

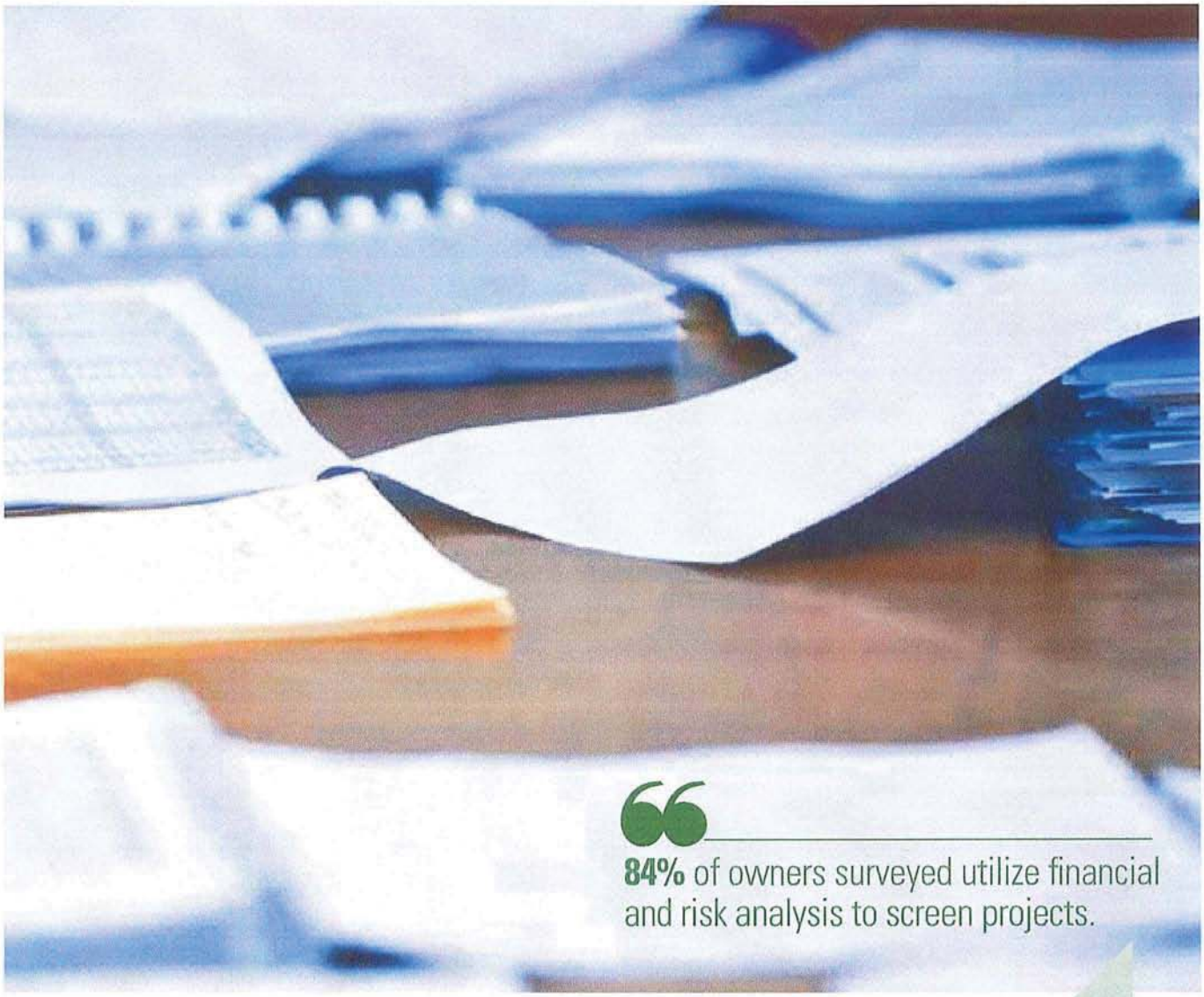
Most owners appear to have a formal ranking process for prioritizing potential projects using pre-established criteria such as operational safety, environmental, legal and regulatory factors, and overall return on investment. A substantial proportion also augments this with more ad hoc analyses.

Much as one would expect, more than 80 percent of owners state that the majority of their capital projects are planned (i.e. are within the annual capital plan), and a similar percentage claims that planned and unplanned initiatives must go through the same rigorous approval process.

Although over half of those taking part in the 2015 survey plan projects at least 5 years ahead, executives from the larger companies are more likely to have a shorter timeframe. Fifty percent of those from organizations with annual turnover greater than US$5 billion say that they only plan ahead for 3 or fewer years. This could reflect the need to respond quickly to changes in demand, backed by a more sophisticated forecasting capability and an internal project development and management team that can mobilize at short notice.

Number of years into the future organizations plan capital construction projects

Source: KPMG International, 2015



84% of owners surveyed utilize financial and risk analysis to screen projects.

Prioritizing projects: Optimizing your portfolio

Jeff Shaw
Director, KPMG in South Africa, discusses the processes and considerations needed to help optimize project portfolios.

Whether project owners are operating in buoyant capital project markets or in those still emerging from the economic slowdown there is intense competition internally for funding and people, and externally for scarce contractor resources. Consequently, organizations need to manage their capital efficiently and effectively across a wide range of projects, to ensure they are aligned with strategic goals.

Core capital allocation components include capital budgeting and planning policies and procedures, a cross-functional capital review committee, and a robust system for tracking and reporting across the portfolio. All potential projects should be systematically identified, classified, screened, prioritized, evaluated and selected. This process must be supported by an appropriate budget allocation and monitoring process. Throughout the capital allocation process, alignment between strategic objectives and the capital project portfolio must be tested.

Of course, this is not the only way to optimize the portfolio; however, this and other approaches should always have established guidelines, to keep projects in line with growth and profitability targets.

With a seemingly endless pool of possible projects, and the need to balance competing interests within ever changing capital and capacity constraints, organizations can struggle to choose the most appropriate mix. Some lack basic guidelines, and may cast the net too wide, which leads to a time-consuming review process that overloads decision-makers with excess information, and causes unwanted internal conflict. Others employ unnecessarily narrow parameters that fail to allow for innovative suggestions that could bring great value.

Once a project is selected, it is easy to neglect the process of evaluating performance against the original business case, to clarify any learnings and document financial data. Given the huge amounts spent on construction projects, the relative success or failure of capital allocation and portfolio optimization could ultimately determine the organization's entire survival.

Keeping the talent conveyor belt running

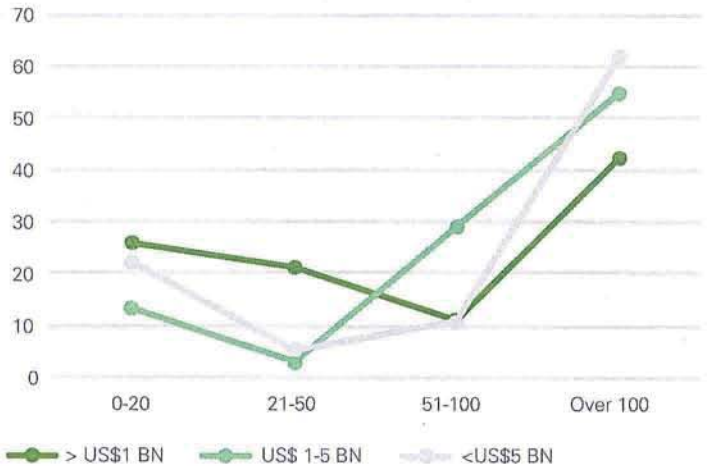
In order to successfully manage the enormous responsibility of a multi-billion dollar project, owners are heavily dependent upon capable project management teams that understand engineering and construction, project management principles and practices and, not least, the increasingly sophisticated technology that controls every step.

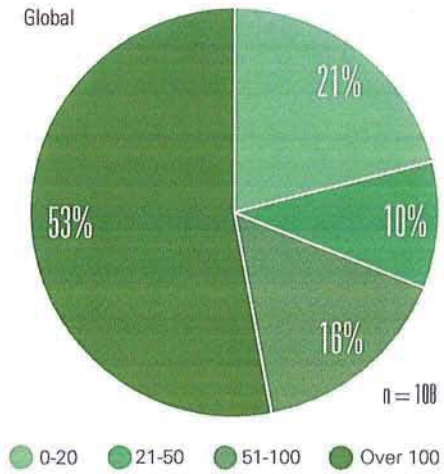
The talent gap is a much-discussed phenomenon in the industry, and owners face the same challenges that contractors have been grappling with for years – to attract, train and retain the best people in the face of severe competition from other sectors. Forty-four percent of respondents say that they struggle to attract qualified craft labor to projects, and a similar percentage claims that a lack of available planners and project management professionals is hampering their project progress.

One respondent feels that one of the organization's most pressing needs is: "making sure we have well trained project managers with good tools to complete projects on time and within budget."

Not surprisingly, there is a strong correlation between organizational size and number of full-time employees specifically assigned to projects. Almost half of respondents from smaller organizations (less than US$1 billion turnover) have 50 or fewer staff, while for the largest entities (turnover greater than US$5 billion), three-quarters have teams of over 50 and 62 percent have more than 100 employees.

Number of full-time employees (FTE) planning and managing capital construction projects





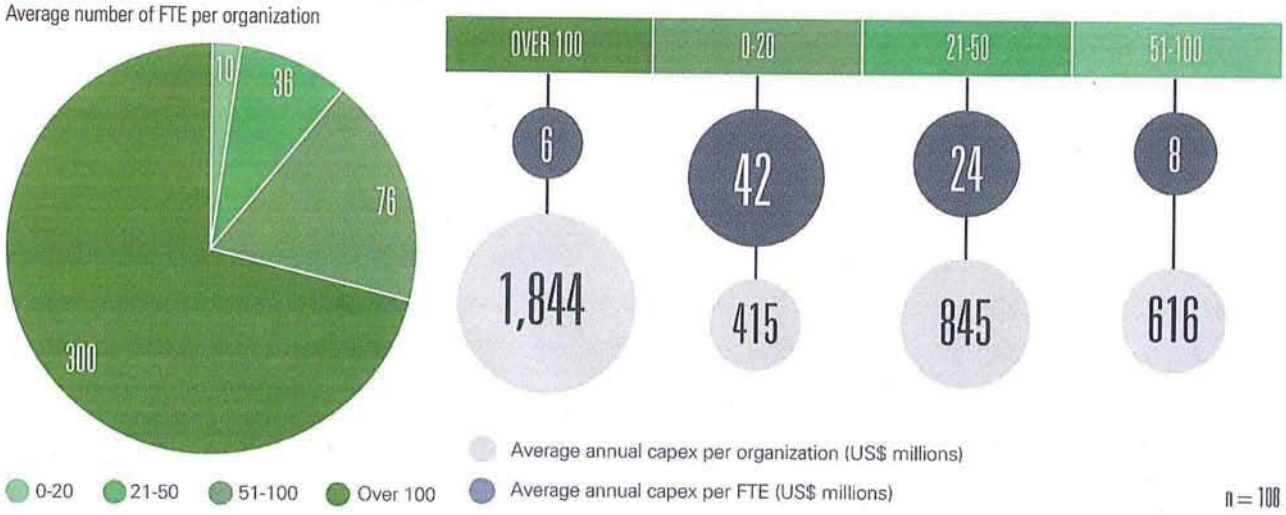
Source: KPMG International, 2015

Those organizations with fewer full-time project staff tend to have a higher annual average capital expenditure per employee. Fears that this could stretch their resources are not borne out by the findings, which show that the smaller institutions in the survey also report a lower rate of underperforming projects. This suggests that it is not the quantity of employees that makes the difference, but the quality of employees.

The larger the organization, the more likely it is to have a significant pool of tried and tested project workers. Twenty-nine percent of respondents from larger entities say that they select their teams based upon past performance, compared to just 11 percent for the smaller organizations. Nevertheless, most project workers are chosen on a case-by-case basis.

> **44%** of respondents struggle to attract qualified craft labor and 45% cite a lack of planners and project managers.

Number of FTE planning and managing capital construction projects



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Source: KPMG International, 2015

A need for outside assistance

Despite investment in recruitment and training, owners routinely bolster their project teams with additional, temporary personnel, particularly in the aforementioned areas of craft labor and planners and project management specialists. Over two-thirds of the executives in the survey note the need to hire a significant number (more than 5 percent of the total workforce) of external project or program management experts to supplement existing staff. And, the larger the organization, the greater the need: 87 percent of the larger institutions report the necessity to bring in outside people.

The energy and natural resources sector has been hit hard by the recent plummeting price of oil, and most players, if not all, will have to reduce staff numbers, which can stretch resources when carrying out major construction projects.

Organizations hiring more than 5% of external project or program management personnel to supplement FTE

Source: KPMG International, 2015

87% of the larger organizations in the survey need to augment project teams with external resources.

Thinking differently: a strategic approach to talent management?

Angela Gildea
Principal, KPMG in the US, argues that project owners in traditional sectors should look to new industries for inspiration.

The art of managing mega projects is declining, while the projects themselves are becoming ever more complex. With many organizations outsourcing increasing numbers of tasks to engineering and construction firms, the required skills of internal staff change from 'executing' projects to managing schedules and contractors. And all of this is happening at a time when many traditional owners are seeing graduates enticed by different, often better rewarded positions in new industries. Companies can reap great benefits by taking a fresh approach to talent management.

Be more strategic

Research has found a distinct correlation between strong talent practices and greater shareholder return. For high performing companies, talent management is more than just a Human Resource issue – it's a strategic imperative and should therefore be closely aligned with wider business objectives and accountability shared across all levels of leadership. This means integrating talent considerations into the following areas:

- **business strategy:** to determine the people and processes to help achieve your goals
- **risk management:** ensuring availability of key resources and planning successors
- **investment and measurement:** measuring the return on investment in talent
- **governance and infrastructure:** ensuring clear ownership of talent management, with appropriate data and systems support.

Analytics: using data to drive talent decisions

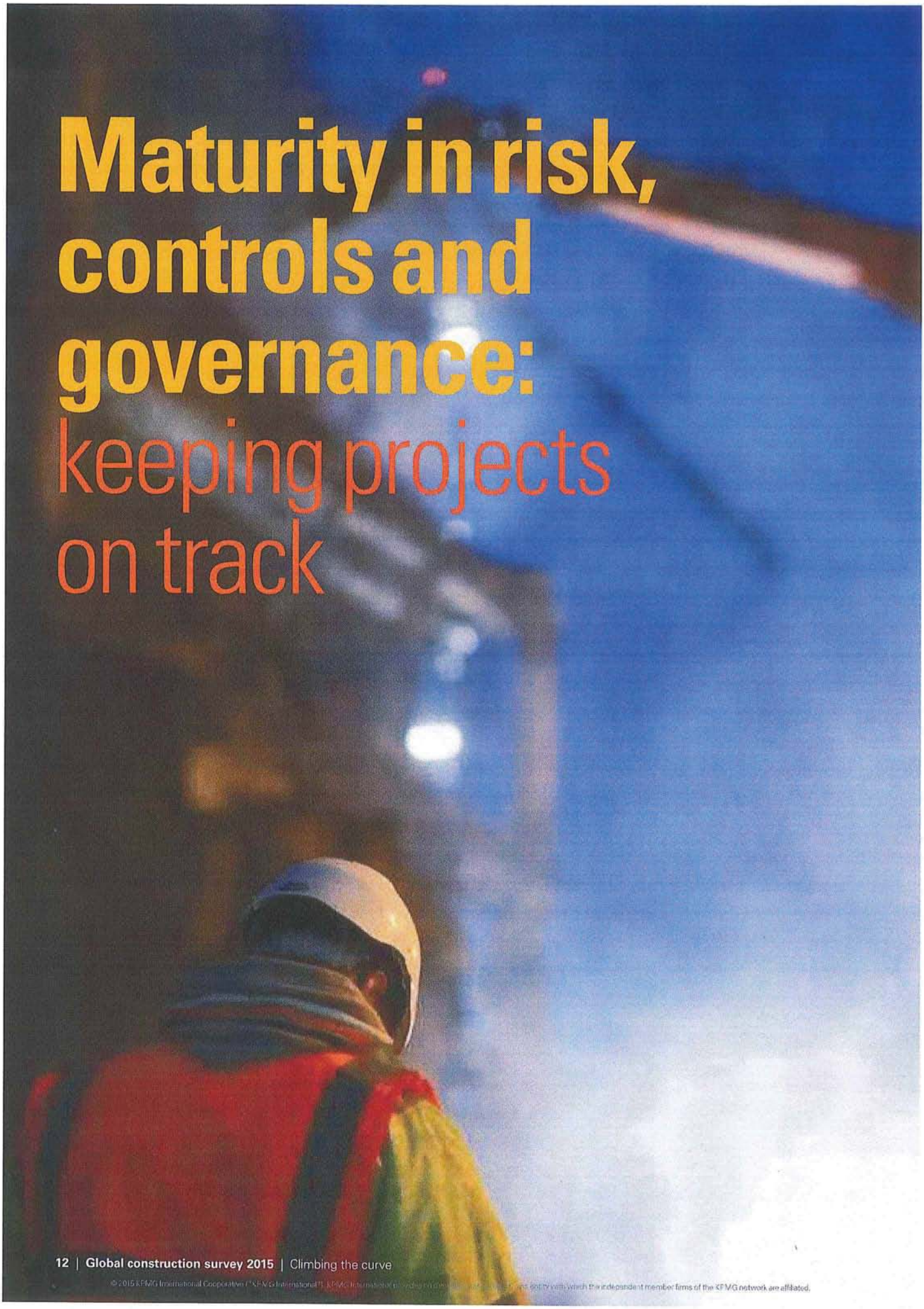
Although data analytics is a mainstay in business operations, organizations have been slower to embrace this approach for managing talent, where uses include:

- **predictive modeling:** to more accurately forecast future people needs
- **retention algorithms:** to predict which employees are most likely to leave or retire
- **valuing top performers:** calculating the (potentially significant) difference between average and exceptional employees, to justify recruitment strategies and acknowledge individual contributions.

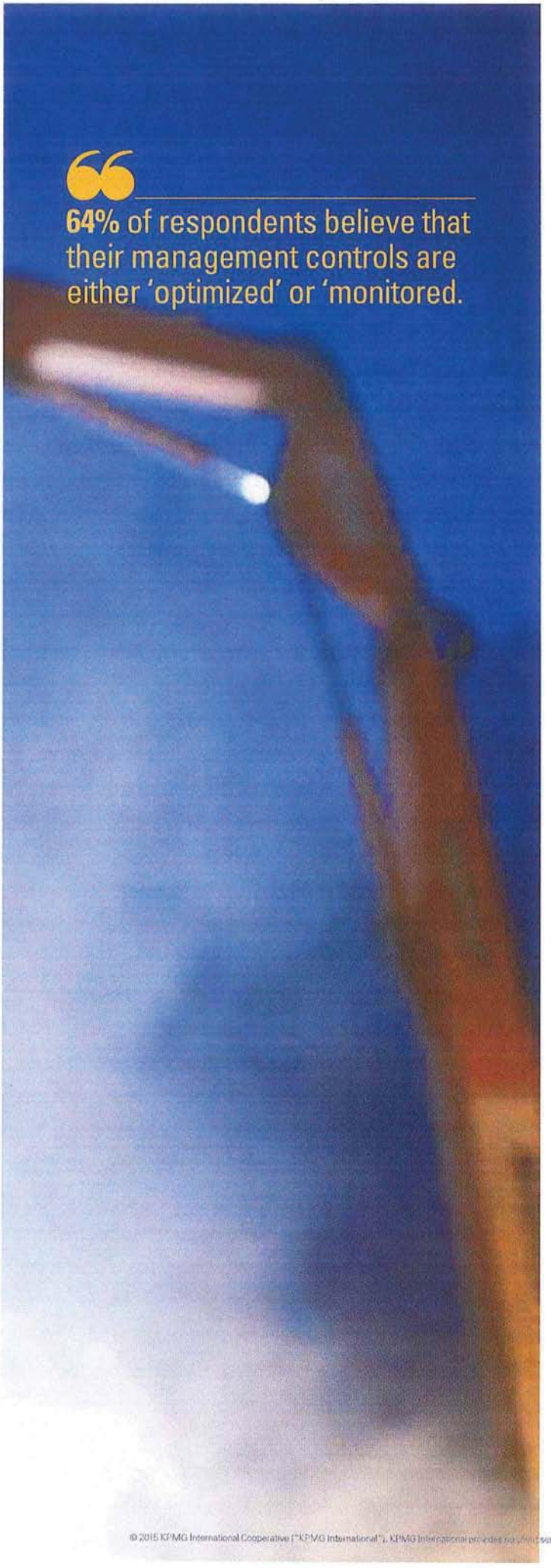
Embrace diversity...of cognitive thought

Most organizations now routinely consider diversity in their hiring practices, but this typically covers gender, race and culture. More enlightened employers are also seeking diversity of a different kind: of cognitive thought, using the following practices:

- **learning and training:** by incorporating courses into formal learning curriculum to build and encourage cognitive diversity
- **hiring the unconventional candidate:** looking beyond the traditional resumé for different skill sets. For instance, data scientists and mathematicians are being hired for operational roles, to introduce innovation and "out of the box" thinking.
- **looking beyond established employees:** to gain additional, external insight from suppliers, independent contractors, customers and recent experienced hires, utilizing emerging technologies such as crowdsourcing and gamification.



Maturity in risk, controls and governance: keeping projects on track

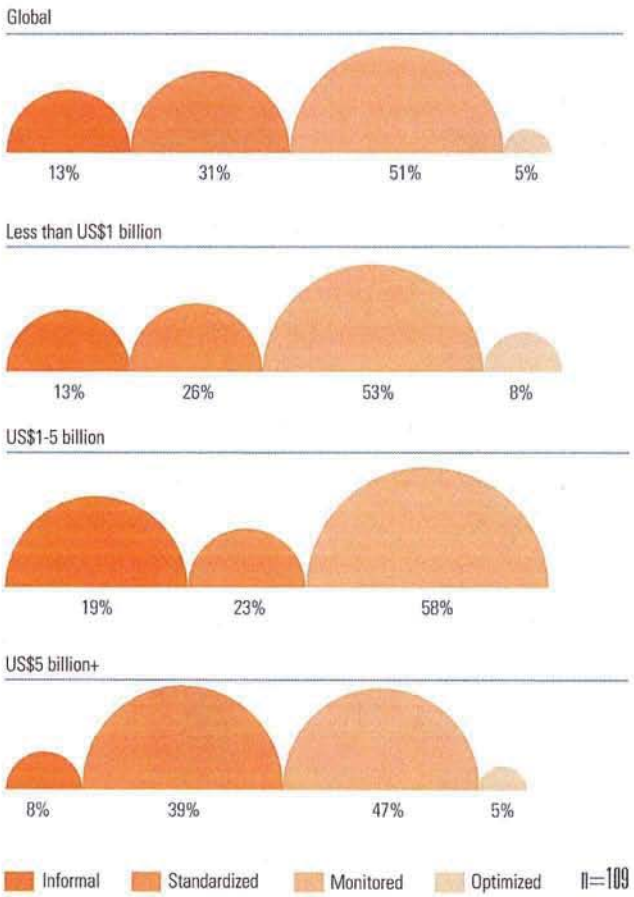


- **Owners appear confident that their investments in project controls have paid off**
- **Half of the respondents say their organization has yet to introduce an integrated project management information system (PMIS)**

A strong sense of optimism pervades the responses to this year's survey. Sixty-four percent believe that their management controls are either 'optimized' or 'monitored,' meaning that they are documented and integrated, with either real-time or periodic testing and reporting, and frequent or occasional training.

However, almost a third of respondents feel their controls are merely 'standardized,' with no testing or reporting to management and only limited training of staff. These organizations may need to consider how they can upgrade this approach to introduce a best practice. The technology companies taking part in the survey are the least likely to have optimized or monitored controls.

Level of sophistication of project management controls



Source: KPMG International, 2015

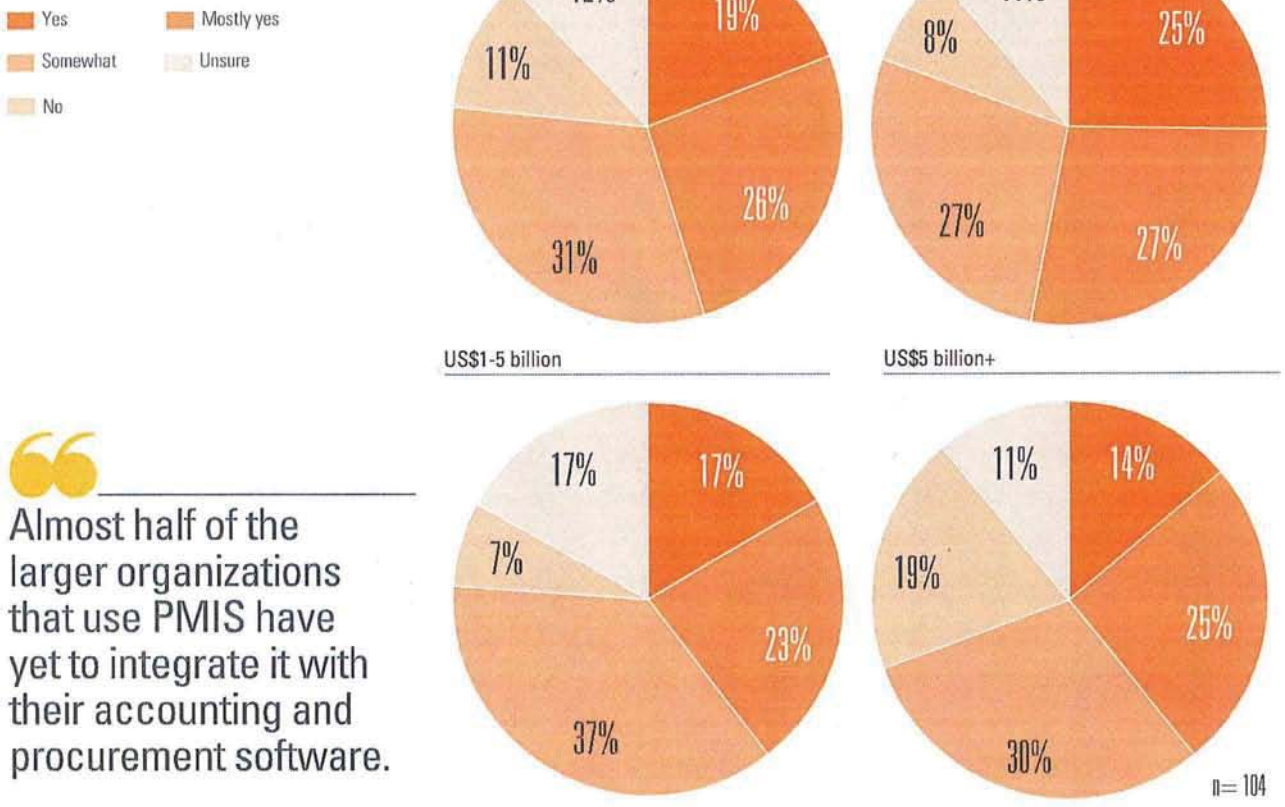
Over the past decade, owners have paid considerable attention to introducing cutting-edge software to improve their project controls. This appears to have brought positive results. When asked about the return on investment in project management tools and training, 55 percent indicate that they are either 'satisfied' or 'mostly satisfied,' while just a handful (13 percent) say they are not satisfied. It is a similar story when it comes to assessing the benefits of investment in risk management tools and project cost reduction.

The respondents also believe that the money spent on project governance and controls has paid off. Over three-quarters say that they have 'definitely', 'mostly' or 'somewhat' reduced costs. However, a significant minority of executives (30 percent) from larger organizations in the survey believe that these investments have either not resulted in lower costs, or are unsure of their benefits. It is possible that the scale and complexity of the organization, along with disparate systems, have restricted the impact of new software, which may not be fully integrated.

The optimism continues when the subject of reporting is raised. A large majority of 73 percent are confident about the accuracy and timeliness of the project level reports they get from their project managers and contractors. Once again, however, respondents from the bigger companies or institutions are slightly more cautious, with a third not convinced of the quality of reports, which could reflect the dearth of skilled personnel among their substantial project management workforces.

Most respondents (86 percent) say that their capital construction projects are tracked and reported on a portfolio basis.

Have investments in project governance and controls reduced project costs?



Source: KPMG International, 2015

> Almost half of the larger organizations that use PMIS have yet to integrate it with their accounting and procurement software.

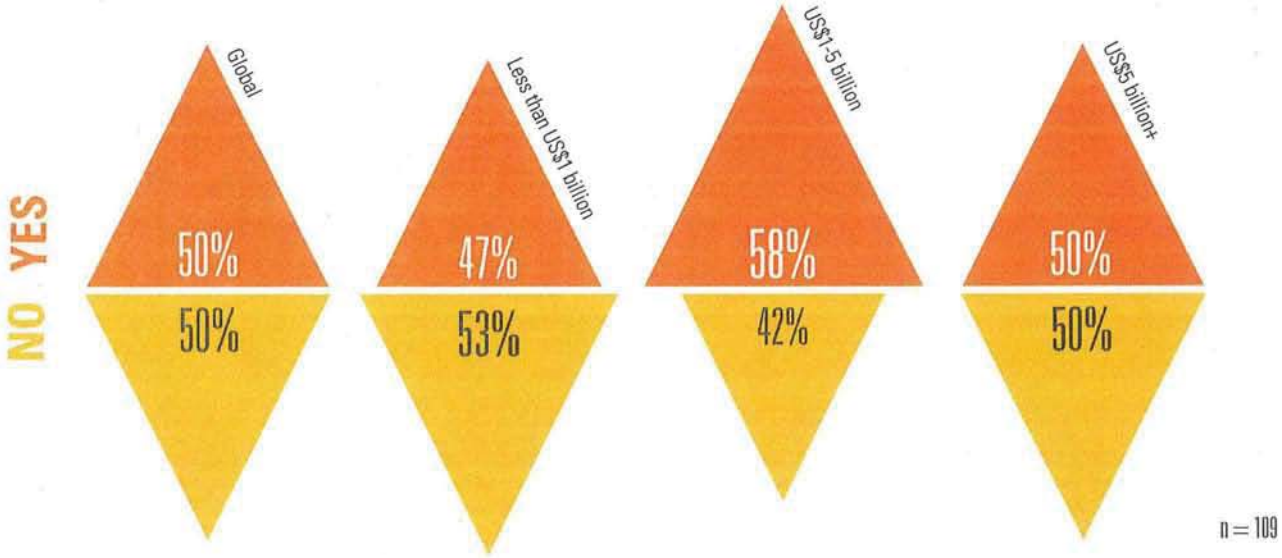
Project management information system use still not widespread

A PMIS is designed to improve project planning, scheduling, monitoring and controlling, in order to raise the quality of decision-making in each phase of the project life cycle. It enables engineers and project managers to communicate project status swiftly and accurately with functional departments, while also keeping senior management up to speed on all the projects in the organization's portfolio.

The respondents to this year's survey are divided exactly 50:50 in their use of such systems, suggesting there is considerable room for improvement – although 41 percent of those without a PMIS say that they plan to acquire one within 2 years.

Of those who have embraced PMIS, a third have yet to integrate it with their accounting and procurement software, and are consequently failing to realize the full benefits of this technology. This figure leaps to 47 percent among the bigger organizations where, arguably, the potential upside is even greater given the scale of their engineering and construction projects.

Is your organization using PMIS to plan and control capital construction projects?



Source: KPMG International, 2015

The perils of confidence: realities of benchmarking

Clay Gilge
Partner Advisory, KPMG in the US, explains how benchmarking the effectiveness of project management processes can provide a much-needed reality check.

Is the confidence in project controls expressed by the survey participants warranted or misplaced? Our global clients ask the same question continuously, as they strive to avoid the kind of setbacks that can cost millions, damage reputations and hold back business.

In response, we have come up with an ongoing benchmarking analysis that evaluates the maturity of clients' processes and controls over time against peers, as well as internally by region and business unit. Ranking these controls at four levels, from the lowest tier 'informal,' through 'standardized,' 'monitored' and, finally, 'optimized,' we find that organizations are consistently over-optimistic in their self-ratings, which typically are a whole tier above our rigorous benchmarked findings.

In this year's survey, for example, 51 percent of owners indicated they are 'monitored,' when our data indicates that only 28 percent have reached this level, with a majority still merely 'standardized.' An inappropriate rating could generate a degree of over-confidence that could potentially lead to problems.

Our tried-and-tested approach requires the verification of actual project management process and control maturity, through document review and project testing. This gives the benchmarking far more depth and enables clients – many of whom are Fortune 500 companies or public infrastructure organizations – to develop a road map toward continuous improvement. As you would expect, the cloud-based methodology is grounded in global project management standards and frameworks such as PMBOK and PRINCE2. We also quickly realized that any assessment must include additional criteria such as sustainability, fraud risk management and 'soft' controls, all of which have been integrated into the benchmarking to produce a comprehensive picture.

Tier 1 – Informal

- minimal processes or controls are designed or appear effective
- no apparent project management process/control for monitoring or improvement activity.

Tier 2 – Standardized

- project management process/control design and effectiveness appear to be moderate
- minimal project management process/control monitoring or improvement activity.

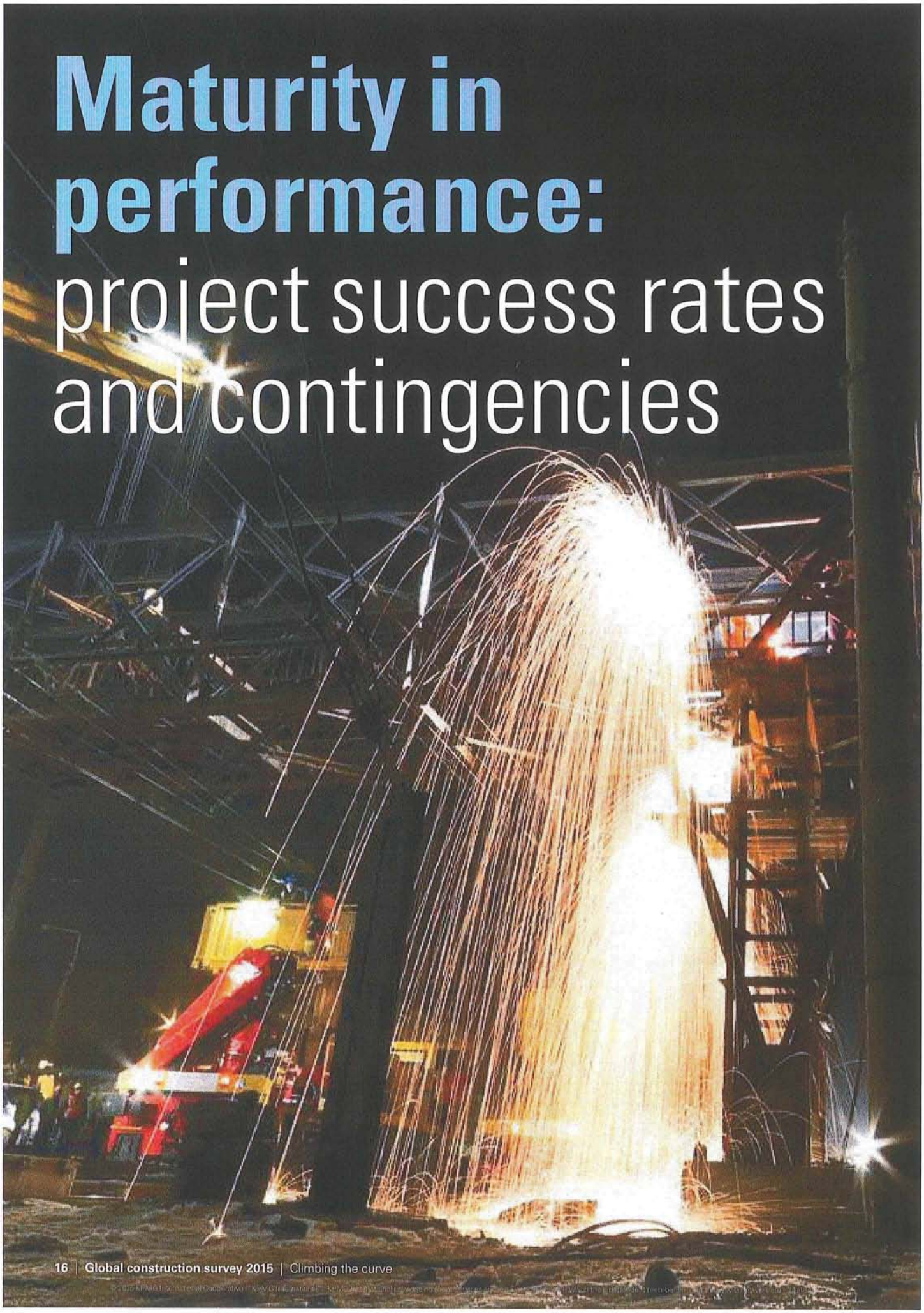
Tier 3 – Monitored

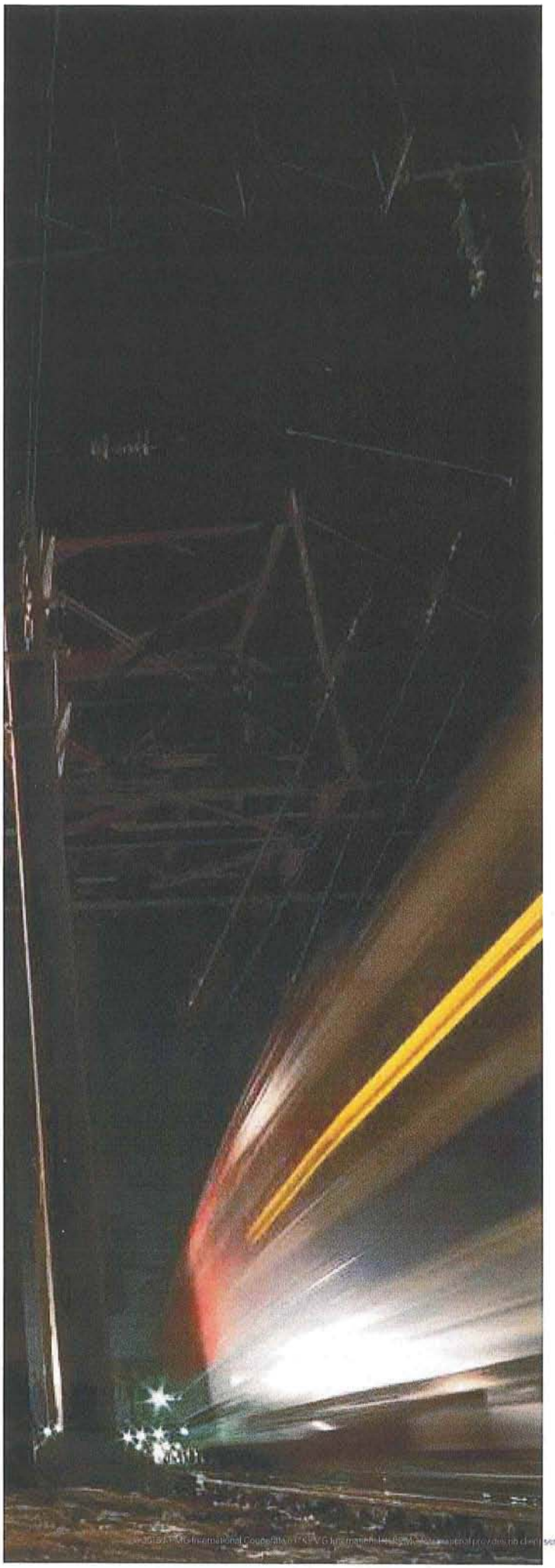
- project management process/control design and effectiveness appear adequate
- periodic project management process/control monitoring and improvement.

Tier 4 – Optimized

- comprehensive project management process/control design that appears to be effective
- continual project management process/control monitoring and improvement.

Maturity in performance: project success rates and contingencies



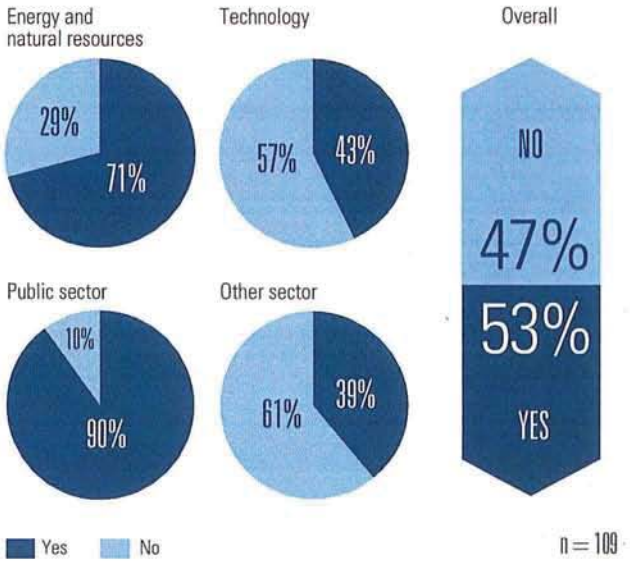


> Realism eats optimism for breakfast – owners should demand practical targets from contractors based upon realistic expectations of what can go wrong.

- **Owners are still failing to bring projects in on time and on budget – especially those in the energy and natural resources and public sectors**
- **Half of respondents do not use a management reserve, which could lead to an over-optimistic view**

The significant investment in project controls – and the high levels of confidence that many owners have in these controls – have not halted the run of underperforming projects. Over half of all the respondents state that they suffered one or more underperforming projects in the previous financial year. For larger organizations, this rose to 61 percent, while executives from the energy and natural resources and public sectors experienced even higher levels of project failure, at 71 percent and 90 percent respectively.

Underperforming projects during the last financial year



Source: KPMG International, 2015

Looking back over the past 3 years, fewer than one-third of all respondents' projects managed to come within 10 percent of the planned budget, with the energy and natural resources, and especially the public sector, performing considerably worse than other industries.

Percentage of projects meeting planned budgets

Source: KPMG International, 2015

And, in the same time period, just a quarter of construction projects came within 10 percent of their original deadlines; only one in ten public sector organizations managed to hit this target.

One interesting observation is that businesses with turnover between US$1 billion and US$5 billion report the best results. Forty-five percent say they met, or were very close to meeting, their budget, and 34 percent managed to achieve similar high standards for delivery times.

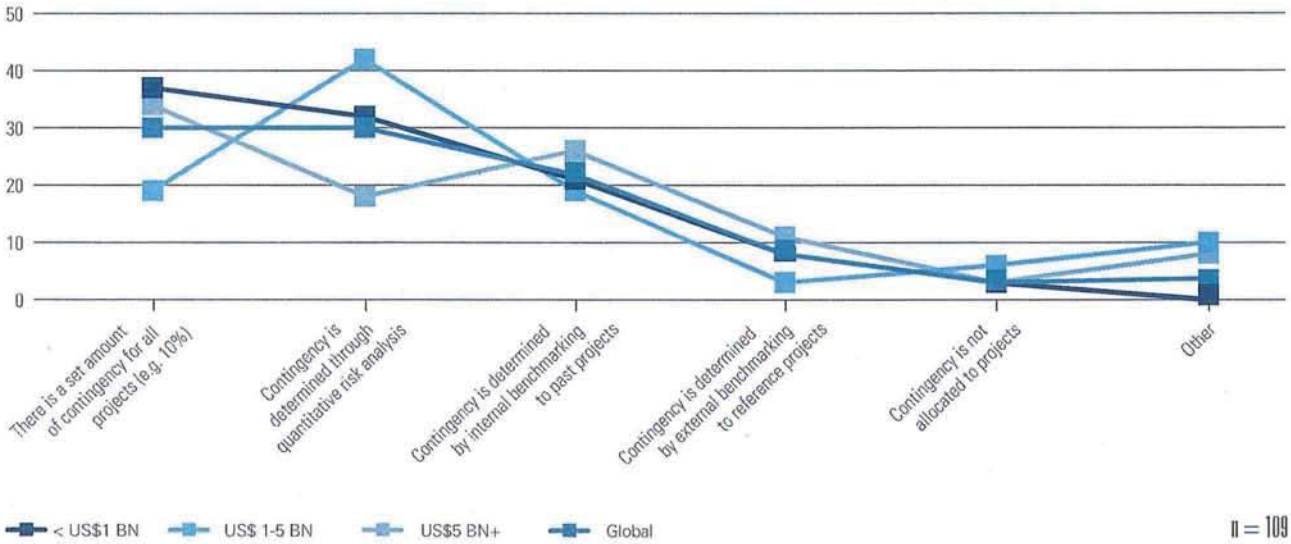
These findings suggest that, while controls may bring many benefits, they have yet to be fully and effectively embedded. The results also raise questions on the skills of those working with the various controls, either within PMIS or otherwise.

Planning for delays and cost overruns

According to one of the survey participants, one of the biggest concerns is "Accurate estimating of anticipated costs prior to committing to the project. Projects are moving so fast they have limited time to develop the scope and accurately estimate costs. This results in issues where the standard contingency used (10 percent) is not enough to cover the project risks."

Contingency planning typically involves downside risk estimates for budget and delivery times throughout the project life cycle. According to the senior executives participating in this year's survey, a range of methods is used to calculate contingency levels. The two most popular approaches are: 1) a set percentage, and 2) quantitative risk analysis, with 30 percent respectively opting for these choices. The relative sophistication of the latter suggests that owners are trying to become more accurate in their forecasting, with respondents from companies of US$1 billion to US$5 billion turnover more likely to adopt quantitative risk analysis.

Main method for determining project contingency



Source: KPMG International, 2015

The survey findings indicate that bigger organizations (which tend to have larger and more complex projects) are more likely to take a conservative view of contingency levels. Over half of the respondents from this segment report that the typical range of contingency is greater than 10 percent of the total estimated cost. Arguably, the size and scale of their project portfolios have led to a cautious attitude, tempered by past project cost overruns.

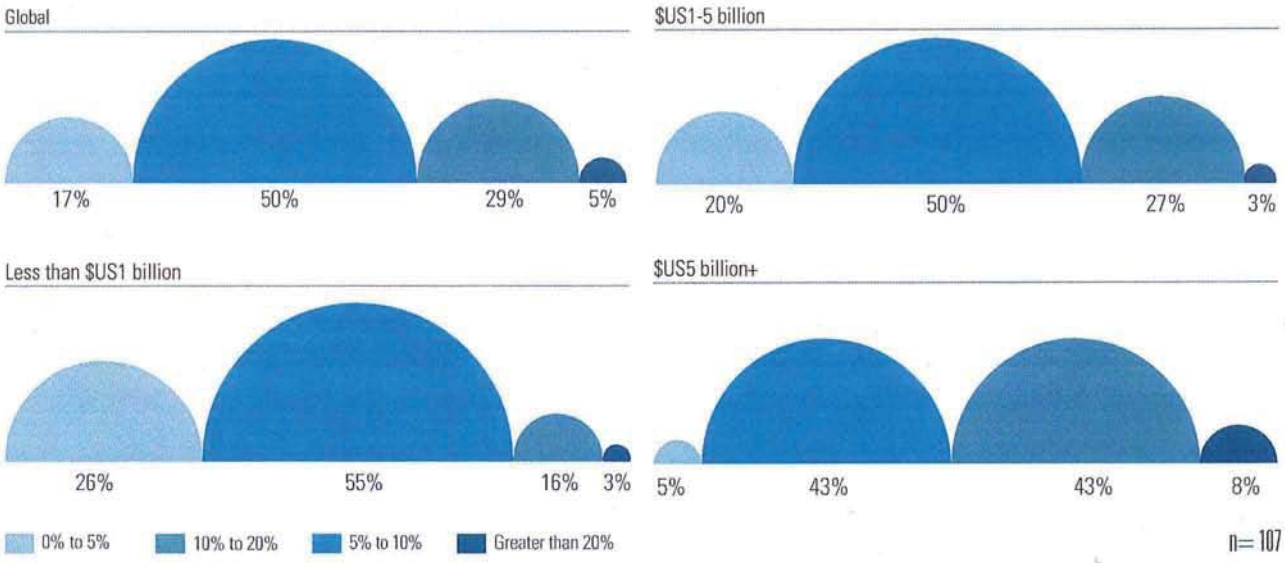
Only half of the respondents state that their organizations use both a project level contingency *and* a management reserve. Management reserves recognize the potential for risks that are outside of the project team's ability to control, which reflects a more realistic and pragmatic view.

In terms of managing contingencies, the single most common method (used by a third of respondents) is to allocate and, if necessary, reallocate contingency funds directly to control accounts based on ongoing project risk assessments. While the use of ongoing risk assessments is a leading practice, allocation of contingency directly to control accounts does not give the project manager good visibility into how the contingency is being used.

Thirty percent (and 34 percent of executives from larger organizations) say that they choose to draw down from a single pool of contingency based upon project risks, which shows a more mature and sophisticated approach.

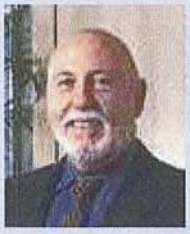
A further 23 percent operate contingency as a single "balancing account" with transfers to and from other control accounts as needed. This only tracks contingency in and out of the project and is not a preferred means of managing contingency in the context of risk.

Range of project contingency (as a percentage of estimated costs)



Source: KPMG International, 2015

Less optimism, more logic: the art of scheduling



Gerald Long
Manager Advisory, KPMG in the US, explains some of the lessons he's learned from over 30 years in construction management.

Scheduling is one of the most difficult and least understood aspects of a project. As well as helping to plan ahead and model outcomes, it can track progress and provide realistic expectations.

With tens of thousands of activities to manage, too many project teams get bogged down in intense detail at earlier stages, rather than viewing activities at a summary level. And most scheduling is far too optimistic, based upon tight estimates with little leeway for delays. It's little surprise that, as this survey shows, only a small proportion of projects meet their delivery and cost goals.

We prefer to apply logic built upon knowledge and experience of what actually happens during the construction life cycle – and what can go wrong. Unfortunately, contractors are nervous about doing this, for fear of scaring the owner, so persist with unachievable targets. Scheduling is not a 'dark art,' but it is a complex one, and practitioners must be intimate with the many sequences within a project, and know what questions to ask subject matter experts. They also need to be able to link the cash flow with the work flow, to evaluate the financial impact of any delays.

The biggest project failures are caused by poor scope management and inadequate communication. A good scheduler stays on top of the workflow and keeps the client informed of realistic progress and projected outcomes.

Maturity in relationships: the new dynamics of collaboration

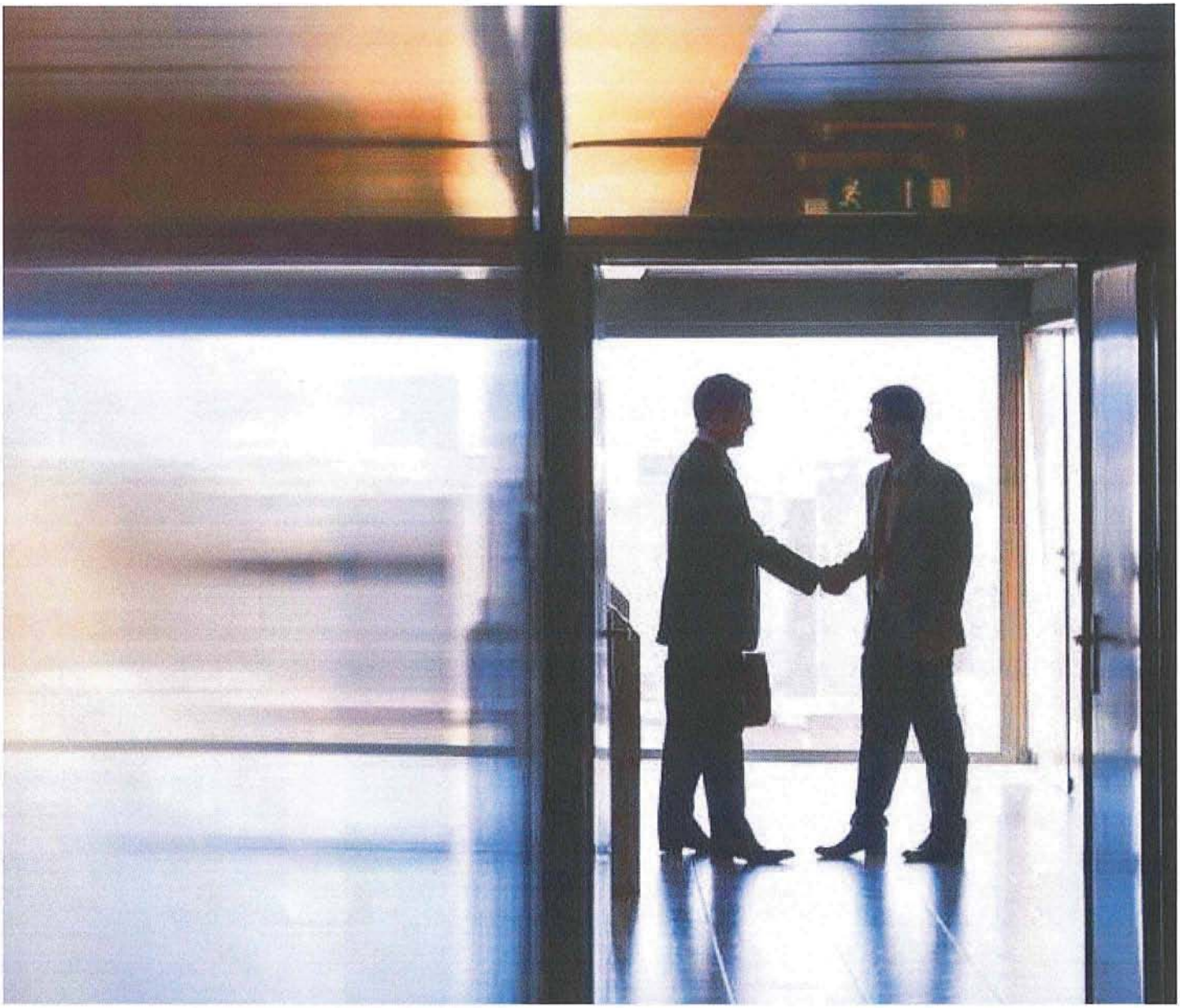
82% of respondents expect greater owner/contractor collaboration over the next 5 years.

- **Project owners seek closer ties with contractors, but have yet to build truly trusting partnerships**
- **Lump sum/fixed price contracts remain the norm**

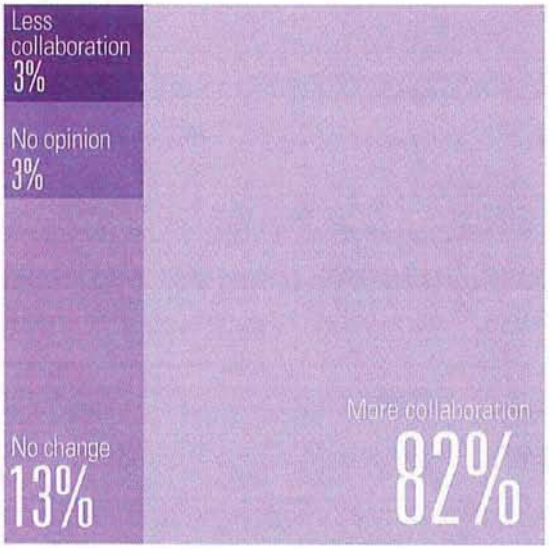
Successful projects are dependent upon strong teamwork, and owners are constantly reviewing the effectiveness of their relationships with contractors. An overwhelming majority of the respondents anticipate more collaboration over the next 5 years. One interpretation of these findings is a desire to integrate contractors into the boardroom to help streamline project delivery, drive down prices and pass on greater risk.

There is, however, another way of looking at the results. Owners may want to stay closer to contractors because they do not *fully* trust them. Only a third believe they have a 'high' level of trust in their contractors, with 60 percent describing the degree of trust as merely 'moderate.'

Indeed, poor contractor performance is cited as the single biggest reason for project underperformance, with over two-thirds (69 percent) of survey participants ticking this box.



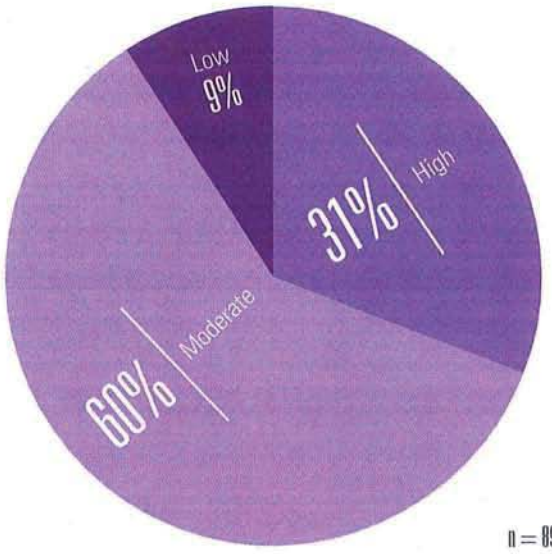
Degree of owner/contractor collaboration over next 5 years



n = 109

Source: KPMG International, 2015

Level of trust between owner and EPC contractors



n = 89

Source: KPMG International, 2015

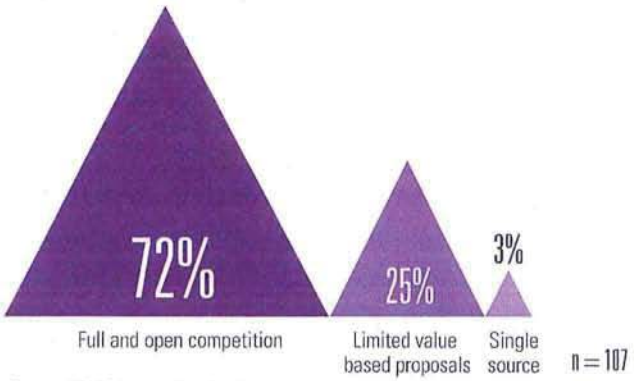
The continued dominance of lump sum (fixed price) contracts underlines the potentially fragile state of owner-contractor relationships. Only the larger organizations involved in the survey embrace other approaches: a quarter use a guaranteed maximum price, while 18 percent adopt a target price with incentives and penalties. A fixed price contract defers risk firmly into the hands of the contractors and does not necessarily foster a collaborative approach.

Seventy-two percent of respondents hold full competitive tenders when awarding contracts, which is another way to maximize risk transfer – and further reflects the lack of trust between owners and contractors. Again, the bigger companies/ institutions show a more enlightened attitude, with 34 percent favoring limited value-based proposals, which reward innovation, expertise and quality, and encourage a greater focus on energy efficiency and design excellence.

Most common contracting strategy

Source: KPMG International, 2015

Primary basis for awarding construction contracts



Source: KPMG International, 2015

Respondents believe that the balance of power is tilting towards owners. Just under half say that they expect to have more negotiating strength when delivering capital projects over the next 5 years, which again, does not imply a more open, collaborative mindset. Executives from larger organizations are more likely to believe that contractors hold the balance of power, which could make this group willing to create equitable, win-win relationships, rather than try to exploit their bargaining position.

> Only a third of respondents believe they have a high level of trust in their contractors.

Regaining control of mega projects

According to
T.G. Jayanth
Vice President Capital Projects, Suncoke Energy Inc., the scale and uncertainty of the very largest construction projects calls for a different approach and more realistic expectations.

Every engineering procurement and construction (EPC) conference I attend is replete with stories of failed mega-projects. As projects have grown larger and more complex, frequently exceeding several billion dollars in value, the capability to execute them effectively has not kept pace.

One response by owner organizations has been an attempt to "contract your way to project success" by passing risk and therefore liability onto contractors. As evidence of this trend, there are several conferences dedicated exclusively to EPC contract management, focused on various risk-sharing strategies.

I don't believe that risk-sharing, at least the way it is currently practiced, is a viable long-term solution for mega-projects. Although contractors should be held fully accountable for carrying out their scope of work, all the risks external to the execution should be the *owner's* concern. Transferring these risks to contractors will end up either driving up the bid price (as contractors price in the risk), or potentially deterring contractors from bidding at all. In the extreme, it could drive contractors out of the project business altogether, as they struggle to fully understand and manage risks they are not equipped to deal with. The net result is that owners will end up paying to cover those risks in any case.

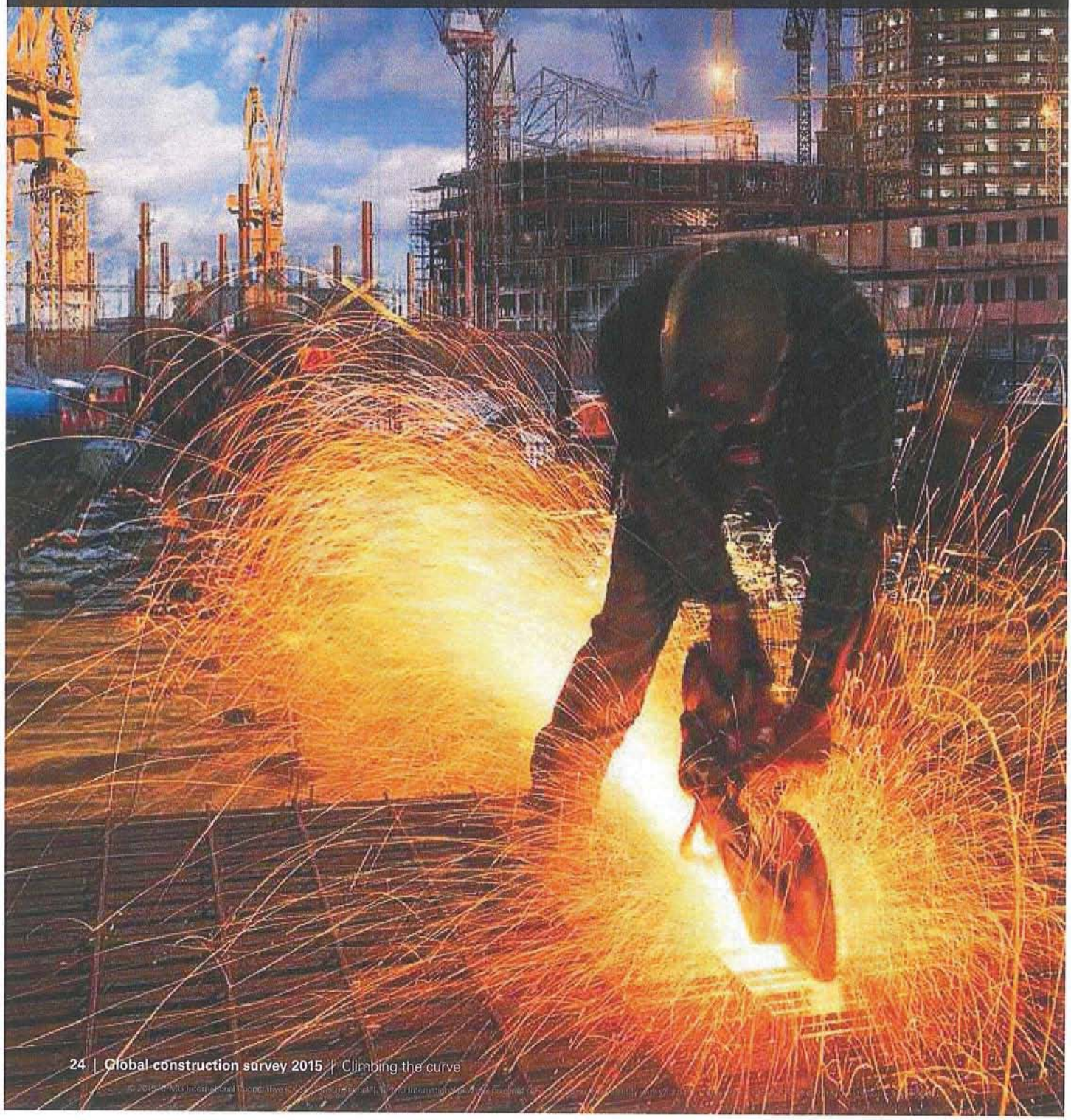
Owners may be better advised to fully factor in all risks during the project development phase, and use the increasingly sophisticated risk management tools that are now available, to give their management a realistic picture of the probability of different outcomes. And, with risks identified upfront, project teams have time to seek ways to mitigate them – sometimes with little or no cost impact. Projects should not be approved without a full understanding of the range – and statistical probability – of possible outcomes associated with projects spanning several years.

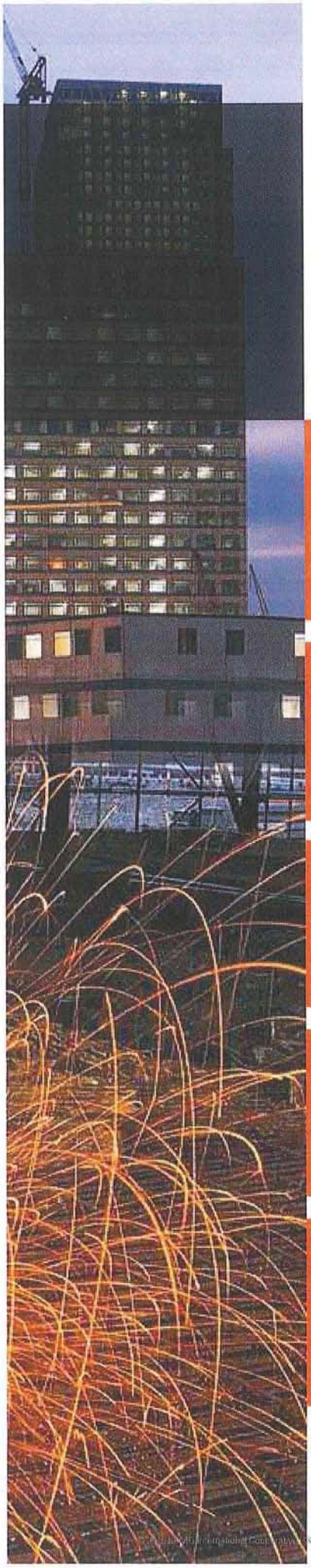
Contract management is important, but good, solid project management and fundamental engineering are arguably even more critical to project success. There is simply no substitute for the meticulous technical and business analysis that's the purpose of the development phase of a project. When this phase needs to be accelerated for business reasons, it is essential to take into account the higher associated risks when estimating return on investment, and ultimately when approving the project.

This is especially significant for the increasingly common, multi-billion dollar mega-projects, encompassing global supply chains and spanning multiple geographies. These may take as long as 5 years to complete, during which time steel and energy prices can swing enormously, essential project team members come and go, and stock markets pass through entire cycles, all of which can impact project costs and final product demand. Many of these variations are hard to predict, let alone model even with the best software. In the midst of such uncertainty, it is practically impossible to produce a static forecast of budgets and schedules.

Despite the cautionary note of this commentary, I think the outlook for projects is bright. The good news is that good project management, risk management and engineering practices are receiving growing attention from both owner and contractor companies. This focus on project execution excellence is driving the development of tools, techniques, and training methods that can only improve success rates and reassure our managements of the ability to execute on schedule and on budget.

Conclusion:
five steps to greater maturity





KPMG's 2015 Global Construction Project Owner's Survey reflects the excellent progress made by owners in planning, risk management and execution in recent years. It also highlights a few areas where owners are still striving to improve. As they climb the project management maturity curve, both private and public organizations should consider the following issues:

1

A fresh approach to talent management

An effective recruitment, development and retention strategy should encompass data analytics to help predict future talent needs. And, by widening the net of potential candidates, organizations can attract candidates with new ways of thinking who can augment the existing pool of engineers. Beyond the broadening skills set, there is ultimately no substitute for experience, and owners must find ways to tap into the skill base of older or retiring employees.

2

Integrated project management information systems

The scale and complexity of many of today's construction projects call for swift coordination and real-time reporting. A fully integrated PMIS can keep key stakeholders informed of schedule and cost status, and help enable faster decision-making to keep projects on track.

3

Realism eats optimism for breakfast

Owners should demand practical targets from contractors based upon realistic expectations of what can go wrong. Scheduling needs to balance sufficient slack with targets that stretch – but don't overwhelm. If necessary, owners may seek external scheduling expertise to ensure that they understand the workflow and the full financial impact of delays.

4

Sophistication in contingency

Contingencies should encourage prudent cost management and not be an excuse for overspending. The use of a management reserve acknowledges the potential for uncontrollable risks, while a draw-down approach enables project managers to react quickly and flexibly to situations, while keeping strong control over expenditures.

5

Building an extended team

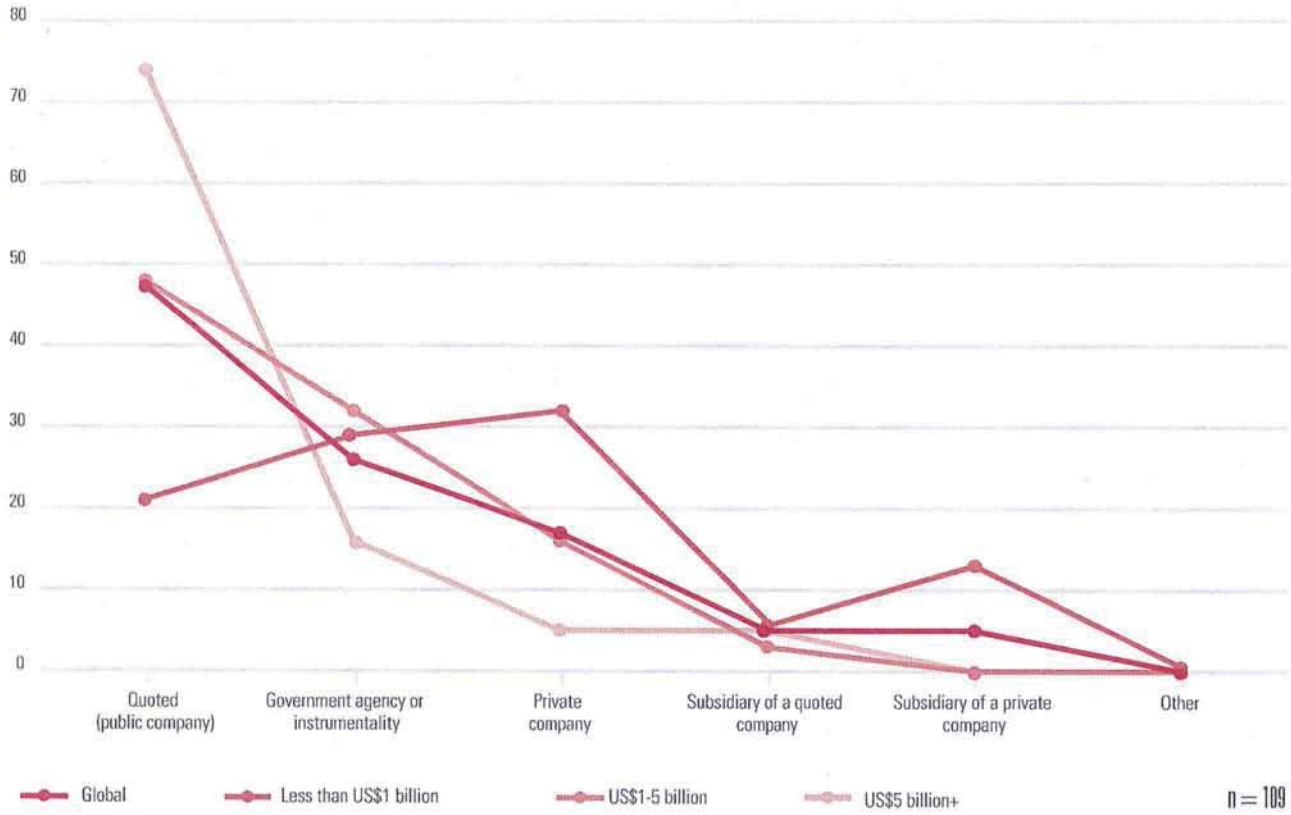
Project owners must invest in relationships with contractors to raise mutual trust and discuss problems or shortcomings. Rather than simply passing all or most of the risk to the contractor, it is preferable to create an integrated project team with common goals and rewards. Where contractors are felt to be lacking in certain skills, owners can discuss how to enhance the team with external expertise.

About the survey

All survey responses were gathered through face-to-face interviews in late 2014 with 109 senior leaders – many of them Chief Executive Officers – from organizations carrying out significant capital construction projects. The interviews were carried out by senior representatives specializing in the engineering and construction industry from KPMG member firms, with the questions reflecting current and ongoing concerns expressed by clients of KPMG member firms.

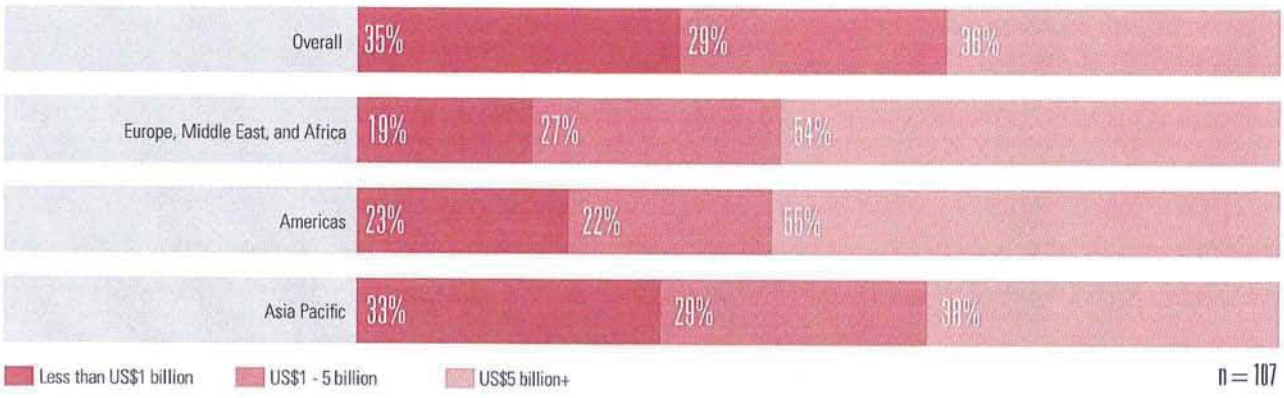
Respondent organizations' turnover/income ranged from less than US$250 million to more than US$5 billion, with a mix of operations from global through regional to purely domestic. The annual capital expenditure budget varied from around US$10 million to over US$5 billion. Twenty-six percent of the respondents' were public bodies – typically government agencies – and some of the main industries represented include energy and natural resources, technology and healthcare.

Entity type



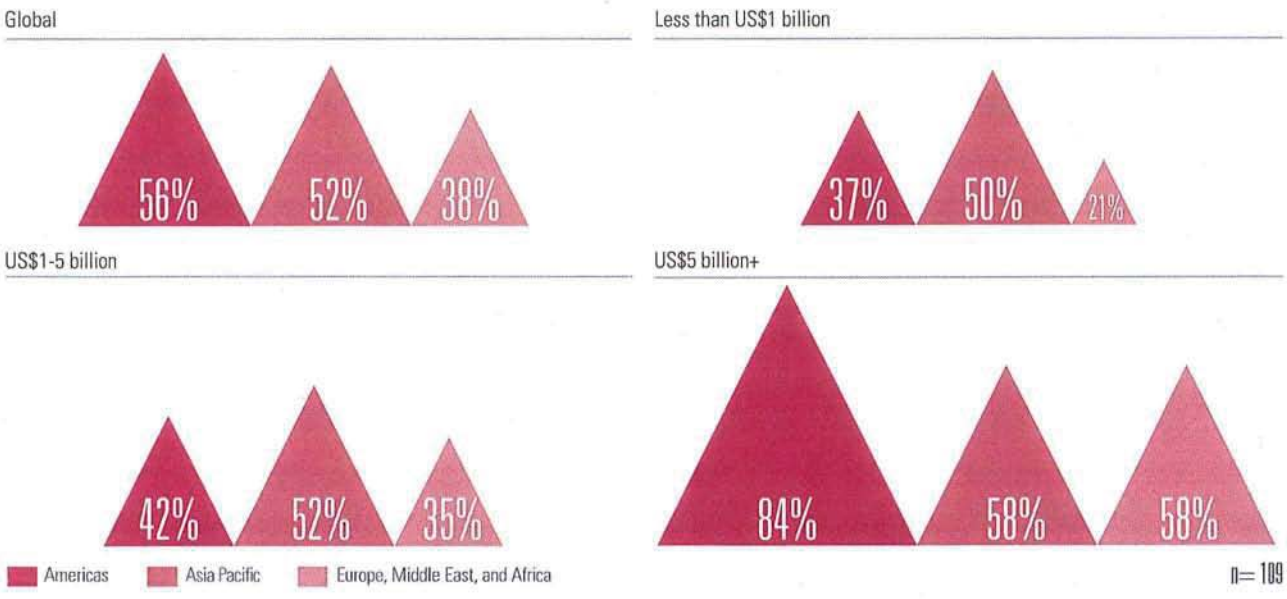
Source: KPMG International, 2015

Annual turnover



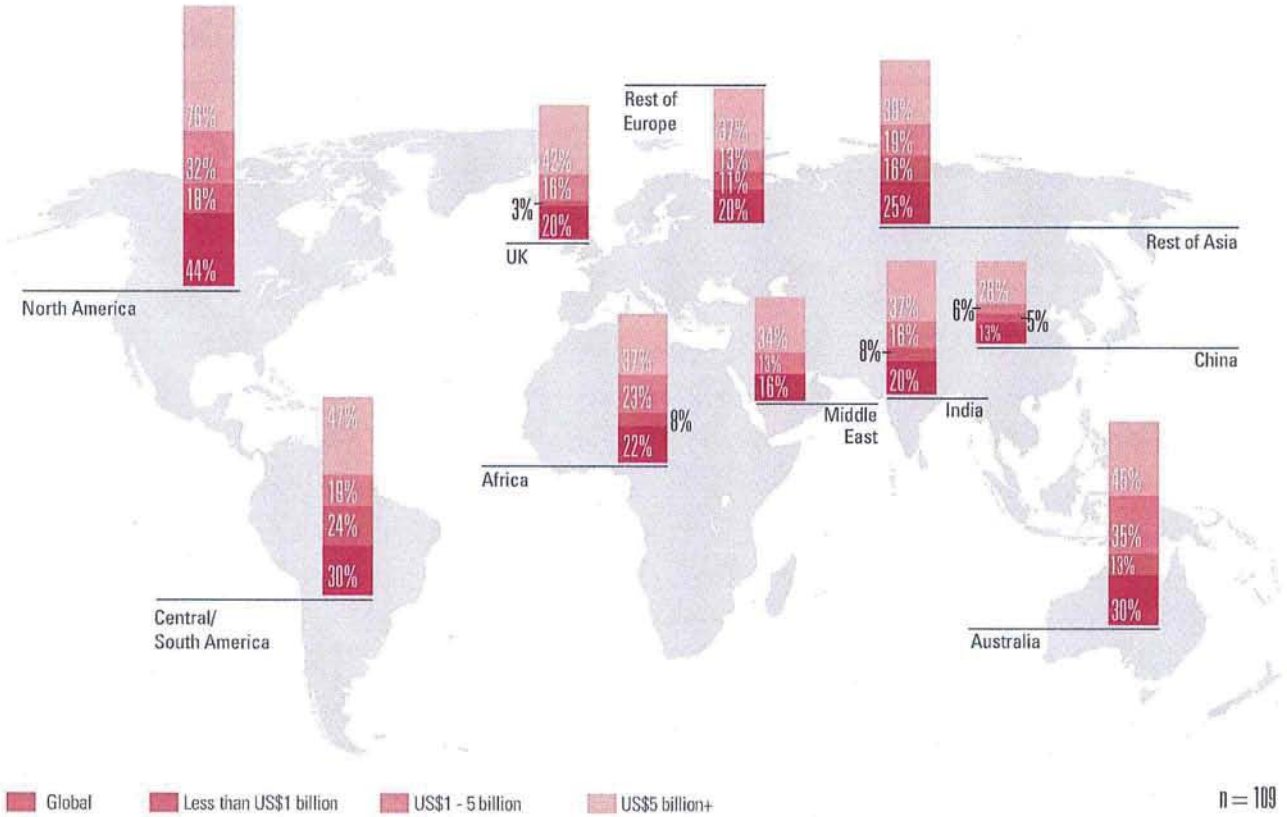
Source: KPMG International, 2015

Regions of operation

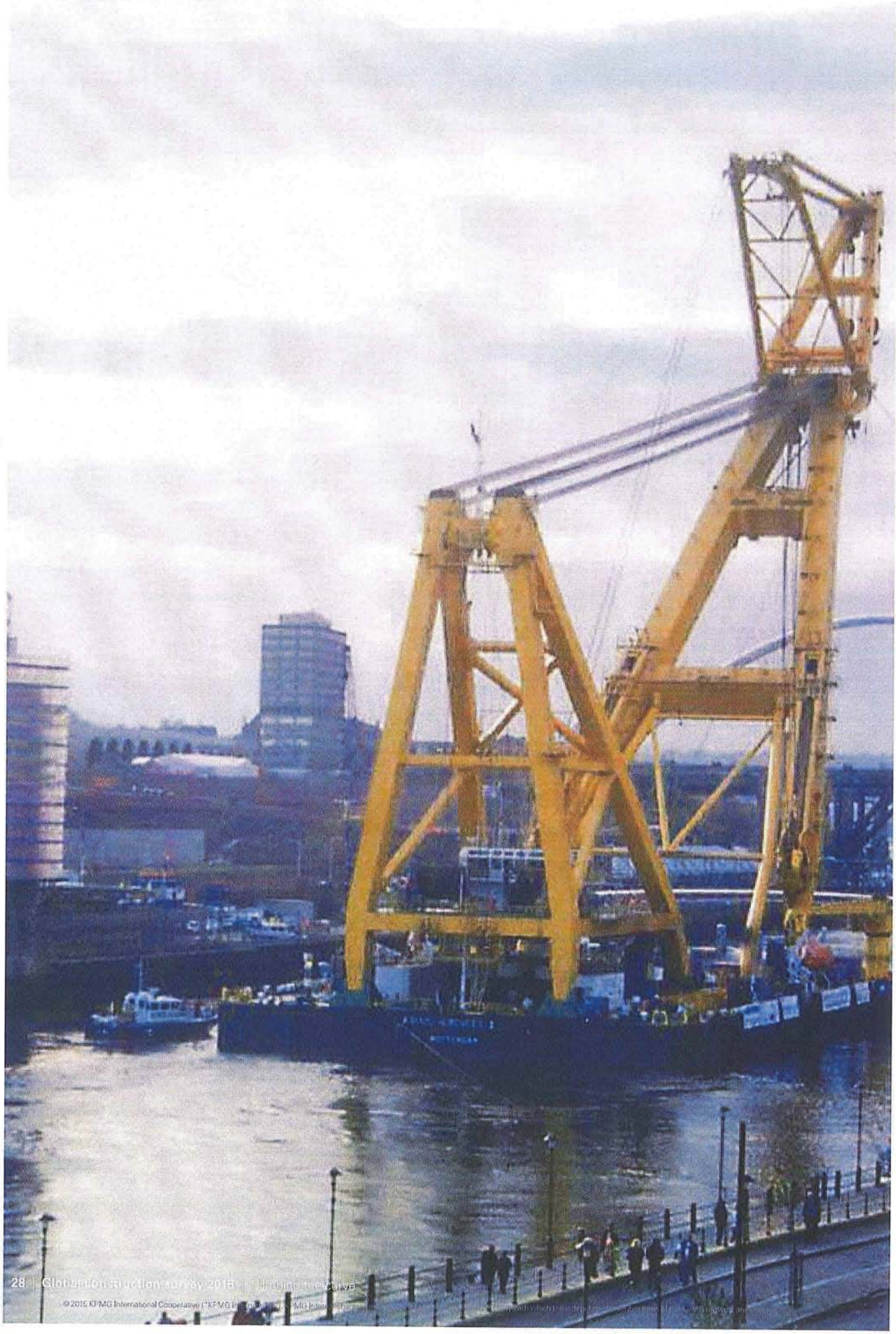


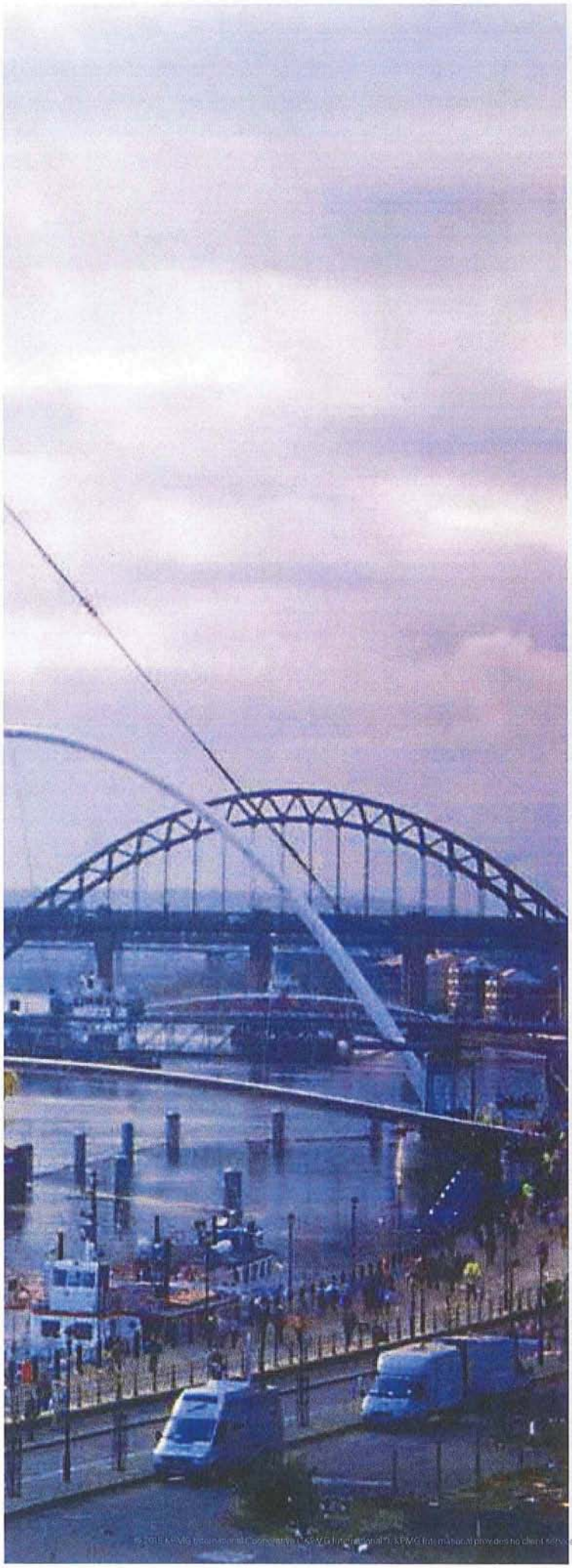
Source: KPMG International, 2015

Sub-regions of operation



Source: KPMG International, 2015





KPMG's global Engineering & Construction experience

Our Building and Construction team is fully committed to serving our clients and understanding their complex and constantly evolving needs.

Our global network enables us to mobilize teams to assist you wherever you are in the world, providing you with access to local and international experience and a tailored service that delivers informed perspectives and clear strategies that our clients and stakeholders value.

Our firms' experienced professionals in audit, tax and advisory bring together a wide range of skills and experience having advised businesses across the globe including developers, contractors, operators, investors, occupiers as well as central, regional and local government organizations on all aspects of the B&C industries.

We can help member firm clients focus on:

Increasing efficiency, through cost optimization, supply chain efficiency and other techniques.

Identifying competitive advantage, by clarifying strengths and weaknesses in your capabilities and producing programs to fill the gaps.

Improve risk management, by refining controls and fostering a culture that embraces and recognizes risk.

Bookshelf

A selection of relevant KPMG reports and insights. To access these publications, please visit: **www.kpmg.com/building** or email us at: **gofmbuilding@kpmg.com**

Global Construction Surveys

KPMG conducts the Global Construction Survey to monitor Engineering & Construction issues and provide timely summaries and insights to help professionals make more informed business decisions in today's rapidly changing environment – this is the eighth edition of the KPMG Global Construction Survey.

2013 Global Construction Survey: Ready for the next big wave?

The 2013 report catches the industry in a more upbeat mood after gauging the views of 165 senior executives of leading Engineering & Construction firms from around the world to determine industry trends and opportunities for growth.

2012 KPMG Global Construction Survey: The great global infrastructure opportunity

The 2012 survey focuses on the insatiable demand for energy and infrastructure in all forms, and the resulting fundamental shifts in focus for nearly all E&C firms.

2010 KPMG Global Construction Survey: Adapting to an uncertain environment

The latest survey highlights the cautiously optimistic outlook of many E&C companies about their immediate prospects and discusses key industry issues and the measures adopted to seize the new opportunities identified.

2009 KPMG Global Construction Survey: Navigating the Storm: Charting a Path to Recovery?

More than 100 senior executives from the Engineering & Construction industry responded to this survey, which focused on how organizations were weathering the impact of the global financial crisis.

Other Thought Leadership

KPMG's Engineering and Construction, Major Projects Advisory, and Infrastructure professionals conduct research and develop thought leadership for clients and industry leaders. This information on current issues facing contractors and owners in a rapidly changing construction environment provides key insights and tangibly contributes to their decision-making processes.

Preventing black swans: Avoiding major project failure

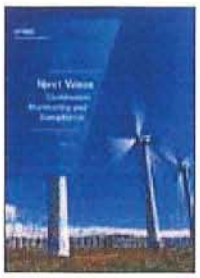
This paper highlights characteristics of major capital projects that can lead to catastrophic failure for owners and contractors, alternative approaches for screening projects, and red flags and triggers for early identification of troubled projects.

How to successfully manage your mega-project

Effective management of mega-projects relies on three key concepts: early planning and organizing, stakeholder communication and project controls integration, and continuous improvement. This three part series covers best practice for managing mega-projects.

Integrated project delivery: Managing risk and making it work for all parties

This paper provides an overview of the current practices and challenges involving IPD and its evolving risk profile. It also offers guidance on how to prepare an IPD strategy and describes the tools and methodologies currently used to facilitate successful IPD.



Next wave: Continuous monitoring and compliance

This report reviews the framework for developing a continuous project monitoring and compliance program that integrates the positive features of project performance monitoring, project risk and controls monitoring, and computer aided auditing.

Preventing fraud in overseas construction projects

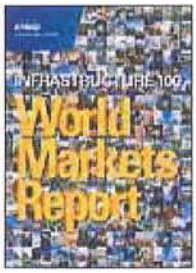
Over the last decade, construction companies have increasingly recognized the imperative of geographic diversification and international expansion and while there are many benefits to investing in emerging markets, the risk of bribery and corruption may be even greater.

Project portfolio optimization: Do you gamble or take informed risks?

This paper addresses portfolio optimization by highlighting some of the challenges and pitfalls of inefficient capital allocation by providing example approaches and practices for identifying and managing projects throughout the life cycle.

ISO 55001: A new era for asset management

This paper discusses the benefits of an integrated holistic approach to asset management, looks at the requirements of ISO 55001 and explains how companies comply with the standard and improve asset performance.

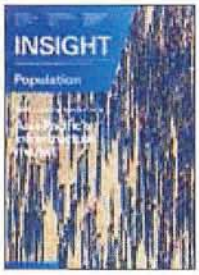


Infrastructure 100: World Markets Report

In the third Infrastructure 100, KPMG highlights key trends driving infrastructure investment around the world and a global panel of independent industry experts identify 100 of the world's most innovative, impactful infrastructure projects.

Insight – The Global Infrastructure Magazine

Insight is a semi-annual magazine that provides a broad scope of local, regional and global perspectives on many of the key issues facing today's infrastructure industry.



Issue No. 6 – Population

This edition of Insight takes a closer look at the link between unprecedented population changes and demographic shifts currently underway and the infrastructure needed to meet these challenges. It also includes a Special Report on Asia Pacific's infrastructure market.

Issue No. 5 – Resilience

This edition of Insight explores some of the world's most impactful stories of resilience. It also includes an exciting Spotlight Special Report on the important changes and opportunities within Latin America's infrastructure market.

Issue No. 4 – Megaprojects

This edition of Insight magazine explores some of the key challenges and opportunities impacting megaproject deliver, and includes a Spotlight Special Report on Africa's infrastructure market, a key growth area.

Issue No. 3 – Infrastructure Investment: Bridging the Gap

This edition explores the complex world of infrastructure finance and funding, including critical topics ranging from direct investment, to innovative financing and funding models, and the evolving infrastructure fund market.

MPA Project Leadership Series

KPMG's Major Projects Advisory (MPA) Project Leadership Series is targeted toward owners with major construction programs, but its content is applicable to all entities or stakeholders involved with construction projects. This series describes a framework for managing and controlling large capital projects based on the experience of professionals from KPMG's MPA practice. They provide services to hundreds of leading construction owners, and engineering, procurement and construction contractors.

- From Concept to Project – Critical Considerations for Project Development
- Stakeholder Management and Communication
- Project Organization & Establishing a Program Management Office
- Governance and Project Controls
- Budgeting, Estimating and Contingency Management
- Monitoring Capital Projects and Addressing Signs of Trouble
- Project Risk Management (future)
- Investing in Tools & Infrastructure (future)

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KPMG's 2015 Global Construction Survey would not have been possible without contributions from Clay Gilge, Brian Relle, Randy Meszaros, Kevin Max, Jeffrey Kagan and Dane Wolfe.

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