The gas pipeline industry is on the precipice of one of the largest capital and system-improvement expansions in the history of the industry. The “perfect storm” of market drivers has coalesced to require new and innovative methods to deliver concurrent major initiatives.
Business “as usual” will not allow our industry to:

- Expand distribution into unserved markets during a time of record low commodity prices.
- Enhance the safety of our transmission and distribution systems to be in compliance with federal and state mandates.
- Replace aged infrastructure (like cast iron pipe) that has served its useful purpose and depreciable life and needs to be replaced to improve system efficiency and safety.
- Build out new gas transmission lines to support newly developed gas-fired electric generation due to the Clean Power Plan (CPP) and the elimination of once through coding at coastal fossil plants.

This report provides the latest perspectives on the three primary methods for delivering major gas projects: Design-Bid-Build, Design-Build and EPCM/Program Management. Each of these methods is described and the potential advantages and disadvantages of using each method are identified. These methods are then evaluated in the context of the following project requirements:

- **Safety** – The ability to see that all workers are protected from danger, risk or injury.
- **Performance** – The ability to successfully complete a complex, high-profile project.
- **Schedule** – The ability to meet critical construction, operational and financial dates.
- **Accountability** – The ability to survive an internal or external audit.
- **Legal** – The ability to enter into contracts that protect the broad interests of an asset owner.
- **Quality** – The ability to deliver quality design, materials and workmanship.
- **Cost Control** – The ability to control project costs and possible change orders.
- **Public Relations** – The ability to handle community and stakeholder interaction during all phases of the project.

**DESIGN-BID-BUILD APPROACH**

The Design-Bid-Build process is often referred to as the traditional approach or the multiple-contract approach in which multiple construction contracts are bid and awarded as lump sum projects based on plans and specifications prepared by an engineer. The project owner hires the design engineer, purchases equipment directly, and hires one or more contractors to perform the construction under separate contracts. The contracts are structured to allow multiple specialty contractors to perform the specific trade-related work in an effort to minimize subcontracting and reduce contractor markups. The engineer may help to pre-qualify contractors and may make recommendations as to contractor selection.

An illustration of a typical project organization for a Design-Bid-Build project is shown in Figure 1.

**ADVANTAGES OF DESIGN-BID-BUILD APPROACH**

1. The owner can select an engineer that has its trust and confidence and is separate from the construction process. The owner works directly with the engineer to implement the utility’s design philosophies and standard practices into the design.
2. The owner can have input as the design progresses and up to the time the plans and specifications are issued for bid without incurring costly change orders. It is not necessary for the owner to identify all its requirements at the beginning of the project.
3. Designs and bid evaluations can be performed to account for the life cycle costs of design decisions instead of just the initial capital cost.
4. The contracts can be structured to minimize the amount of subcontracting by prime contractors, minimizing contractor markups. Equipment is purchased directly from the supplier, eliminating contractor markups. Since the construction contracts are smaller and more specialized a larger number of qualified contractors may be available to bid the work, resulting in lower project costs.
5. The owner controls the contingency pool for the project.
6. The owner has direct control over the selection of material vendors and contractors for the project.
DISADVANTAGES OF DESIGN-BID-BUILD APPROACH

1. The owner is responsible for controlling the interfaces and coordination among all the equipment and materials suppliers and the various construction contractors. This may be overwhelming and result in delayed schedules or increased costs.

2. Total project costs cannot be confirmed until the final construction contract is completed.

3. Delays in completion of one contract may impact other contracts, resulting in potential additional project delays and/or costs to the owner.

4. There is no single responsible party to guarantee project cost, schedule and performance.

5. Owner manpower and costs to coordinate and manage the interfaces among the construction contracts are increased over approaches that have a single contractor to handle such interfaces.

6. The owner is exposed to multiple contractor claims for impacted productivity, late delivery of owner-furnished materials, weather delays and labor disputes.

7. The owner is responsible for errors and omissions in design.

8. The owner has ultimate responsibility for site safety.
DESIGN-BUILD APPROACH

The terms Design-Build, EPC (engineer, procure and construct), and turnkey are generally synonymous and used to describe a project delivery approach in which the owner defines the project and then hires a contractor with total responsibility for the detailed engineering, procurement, construction and coordination of all the project work. The owner carefully prequalifies bidders based on safety record, related project experience, bonding capability, previous success of proposed team, etc. The owner prepares a specification for bid by three to five prequalified Design-Build teams. The bidder performs conceptual design and preliminary engineering to estimate the material quantities required for the project and obtains prices for equipment from suppliers. Construction pricing may be from the contractor’s own experience or from quotations from potential subcontractors. The Design-Build contractor selects the equipment and construction subcontractors who provide the best value to the project from the Design-Build contractor’s perspective while still meeting the requirements of the owner.

The Design-Build contractor self performs the detailed design or subcontracts it to an engineering firm. The Design-Build contractor is the general contractor. Typically, the contractor’s strategy is to purchase equipment and material directly from the supplier eliminating subcontractor markups. The Design-Build contractor will contract directly with specialty contractors for the construction work not performed by its own personnel. The scope of each subcontract is defined as clearly as possible to reduce the likelihood of change orders for the Design-Build contractor. The final project cost from the Design-Build contractor to the owner will include fees and expenses for providing the overall project management, accepting and managing project risks and recovering the substantial cost of preparing the initial Design-Build proposals to the owner. In some cases, the markups and the fee can make the Design-Build contract more expensive than the Design-Bid-Build approach.

An illustration of a typical project organization for a Design-Build project is shown in Figure 2.
ADVANTAGES OF DESIGN-BUILD APPROACH
The project cost and schedule can be defined very early in the project. If the scope is well defined and the owner identifies its requirements in the Design-Build contract, there should be few, if any, change orders. The owner can obtain a high degree of confidence on cost, schedule, and performance from a single responsible party. Owners with limited staff to dedicate to the project can rely on the Design-Build contractor to coordinate each phase of the project. The owner can use its limited staff to monitor the contractor to confirm that the project meets the requirements of the contract. The project schedule can be condensed with close coordination of the design, procurement and construction activities by the Design-Build contractor allowing the owner to better define the project prior to issuing EPC bid documents. Design-Build contractors may have innovative approaches that are less costly than the owner’s standard practices and may meet the owner’s requirements at a reduced cost. All contractual issues between the Design-Build contractor and the subcontractors are the direct responsibility of the Design-Build contractor. Lower material and equipment costs may be passed through to the owner during the bidding process due to the volume buying power of the Design-Build contractor.

DISADVANTAGES OF DESIGN-BUILD APPROACH
The Design-Build contractor receives an additional fee for managing and accepting project risks and higher exposure to risks lead to higher pricing. Money follows risk. The contingency included in a Design-Build price depends on the level of detail in the bid documents, project schedule, difficulty of construction and unknowns. The amount of contingency in the Design-Build price can be reduced when most of the unknowns, such as subsurface or environmental risks, are defined prior to issuing the bid documents. Well-defined subsurface conditions also reduce owner exposure to change orders. The owner generally does not select the equipment supplier. The Design-Build contractor will typically solicit bids from pre-qualified and/or owner-specified vendors and select equipment with the lowest evaluated cost. Performance specifications that consider life cycle costs must be part of the initial bid package.

Some owners may take bids on specialized equipment and then assign those contracts to the Design-Build contractor. This allows the owner to select this primary equipment and still obtain overall system guarantees. Generally the owner is not involved in the detailed design decisions and has very limited time, if any, to review design drawings. Scope and schedule need to be clearly defined very early in the project. Changes in scope or schedule after award will most likely cause the Design-Build contractor to revise the price of the project. The owner will receive the contractor’s standard drawing formats unless otherwise specified in the bid documents. And, unless specified, the owner may also not receive detailed documentation, calculations, or manuals, since the engineer typically only produces those documents necessary for construction of the project.

EPCM/PROGRAM MANAGEMENT APPROACH
EPCM (engineer, procure, construction management) and Program Management are very similar in concept and have many of the same pros and cons. The primary difference between the two delivery systems is related to the scale of the project or program. EPCM would more likely be used for smaller-scale efforts of shorter duration.

The Program Management approach provides for meeting all of the owner’s project delivery needs related to a large and complex effort involving the construction of multiple facilities over a several-year period. The owner may choose to use internal resources for program management or, if the owner has limited resources, the owner may hire an outside resource as program manager. The program manager can be a construction general contractor or a consulting engineer. Other common names used for a program manager are owner’s agent and owner’s engineer. The program manager is an agent of the owner and serves as a single point of management for the entire process of completing the project(s). Again, very similar to EPCM, but EPCM lacks the continuity of multiple project phases over a period of years that Program Management provides. An example would be the engagement of the program manager in the routing and permitting on the front end of a longer-term effort, well before the EPCM is selected.

Hereinafter, we will refer to EPCM and Program Management as Program Management.
The program manager provides detailed managerial support and added technical value to the owner and is normally involved in the earliest stages of a project. A program manager offers current planning methodologies, public involvement and testimony capabilities, design experience, knowledge of construction methods and pricing, an understanding of competitive market conditions, and effective scheduling and cost control systems. Program management is successful when the project’s planning, permitting, design and construction phases are effectively integrated into a single process. The program manager can deliver a project(s) with consistently successful results in several areas of measurement over the course of several years by developing an overall master plan for the project(s). The master plan might include such tasks as:

- Develop the program goals, objectives, and priorities.
- Provide for the integration of all program components and functions by responsibility, including administrative, regulatory, financial, engineering, construction, commissioning, documentation, procurement and operations.
- Provide an organizational chart.
- Provide a directory of team members with locations, telephone and fax numbers.
- Describe the relationships between the program management staff and the owner as well as future consultants, contractors, construction managers, facilities users, government agencies, intervenors and other groups.
- Describe the key program management tasks and establish the procedural basis for executing program management functions.
- Establish state-of-the-art management controls to effectively manage time, quality, costs and resources to achieve a high level of performance.
- Establish communications procedures, information document flow and database management procedures.
- Define programwide standards, policies and procedures.
- Define program public information and coordination requirements.
- Identify the approvals and timing required.

The master plan provides the framework for the program manager to assist the owner in many other ways, including:

**PRELIMINARY PHASE**

- Define project scope
- Develop estimated contract costs
- Develop preliminary schedules
- Identify potential resources
- Review RFP provisions for uniformity, clarity and completeness
- Develop evaluation criteria for various resources
- Interview engineers, vendors and contractors
- Evaluate proposals
- Make recommendations for selection

**DESIGN PHASE**

- Confirm program scope and concept
- Develop design schedules
- Conduct and coordinate design review
- Conduct value engineering review
- Monitor design progress
- Conduct constructability reviews
- Coordinate agency approvals
- Conduct budget compliance reviews
- Interface with existing operations

**CONSTRUCTION PHASE**

- Contractor mobilization
- Site logistics plan
- Construction safety program
- On-site contractor coordination
- Schedule conformance reviews
- Project payment applications
- Change orders
- Claims management
- Security program
- Agency liaison
- Expediting
- Quality Assurance program
- Weekly progress meeting minutes
- Monthly status report
Program Management still requires that designs are completed, materials are procured and projects are built. The program manager may recommend either the Design-Bid-Build approach or the Design-Build approach for each individual project within the construction program. An illustration of a typical project organization for the Program Management approach is shown in Figure 3.

**FIGURE 3: Program Management Organization**

**ADVANTAGES OF PROGRAM MANAGEMENT APPROACH**

1. This approach provides a comprehensive, continuous level of service for the owner with staff or a third party overseeing the entire process from project planning to project closeout.

2. The owner has more control of design and construction processes throughout the project. The program manager provides timely cost and schedule information to the owner, allowing informed decisions on cash flow and providing accurate information to internal and external stakeholders.

3. The owner can avoid hiring additional staff for specific project-related functions. The program manager can easily increase or decrease resources on the program applying specific resources when and where they are needed to maintain project objectives.

4. The program manager provides current knowledge of design and construction resources, material vendors and best practices. Program managers typically are involved in the largest, most complex projects in the country and the world. They bring a unique perspective and understanding to the owner.

5. Bid packages for engineering, materials and contracting can be staged based on project needs such as outage windows, financial objectives, seasonal weather, permitting requirements and environmental restrictions.

6. The program manager can be provided with penalties or incentives to maintain schedule and budget.
DISADVANTAGES OF PROGRAM MANAGEMENT APPROACH

1. The program manager assumes no contractual responsibilities for design or construction. Contracts for engineering, materials and construction labor are held and maintained by the owner. Contract terms and conditions must contain strong enforcement language that allows the program manager to maintain budgets and schedules.

2. A strong working relationship between the owner and the program manager is paramount to success. Early involvement in the program develops trust and confidence between the program manager staff and the owner’s staff. A keen understanding of the critical internal and external issues related to the project is fundamental for success.

3. The program manager must rely on the owner for key decisions that impact the project budget and schedule. Regular, documented communication is required.

EVALUATION OF PROJECT APPROACHES

There are three recognized methods for delivering major projects currently in use today. This report has described and listed the generally accepted pros and cons of each. In order to maximize the value of this effort for an asset owner, an evaluation was performed of the three approaches for delivering major projects in the context of specific project requirements identified by utilities addressing similar needs. These requirements are:

- **Safety** – The ability to see that all workers are protected from danger, risk or injury.
- **Performance** – The ability to successfully complete a complex, high-profile project.
- **Schedule** – The ability to meet critical construction, operational and financial dates.
- **Accountability** – The ability to survive an internal or external audit.
- **Legal** – The ability to enter into contracts that protect the broad interests of an asset owner.
- **Quality** – The ability to deliver quality design, materials and workmanship.
- **Cost Control** – The ability to control project costs and possible change orders.
- **Public Relations** – The ability to handle community and stakeholder interaction during all phases of the project.

Each project approach was given a rating of high, medium, or low, with a high score indicating the best or most favorable outcome for achieving established goals. These ratings were weighted based on their significance to other utilities addressing similar needs (see bold) and were compiled to draw conclusions for the recommended approach.
SAFETY

Safety is defined as the ability to see that all workers (office and field) are protected from and do not contribute to danger, risk or injury to themselves or others. Safety is of paramount importance to the project for personal, financial and business reasons. Fundamentally, everyone needs to return from work to their family and friends whole and healthy. Project safety begins with good planning and design and concludes in the field with education, diligence, communication and cooperation amongst individual workers, crews, subcontractors, specialty contractors and leadership. The Design-Bid-Build approach puts much of the responsibility for safety squarely onto the owner. The owner’s safety policies and procedures, and corporate/company safety culture, can permeate the project, for better or worse. A strong safety policy and culture from an owner can influence a design that better incorporates safe practices. Procurement policies can reward safe work performance, as quantified by such indices as Total Recordable Incident Rate (TRIR) and Days Away, Restrictions and Transfers (DART). See Tables 1 and 2.

Dedication to safety principles and practices in the field can be delivered in a Design-Bid-Build contract, if the owner takes the lead. However, safety leadership and the resulting performance does not occur project by project. Therefore, to achieve best-in-class safety performance, owners will commonly select Design-Build or Program Management as a method of major project delivery. The Design-Build approach allows the owner to select a single point of contact for all safety-related questions or issues. The Design-Build team is responsible for the design of infrastructure that can be safely installed, the procurement of materials and equipment from suppliers with good safety records — demonstrating strict adherence to the owner’s safety policies — and constructors that employ labor, means and methods that are safe and compliant with local, state and federal regulatory agencies. The program manager combines its safety practices and culture with that of the owner to form a comprehensive best practice to mitigate project safety risk. The contract for Program Management must be specific about who has field responsibility for coordinating, reviewing and enforcing the safety program. Safety requires diligent attention to detail. A program manager is well-suited for that level of attention.

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<th>Project Requirement — Safety</th>
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<td>Design-Build</td>
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<td>Program Management</td>
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**TABLE 1:** Total Recordable Incident Rate (TRIR).

**TABLE 2:** Days Away, Restrictions and Transfers (DART).
PERFORMANCE
Performance is defined as the ability to successfully complete a complex, high profile project. One of the major disadvantages of Design-Bid-Build is the reliance of the project team on others for completion of critical milestones or deliverables. A single point of failure to meet permitting and design deadlines, material deliveries, system outage windows, construction sequence, etc. can impact multiple aspects of the project. The successful completion of a project is the deliverable for a Design-Build contract, but there is higher performance-related risk associated with a megaproject being the responsibility of one contractor. A Design-Build contract by its very nature requires that an owner relinquish control over many aspects of the project to the contractor. Owners can protect themselves from a contractor that might fail to complete a project by requiring a bid and/or performance bond with the project and imposing liquidated damages for failure to meet performance milestones. Burns & McDonnell believes that the Program Management approach provides the highest level of confidence that a very large project will be completed successfully. The program manager has a more comprehensive perspective of the project and usually has been brought onto the project early enough to have a fundamental understanding of all the issues that impact the project outcome as well as strong working relationship with the owner’s staff. Therefore, we evaluate the performance requirement as follows:

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SCHEDULE
Schedule is defined as the ability to meet critical construction, operational and financial dates. Issues that impact and determine project schedule risk are equipment deliveries, manpower availability and labor productivity. The Design-Bid-Build approach substantially places the schedule risk on the owner. It is the owner’s responsibility for monitoring progress of each component of the project. Multiple equipment suppliers and contractors make it difficult to coordinate work efforts. Delays in the completion of one contract may impact other contracts resulting in potential project delays. Schedule risk is also predominantly with the owner when a program manager is employed, since the program manager is generally an agent for the owner.

The Design-Build approach places the risks associated with meeting the project schedule almost entirely on the contractor. When evaluating the performance on a large project, this can be a disadvantage due to the single point of responsibility; however, in the context of schedule, a single point of responsibility is desirable. The contractor has complete responsibility for managing the activity of the project to see that deadlines are met. Combining the design and construction functions under one Design-Build contract can reduce the overall time required to complete the project. It is possible for a Design-Build contract to contain a liquidated damages clause to protect the owner from reasonable and quantifiable costs associated with the late completion of the project. Therefore, we evaluate the schedule requirement as follows:

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<td>Program Management</td>
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ACCOUNTABILITY
Accountability is defined as the ability to survive an internal or external audit and can be one of the most important aspects of the project(s). Project accountability starts with the selection of a project team. The owner or the owner’s program manager should endeavor to competitively bid work to qualified vendors and contractors who are allowed to compete on an equal basis on various phases of the project. However, on a project of great magnitude, potential bidders should be carefully prequalified with close examination of reputation, bonding capability, safety records, labor, equipment and production availability, and financial stability. Competitive bidding will demonstrate to internal and external auditors that the owner has avoided any real or perceived favoritism in the selection of equipment and material vendors or contractors.
Financial and procedural accountability for a project realistically lies with the party having ultimate control over the design, procurement and construction. Projects developed under the Design-Bid-Build and Program Management approaches are more easily audited than a Design-Bid project since all contracts for engineering services, materials and equipment and construction labor are held by the owner. The Design-Bid-Build and Program Management approaches spread out project accountability over several contracts with several personnel from either the owner or the program manager, acting as the owner’s agent, administering the effort to document the project and maintain records. Therefore, the owner has more direct access to the significant documentation of the project, i.e., drawings, specifications, cost estimates, contracts, expenditures, etc., as well as the documentation of design and construction decisions made throughout the project.

A Design-Build project provides the owner with little direct control over how the project is completed. The Design-Build contract is typically the only contract held for the project and the Design-Build contractor represents the single point of responsibility with which all accountability for the project lies. Project accountability will be only as good as the records maintained by that single contractor and the owner may have limited access to those records during the course of the project. Reviewing project documentation and record keeping after completion of the project does not allow the owner to require possible adjustments of the project as needed. Therefore, we evaluate the accountability requirement as follows:

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**LEGAL**

Legal is defined as the ability to enter into contracts that protect the broad interests of the owner and is of critical importance to the project with regard to errors and omissions in design, warranties for material, delivery guarantees, construction liability and completion dates. Any request for proposal (RFP) needs to have strong language that indicates to the bidder for equipment or labor the importance and complexity of the overall project. Well-crafted RFP’s lead to strong contracts with competent, qualified suppliers that offer a fair and balanced approach to managing the risk, milestones and deliverables of the project.

Good RFPs and strong contracts are ultimately the responsibility of the owner and its legal counsel. However, the owner can obtain valuable input on the perspective of vendors and contractors regarding contract terms and conditions from an engineering consultant that prepares plans and specifications or a program manager that works in the design and/or construction industry. The Design-Build approach does not provide the owner with this important third party perspective. Therefore, we evaluate the legal requirement as follows:

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**QUALITY**

Quality is defined as the ability to deliver accurate design, materials that meet specifications, and good workmanship. Megaprojects are uniquely challenging. Several parts of the project(s) may be first-time installations for an asset owner, large installations of certain technologies and/or materials or have heavy impacts on customers and communities. In addition, intervenors will be keenly aware of the project(s) and will be watching the daily work effort. There will be little patience for lifestyle-impacting delays due to simple mistakes such as missed utility locations or catastrophic mistakes that our industry has recently experienced. The assurance of quality is fundamental to the success of the project.

The owner’s quality control in the design generally has three aspects: the amount and type of drawings and documentation received; the owner’s ability to have the project reflect its design philosophies, criteria and standards; and the owner’s ability to make comments and changes during the design process. The owner’s quality control of equipment and materials is similarly
dependent on its ability to review vendor drawings and its ability and willingness to travel to manufacturing facilities to view and inspect fabrication of major materials and equipment especially those items that impact critical project milestones. Finally, the owner must commit resources to inspect the installation of the project to make sure that the contractor follows the plans and meets the specifications of the contract.

The Design-Bid-Build approach provides an engineer that works directly for the owner. The owner may contract with the engineer to implement quality control measures such as drawing review schedules, visiting specific manufacturers, use of standards and philosophies, and application of drawing standards. The scope of the engineer’s work can be written to prepare equipment specifications and to make plant visits at regular intervals. Further, the engineer can provide construction management and field inspection as part of the scope of work. A scope of work that includes design, plant visits and construction management will protect the interests of the owner and generally delivers reasonable quality.

The Design-Build approach requires that all expectations, criteria and applicable standards be identified at the beginning of the project and defined in the Design-Build contract. A Design-Build contractor typically produces only the documents necessary to construct the project and relies heavily on vendors and subcontractors to meet specifications and deliverables. There is typically no plant inspection of materials and equipment. Work by subcontractors is typically not inspected by the engineer. The Design-Build team is a single entity. Design-Build contracts can be structured to give the owner approval rights for all or part of the design. However, unless the comments are consistent with the Design-Build contract, it may be difficult to incorporate owner comments without a change by the contractor.

A program manager can provide any or all of the services described in the Design-Bid-Build approach and can strongly supplement an owner that chooses a Design-Build approach. Therefore, we evaluate the quality requirement as follows:

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**COST CONTROL**

Cost Control is defined as the ability to control project costs and possible change orders.

Project cost risk is directly related to:

- The accuracy of the scope used to prepare the project budget
- Variations in material quantities required to construct the project such as pipe, cut/fill quantities, number of underground conflicts, etc.
- The accuracy of equipment cost estimates
- Expected labor cost and productivity
- Equipment and materials escalation due to market conditions, inflation, currency valuations, political interests, weather, shipping challenges, etc.

For the purpose of this evaluation, the cost control criteria do not seek the lowest project cost, but the ability to best control project costs during the selection of vendors and once contracts are entered into by the owner. Project cost follows project risk. Some project risk, such as labor cost, productivity and materials escalation, is shifted to the vendor or contractor when a contract is awarded. The Design-Bid-Build approach and the Program Management approach require that the owner retain substantial project risk by holding all contracts for engineering, procurement and construction and, therefore, the owner should have lower overall project costs. However, since the owner retains the project risk, the owner’s ability to control the seemingly lower costs may be jeopardized. Both the Design-Bid-Build approach and the Program Management approach employ engineers to facilitate the pre-qualification and selection of vendors and contractors and are effective for controlling costs. However, program management is rated higher due to: 1) the ability to review engineering
costs, 2) better management and tracking tools and 3) a specific focus on cost control.

The Design-Build contractor receives a fee for accepting risk in the project. Design-Build contracting shifts risk away from the owner. The contractor is responsible for the scope of the project within the limits defined in the contract. Risk factors for the contractor include material quantities, equipment cost, labor cost and productivity, materials escalation, etc. The cost risks that remain with the owner are primarily due to changes in scope and unexpected events (force majeure). However, the Design-Build contractor’s ability to be innovative in design and construction may offset some of this added cost.

The definition of cost, restated, is the ability to control project costs and possible change orders. The Design-Build method may be more costly to the owner because of the risk burden placed on the contractor but, if the scope is well-defined, the price and potential change orders are controlled. Therefore, we evaluate the cost control requirement as follows:

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PUBLIC RELATIONS
The definition of public relations is the ability to handle community interaction during construction. Truth and consistency are the fundamentals of public relations whether in the office or on the project site. Public relations personnel should be involved in the project as early as possible. Staff needs to know the concerns of stakeholders and know the mitigation proposed to alleviate those concerns. Early involvement of some members of the utility or program management team provides continuity of message to the public through project completion. Communication with stakeholders — such as the press, neighborhood associations, community groups and elected government officials — must be provided by the project team for each segment of the project. Responsibility for this type of general communication typically lies with the owner’s public relations or communications department or a special media consultant. A special media consultant could be placed under the responsibility of a program manager or be one of the requirements for selecting the program manager. Engineers, vendors and contractors working in the context of the Design-Build approach may not be prepared for communication with the general public, especially on large or controversial projects.

Communication with the public on the project site is important. In some cases, the Design-Bid-Build or Design-Build teams may be able to provide adequate communication with homeowners, business owners, passersby, technical staff from local government or permitting agencies, or law enforcement. However, a well-qualified construction manager and team of inspectors watching the interests of the owner and prepared to handle specific questions can be more effective. Working with utility or internal staff public relations personnel, they can be available to notify property owners of advancing construction, solve immediate ingress/egress issues, coordinate service outages, provide right-of-way restoration mediation, etc. The construction manager and inspectors can be owner’s staff, can be a contractor under the oversight of the program manager, or can be part of the program manager’s trained staff. Therefore, we evaluate the public relations requirement as follows:

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SUMMARY OF RESULTS

A sample analysis of project requirements is summarized in Table 3 and 4. The scoring is based on three points for a “High” rating, two points for a “Medium” rating, and one point for a “Low” rating. The scores for two project requirements, Accountability and Legal, that might be considered most important to other utilities addressing similar needs were doubled in the tabulation shown in Table 3. An alternative was evaluated emphasizing Cost Control and is shown in Table 4. Safety was double weighted in all cases.

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<tr>
<th>Project Requirement</th>
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<th>Design-Build (EPC)</th>
<th></th>
<th>EPCM/Program Management</th>
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*Weighted x 2 due to importance to the project

TABLE 3: Sample Summary Assessment of Project Delivery Approaches.

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<th>Design-Build (EPC)</th>
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<th>EPCM/Program Management</th>
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</table>

*Weighted x 2 due to importance to the project

TABLE 4: Alternative Summary Assessment of Project Delivery Approaches.
CONCLUSIONS

This report provides the latest perspectives on the three primary methods for delivering major gas projects: Design-Bid-Build, Design-Build, and Program Management. Each of these methods was described and the potential advantages and disadvantages of using each method identified. The methods were then evaluated in the context of eight project requirements important to other utilities addressing similar needs.

The Program Management approach scored the highest in the sample evaluation and provides the owner with a method to deliver a large and complex project that involves construction of multiple projects over multiple years. The Associated General Contractors of America supports this conclusion in Project Delivery Systems for Building Construction by stating that the current trend in delivering major projects is for owners to outsource the overall management of their major construction projects.

EPCM is very similar to Program Management, dependent on the scope, scale and length of effort required. A new high-pressure gas transmission line might be a good candidate for EPCM. A major gas upgrade effort, over a 20-year period, is a program.

The Design-Bid-Build and Design-Build approaches clearly have distinct advantages and disadvantages. The Summary of Results seems to favor the use of Design-Bid-Build over Design-Build. Interestingly, a change in the sample weighting to de-emphasize Accountability and Legal and emphasize Cost Control keeps Program Management as the preferred method of delivering major projects and rates Design-Build over Design-Bid-Build. Changes in “weighting” various project requirements important to your organization may help you reach your own conclusions. However, a well-qualified program manager should complement the advantages and strengthen areas of weakness of both methods.

FURTHER READING


BIOGRAPHY

MIKE BEEHLER, PE, is a vice president at Burns & McDonnell. After working as a transmission engineer and project manager for two IOUs, Mike led initial development of critical infrastructure protection for Burns & McDonnell. He initiated the application of sustainable principles into T&D design preceding the development the Envision program and PEER. Mike has written and presented extensively on the subjects of reliability-centered maintenance, program management and the smart grid. More recently, Mike has written, presented and consulted on industry megatrends, EPC project delivery, “the value of the grid” and the growth of the gas industry. Mike earned a Bachelor of Science in civil engineering from the University of Arizona and a Master of Business Administration from the University of Phoenix. He is a registered professional engineer in eight states, a member of IEEE, and a Fellow in the American Society of Civil Engineers.