

WHITE PAPER / **LNG PLANT CONSTRUCTION**

ADVANTAGES OF IN-HOUSE MECHANICAL CONSTRUCTION RESOURCES

BY Steven Carty, PE, PMP, AND J. Brett Williams

Successful completion of LNG infrastructure projects requires timely delivery of critical materials. By hiring an engineer-procure-construct (EPC) team that offers in-house fabrication, as well as engineering, permitting and construction services, LNG companies can streamline the critical path to improve project quality and efficiency.



Several factors are driving the market for liquefied natural gas (LNG) facility expansions and investment in new infrastructure, including satellite facilities, peak shaving plants and marine import/export terminals. More domestic natural gas supply is available than ever before due to technological advancements in shale gas extraction. There is a growing preference for natural gas as an economical and more environmentally friendly fuel for electric generation. Plus, state and federal regulators are viewing LNG infrastructure projects more favorably as the value of utility on-system supply for peak-shaving purposes continues to increase.

To capitalize on growing demand, owner-operators are increasing and upgrading plant storage and production capacities; constructing new LNG facilities entirely; or, at a minimum, replacing existing LNG facility components in kind. Regardless of the type of capital improvements your organization chooses to undertake, efficient construction practices and subcontracting plans are essential.

Effective scheduling and timely delivery of materials — particularly hard-to-obtain materials like cryogenically welded stainless steel piping — can make or break a project. Hiring an engineer-procure-construct (EPC) team that has all of the necessary mechanical construction resources in-house provides time and cost savings. In some cases, having access to in-house resources could mean moving critical infrastructure projects forward, rather than missing out on the opportunity to get your plant back online within the required seasonal window.

Moreover, when you work with a team that has experience in all aspects of the EPC process — including engineering, permitting, fabrication and construction — you streamline the critical path, thereby improving project quality and accelerating the schedule.

TIME SAVINGS

Working with an EPC company that has mechanical construction resources in-house saves owner-operators time by virtually eliminating the traditional subcontracting process.

Typically, hiring subcontractors involves a competitive bidding process. You have to develop and issue a request for proposal (RFP); evaluate the bids you receive; compare direct costs such as labor, equipment and materials, as well as overhead costs and time and material rates; and resolve any exceptions or clarifications. You also have to vet each potential subcontractor, including evaluating qualifications, checking references and verifying safety records. All of this takes time and resources that could be better spent on the design and construction of your facility.

When you work with an EPC team that self-performs mechanical construction, most of the traditional subcontracting process becomes unnecessary. You don't need to reevaluate qualifications, references or safety records, because you've already vetted and hired the EPC team. You'll still need a cost estimate, but the EPC firm can work directly with the mechanical construction team to develop it. The entire process can be very open, which makes it easy to engage in collaborative discussions at a much earlier stage in the design development process and open up value engineering discussions throughout the process.

COST SAVINGS

Having access to in-house resources can save owner-operators money by greatly reducing subcontractor markup. It also eliminates the need for redundant construction management, site safety professionals and schedulers, which paves the way for additional efficiencies.

Reporting requirements are reduced, since all time, labor and material rates are available to the single construction manager. Administrative processes will be executed via a common management system (usually a modern, web-based system for complex projects). So, shop drawings and documents, requests for information and management of change information all have the same familiar look and feel.

Having one party responsible for safety reduces the opportunity for miscommunication and provides a single responsible party with a unified safety system. This contributes to a safer work environment overall. Because safety tracking and management systems vary from organization to organization, training and ramp-up time is typically needed to see that the subcontractor and EPC firm are aligned. With in-house resources, all safety professionals are able to hit the ground running.

When construction resources are available in-house, one party is responsible for scheduling over the entire project. Instead of having to collect delivery dates from subcontractors — which may require waiting on information from their suppliers — the scheduler can go directly to the in-house equipment or material provider. Scheduling, earned value analysis and other information become easier to share when they are in the same or compatible formats.

All of these factors help project managers anticipate and prevent problems or delays, saving owner-operators both time and money on LNG infrastructure projects.

ACCESS TO CRYOGENIC WELDING CAPABILITIES

Because LNG makes traditional carbon steel piping unserviceable, LNG is conveyed through cryogenically welded stainless steel instead. Obtaining enough stainless steel piping and other appurtenances in cryogenic service (such as control valves) in a timely manner is one of the biggest challenges LNG infrastructure project managers face. LNG facilities usually bid cryogenic welding work out to a firm with prior LNG mechanical piping experience. Unfortunately, and despite high demand for cryogenic welding, such firms can be hard to find.



Cryogenic welding is a specialty within a specialty. Any type of pipe fabrication requires dedicated shop space that meets special welding conditions. Qualified welders must be skilled and experienced in a number of processes, and shops must fabricate in accordance with numerous American Society of Mechanical Engineers (ASME) codes.

Before leaving the shop, fabricated spools should be inspected to confirm accuracy, weld quality and conformance to your design and specifications, as well as to code requirements. Ideally, all quality control personnel should be Certified Welding Inspectors in accordance with American Welding Society (AWS) QC1.

Welding shops with cryogenic capabilities tend to be small, and many LNG facilities may be unaware of shops outside their region. Even if more distant shops have capacity, shipping the material may be expensive. Hiring an EPC contractor with stainless steel cryogenic welding capabilities gives you ready access to these hard-to-find materials.

EFFICIENCIES WITH IN-HOUSE FABRICATION

For the greatest flexibility and efficiency throughout your LNG construction project, you will want to work with a piping shop that can fabricate stainless steel of all grades and types, as well as sizes — Schedule 5 through Schedule 80 — and manufacturing process, either electric resistance welding (ERW) or seamless. This requires skilled craftsmen who have the knowledge and experience needed to adhere to the stringent welding and handling conditions necessary for stainless steel fabrication.

An EPC team with an in-house fabrication shop that is union signatory will have existing relationships with the local labor force. Labor force includes craftsmen with the unique skill set required to produce LNG piping and other stainless steel features typically required for LNG service.

STREAMLINING THE CRITICAL PATH

As the demand for LNG development projects continues to grow, owner-operators who work with an EPC firm that can oversee all aspects of construction — including producing cryogenically welded stainless steel piping in-house — will bring their infrastructure improvements online faster and at lower cost than their competitors.

Few multidisciplinary EPC firms can provide complete design and construction services that support heavy industrial work and all associated systems, from material fabrication to wastewater treatment, electrical power generation, grid interconnection, and oil, gas and chemical infrastructure. Such firms can oversee LNG projects from concept to commissioning, cutting out all the seams in the critical path to deliver high-quality projects more efficiently.

BIOGRAPHIES

STEVEN CARTY, PE, PMP, BURNS & McDONNELL,

is a construction project manager, who provides design, program management, construction management and EPC solutions for clients in the natural gas industry. With more than 23 years of experience in the civil engineering and natural gas utility industries, Steven has experience in the installation, relocation and retrofitting of utility assets and in leading multidisciplinary teams from concept through design, construction, commissioning and startup.

J. BRETT WILLIAMS, AZCO INC., a Burns & McDonnell company, is president of AZCO, an industrial contractor that provides construction and pipe fabrication. He was previously a regional president at Burns & McDonnell, where he led a 350-member team in completing more than \$12 billion of aviation, environmental, pipeline, heavy industrial and electrical upgrade projects. He received his bachelor's degree in construction engineering from Pittsburg State University and his master's degree in construction science from the University of Oklahoma.

ABOUT BURNS & McDONNELL



True partnerships lead to successful projects. At Burns & McDonnell, we dedicate experienced and innovative leaders to your work, beyond the specific needs of a particular job and always with safety in mind. We build long-term relationships as our people — engineers, architects, construction professionals, scientists and more — become valued extensions of your own teams, often for decades at a time. It's a point of pride that our clients find it difficult to tell the difference between a Burns & McDonnell employee and one of their own. And that's no surprise, considering that we, as employee-owners, carry the commitment of ownership: We succeed when you do. Learn more at burnsmcd.com.

ABOUT AZCO



Established in 1949, AZCO, a wholly owned subsidiary of Burns & McDonnell, is a leading national industrial and fabrication contractor headquartered in Appleton, Wisconsin, with additional offices in Colorado. AZCO is 100% employee-owned. For more information, visit azco-inc.com.