"The benefits of a template for efficient execution of LNG projects"

Authors

Amos Avidan, Phil Hunter and D. Messersmith, Bechtel Corporation
Wes Qualls and Jim Rockwell, ConocoPhillips Corporation

USA
ABSTRACT

Growth in construction of new baseload liquefaction capacity seems to be accelerating at an even faster rate than the historical 7% per annum rate of the past decade. This is occurring at a time when Engineering and Construction (E/C) activity is high in all sectors of the energy industry, and is forecast to stay high for several years. At the same time, the increased demand has contributed to significant escalation in commodities and equipment pricing in the past 3 years. This volatility continues and affects not only pricing but also delivery schedules. The higher global growth in demand is placing unprecedented strains on available resources throughout the entire LNG value chain. One area of concern is availability of qualified E/C teams to design and execute these complex projects. The shortage of these resources is helping drive up costs, raises concerns over quality, and is starting to cause postponement of some proposed projects.

Proper planning and proper execution of large capital projects are now even more important than in the past. Bechtel and ConocoPhillips have developed an LNG template based on our experience in designing, building and turning over recent LNG projects that helps ensure certainty of outcome to the owners. This template is based on the proven ConocoPhillips LNG liquefaction process. The template addresses such critical areas as project planning, building on proven experience, effective technology selections, aligning of objectives between the owners’ and the contractors’ teams, and optimal contracting and execution strategies. This approach has been used successfully on such LNG projects as Atlantic LNG, Egyptian LNG, Darwin LNG, and Equatorial Guinea LNG. A mark of distinction for the Collaboration LNG projects in today’s E/C world is that all of the LNG trains which are in operation have been completed on budget, ahead of schedule, and quickly met their design objectives. Several other projects are in the planning and engineering phases.

The template approach has been applied Egyptian LNG Trains 1 and 2 project at Idku, which has demonstrated new benchmarks for low capital cost, staying on budget, accelerating a challenging schedule, and achieving design capacity and turnover in a short period of time. The project started with a design based on the original LNG template which was updated following the successful Atlantic LNG projects, and then modified for local conditions. Local factors such as client needs, gas composition, labor availability and contractibility consideration were taken into consideration in the planning phase. This has led to world-class project execution. Planning for Commissioning and Startup (CSU) started at the beginning of the project, and culminated at turnover.

The CSU team assembled for the Egyptian LNG Project adjusted to changing critical path activities as the project schedule was accelerated. Obstacles such as refrigerant supply and quality, materials quality, and operational issues were overcome in a safe, timely and cost-effective manner. For example, gas feed composition upon startup of Train 1 was significantly leaner than design. Equipment designed to remove heavy components was only operated in batch mode, but the CSU team adjusted plant operations accordingly, and was able to achieve world-class turnover to the owners. The contract dates for first LNG production and the turnover of the first ELNG train were September 1 and November 1, 2005, respectively. LNG production for the first train occurred on May 6 with turnover following shortly on July 12, 2005, four months ahead of schedule. First LNG for the second train occurred on September 1, 2005 with turnover following shortly on October 20 2005, seven months ahead of contract schedule.

The template approach of Atlantic LNG Trains 2/3 was successfully applied to Atlantic LNG train 4, which was designed, constructed and started up in a similar manner. LNG was produced in December, 2005, ahead of schedule. This train is currently the World’s largest operating LNG train with a nominal capacity of 5.2 MTPA. To achieve this higher capacity, the Train 2/3 template was modularly expanded with the addition of one additional propane and one additional ethylene refrigerant gas turbine/compressor string – a prudent extrapolation which maintained the basic template approach.

The template was also applied to the design of the Darwin LNG, which made its first LNG late in December, 2005. In this case the template needed to be adjusted for higher N2 content in the feed gas by the addition of a Nitrogen Rejection Unit. The template SD drivers were replaced with more efficient LM 2500+ aeroderivative gas turbines. Other changes were judiciously incorporated as well, making the Darwin LNG one of the most efficient natural gas facilities in the world. All of these changes maintained the basic LNG train template, while adjusting it to meet owner needs.