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Open Ended Risk Value Engineering

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Many of the asset owners who engage with the Qcells EPC team want to know how to incorporate value engineering into the development pipeline to maximize quality and performance while reducing overall cost. This paper will review several ways that owners and EPCs can collaborate to seal off open-ended risk, driving up value each step of the way. Specifically, we will discuss the importance of owner-provided due diligence across three major risk factors: topography, geotechnical analysis, and building area studies.

The EPC's perspective underscores the importance of sharing due diligence early on. When a project arrives for engineering, the team classifies project details according to risk. Anything that leaves open-ended risk gets captured by a contingency, increasing costs due to uncertainty. For example, have geotechnical studies ruled out the presence of fragile karst landscapes at the project site, requiring specialized foundations to prevent structural damage when soil swells and shrinks? Contingencies are the only way to price projects lacking the information needed to verify risk.

When projects identify risk, try and drive down some of that contingency by evaluating through further studies. If geotechnical analysis shows a karst risk, bring in a specialist to get more detail about the presence of sinkholes and terrain susceptible to soil erosion within the buildable area. A greater understanding of site conditions helps the EPC mitigate risk, reducing contingencies at the outset and the scenarios that call for change orders before or during construction. Preserve time for further study as best as possible. On a tight schedule, projects sometimes face added costs simply because there's no time to evaluate risk and reduce contingencies.

Avoiding 'Topo Bust'

At the start of construction, many projects mobilize equipment, go to start grading the surface, and discover that actual elevation doesn't match topographical survey data. Owners generally understand the need to supply a quality LIDAR survey for project design and engineering. But what specifications can project owners give to their surveyors to minimize risk of topo bust?

First, Qcells expects LIDAR surveys to capture 25 points per meter of surface density. This level of granularity enables engineering to generate grading cut-and-fill values that are within tolerance. Sometimes projects bring back topographical data with 2-foot contours, leaving the EPC to assume that there's a straight line between points. As these projects advance to a more detailed design, low-quality data yields unreliable cut-and-fill values.

To validate aerial data from the LIDAR survey, Qcells routinely records elevation data for 2 ground-level truthing points per acre with a discrepancy of +/- 3 inches. But owners do not have to wait until topographical verification by the EPC to ensure a match between data in the engineering CAD files and physical measurements collected from the field. When owners can incorporate truthing points into the scope of the initial topographical survey, the EPC can come back with greater confidence on civil terrain work, a significant item in the overall construction cost.

Be aware of seasonal changes at the project site when capturing topographical data and verifying it. Avoid capturing data at times when there are significant obstructions in the field, such as planting season in crop fields and times when tree foliage blocks an aerial view of the ground. Also take note of how crop growth, crop harvests, and site modifications on farmland can affect topo data.

For Geotech, Put Value Ahead of Price

Owners face another set of tradeoffs when commissioning preliminary geotechnical studies, often without specifications to recognize the quality of data needed to mitigate risk. For starters, it's better to search for value rather than the lowest price when selecting a geotechnical consulting firm. The analysis for solar projects is different than the analysis for buildings and other structures, so there tends to be a disconnect when EPCs review studies from a firm that is less familiar with solar projects.

Some geotech reports come in with data on soil samples collected from various depths in the ground on the belief that soil borings can serve as a proxy for pile load testing, a more complex battery of tests showing how structural piles respond to stress from various conditions like compression and lateral force. EPCs use pile load test results to determine the size of piles based on different soil properties throughout the project site. The problem is that soil samples alone are not a suitable proxy for pile load testing. And in the absence of suitable data, EPCs can only make assumptions and tack contingencies onto the project price.

For electrical resistivity testing, some geotech engineers probe to 10-foot embedment, which may be considered suitable for buildings and other structures. For solar projects, including electrical substations, you need a deeper model for grounding to ensure that the conductor can safely dissipate a fault without putting operators and other personnel at risk. Due to the significant current that may be present in a substation, Qcells expects electrical resistivity testing to measure to a depth of 500 feet. For field areas covered by solar panels, where the equipment carries less current than in the substation but still far more than the average real estate project, we look for testing to a depth of 200 feet.

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For thermal resistivity, geotechnical engineers test how quickly cable heat can dissipate within the soil. A competent laboratory will ensure that you have enough data points to represent the entire project site.

Complete Buildable Area Studies Early

Buildable area studies include a dozen major elements of due diligence, each one affecting the development timeline and the likelihood that site constraints could drive up project costs or reduce capacity. Each study has different implications for site access and construction approvals, but the ones on Conditional Use Permit and Special Use Permit Completion, Wetland Delineation, Archaeological, Tree Clearing, and Road Use Agreements tend to add the biggest contingencies.

The importance of completing all these studies early cannot be overstated. Without completed studies, projects run the risk of discovering at any time that an additional wetland delineation or an endangered species habitat or the discovery of archaeological buried treasure cuts off access to a large portion of the project site. Once the project site shrinks, other dominoes start to fall. Project engineering might have to start over based on a revised bill of material. Financing might also have to go back to the drawing board in search of an offtake agreement for a smaller project site. These types of unwelcome changes come at a high cost and are to be avoided wherever possible.

Collaborate Early and Often

While some projects come in with short lead times to perform engineering and generate a bid price, the sky is the limit when it comes to collaboration opportunities between owner and EPC. For our most collaborative customers, Qcells shares a complete list of value engineering options: everything from rotation of substations, alternate piles, alternate trackers, different inverters, and more.

When given the time to entice value engineering, small changes can lead to very large savings. For example, consider a 30 percent project design that spec's black steel piles for approximately $11 million. Given the time to check alternate materials, the project can achieve $1.5 million in savings from an immediate switch to 5 mil galvanized steel. Later, for the 90 percent designs, the project can achieve reductions in pile size, length, and quantity for an additional $3+ million in savings on steel procurement costs.

Qcells has many different contracting structures that can help entice value engineering. When we can start the collaboration early and enable as much engineering and design flexibility as possible, we have the greatest opportunity to improve quality and reduce cost.

About Qcells

Qcells EPC provides complete utility-scale turnkey solutions through the entire project lifecycle from modules, solar and energy storage project Engineering Procurement and Construction (EPC) services to the US utility-scale market. With a track record that includes 8.4 GW of sustainably produced module manufacturing capabilities in Georgia and nearly 2 GW of developed, constructed, and operating projects, Qcells USA is a dependable partner throughout the entire project lifecycle. Qcells USA is a flagship company of Hanwha Group, a FORTUNE Global 500 firm and a top 7 business enterprise in South Korea.

For more information, visit www.qcells.com and on LinkedIn.

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