

# Reducing Construction Cost of Extra High Voltage Substations <sup>1</sup>

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## Aim

This article aims to present some ideas to reduce the cost in substations construction projects based on the experience and best practices. The article emphasizes constructing a systematic model for cost reduction based on the value chain; it also presents different approaches for cost reduction by focusing mainly on the civil scope.

## Value chain

The value chain model serves as a tool to sustain the cost reduction and embed this goal into the system in order to reach a more strategic approach rather than isolated one stand initiative.

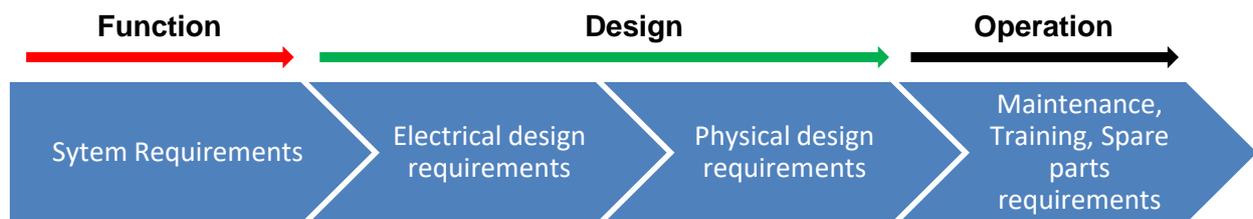


Fig.1 Value Chain

The basic definition of the project that, it is a unique and, has beginning and end date. The uniqueness of the project means there is always some unique requirements for each project, by realizing these requirements the design parameters must be considered. In the above value chain figure the system requirements and, restriction for each project should be known to help in determining the electrical design parameters required for that project, subsequently the physical requirements to accommodate the electrical equipment are determined. The operation requirement should also be gathered based on the full picture rather than accumulating the spare parts or providing training without reasonable needs. Imbedding this value chain into the system will help in realizing the actual requirements and subsequently cut off the cost automatically by eliminating the redundant activities and materials.

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## Cost Reduction Approaches

### **1- Reduction of the reinforced concrete quantities**

As the RC concrete work will be the major contributor in the civil work cost, the following suggestions might be used to reduce the quantities:

- Land utilization: use compact model by minimize the buildings number (Two or one building instead of four). This approach will reduce number of tunnels too.
- One story building instead of multi-story building, wherever the space is available
- Minimize the length of the tunnels by decreasing the distance between the buildings
- Replace the tunnels wherever it is possible by utilizing duct banks and trenches

The concept here is to reduce the concrete work by utilizing and managing space, to effectively accommodate the electrical requirements.

### **2- Reduction of the civil work time**

Generally, reducing time is going to be in a trade of cost but, crushing project time will contribute in the cost reduction over the long run. Compressing the civil work time will allow the electrical installation to start earlier, leading to early energization of the substation and eventually to a better economic outcome from utilizing the energized substation.

One way to minimize the civil work time is by using precast members for the buildings super structure, this approach will approximately reduce the civil work time at minimum by 50% in case of utilizing good construction management planning.

### **3- Contract management**

Turnkey contracts and lump sum contracts have been used universally, especially for the public-sector projects. Anyway, since its introduction in 2002, Target value design (AKA Target cos) has been used commonly by the construction industry in United States, the concept has been used for decades in manufacturing as a lean approach for cost reduction. The researches show that using this concept in construction industries will lower the cost below the market price by 15%.

The target value design management approach is simply estimating the project cost (work cost plus the contractor profit) then, all parties will work together to cut down the cost. At the end of the project the cost saving will be shared based on a pre-agreement system between all parties. This approach will ensure that, the interest of all parties will be aligned to raise the performance, enhance the collaboration and to establish a lean process. The contractor is going to have the incentive to produce effective design and, also will use lean construction management practices in order to achieve optimum cost.

## About the Author



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