

**B3 – SUBESTACIONES**

**OPTIMIZATION OF EFFORT AND COST STRUCTURES IN SUBSTATION DESIGN  
USING A 3D SUBSTATION ENGINEERING SOFTWARE WITH INTEGRATED DESIGN  
CALCULATIONS**

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***Summary** – In general the current situation shows that a worldwide reinforcement and upgrading/expansion of grid capacity is needed to meet the future demand of the growing population and demand. This, in turn, leads to refurbishment of old grid structure and replacement of end of life substations. The problem is how to meet the increasing demand for higher-capacity substations in an efficient and cost-effective way. After a check and determination of the capacity of the existing substations the goal is to subsequently avoid unnecessary oversizing of the substation and higher costs of poor design quality during the construction phase. This paper presents how to optimize the substation engineering process e.g. when upgrading or refurbishing the substations by saving costs and time during the planning and construction phase. This optimization will be reached by implementing a new concept of the integration of specific substation design calculations in a substation engineering software - using a 3D substation information model (substation BIM) created in a 3D CAD environment. The fundamental improvement of the new concept over traditional concepts is that the calculation phase is not done after the CAD design but is integrated into the 3D physical design. With software integrated calculation tools – lightning protection calculation, clearance calculation, phase checking, sag calculation and short-circuit current calculation of effects - the designer can dynamically optimize the design towards the most cost-effective design.*

***Keywords:** substation design – cost optimization – 3D – substation upgrading – calculations – short-circuit current effects – information model – software*

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