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How to realize the benefits - Experience from a cancelled pilot

Paper 10804 – “Novel approach to implementation of fully digital substation - Expectations on pilot project Sigtuna 130/20 kV substation” identifies several drivers for digitalization of substations. With a novel digital PACS concept that includes the use of process bus there is a possibility to reduce the life cycle cost, compared to a standard station bus solution. The estimated savings for the costs affected amount to 6-12 percent on capital expenditure for brownfield installations and 13-19 percent for greenfield installations.

Savings are generated by less area for control room buildings, use of cable PVC conduits instead of cement cable trenches, reduced number of control room cabinets, local HMI, etc. The total life cycle cost will be lower even if operational expenditures are slightly higher.

The prerequisites for reaching the savings include several development steps. When a pilot project is established to fulfill these prerequisites the following success criteria are important:

- Established descriptions of engineering work processes to build bus-based digital substations that covers process, bay, and station level.
- Gathered data to verify reduced lifecycle-costs for IEC 61850 PACS (CapEx). Operational expenditure costs (OpEx) cannot be verified during a pilot.
- Verified technical solution responding to DSO needs, considering even newly incoming technology and digital transformation towards a data driven DSO
- Verified specific savings due to smaller area for control room buildings, cable conduits, reduced number of control room cabinets, local HMI etc.
- Well established test and monitoring method and supporting tool set. One of the main challenges for the operation and maintenance is to establish routines and tools for efficient handling of the system.

Unfortunately pilot project Sigtuna was terminated in January 2022, due to high costs associated with perceived risks for a project including a large development part. The follow-up of the experiences of the project gave a lot of valuable knowledge. The conclusions on how to realize the benefits were:

- Several bids received, so it is possible to specify a fully digital substation with novel technical solutions. Nothing speaks against the expected potential for the concept.
- The high ambition and scope for the project together with a request for a fixed prize contract led the contractors to assign high amounts for the perceived risks. This substantially increased the prizes.
- The choice to include a development phase was correct, considering the ambition set for the project. An alternative could be for the DSO to run the development activities, but that would require much more internal resources.
- Need to have frequent dialog with the market actors related to development, both prior to and during the procurement phase. Consider the roles of the market actors.
- The selection of a project with a complete substation replacement into a demonstration site was assumed to motivate the contractors to give a good prize but that was actually not considered beneficial.

- The costs for testing novel technical solutions have decreased as several suppliers have already tested many of the alternative solutions. So, there is much less need for a Real-Time-Simulator.
- The contractors/suppliers see a challenge in procuring and integrating equipment from other suppliers. It is difficult to achieve synergies between the contractor responsible for the complete system and suppliers that delivers different parts. This is considered a risk that makes it less interesting for the contractor from a business development perspective.