

COMPARISON OF DIFFERENT ARCHITECTURES OF DIGITAL SUBSTATION

PS 2

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DEVELOPMENT OPERATION OF DIGITAL SUBSTATION

Preconditions for research:

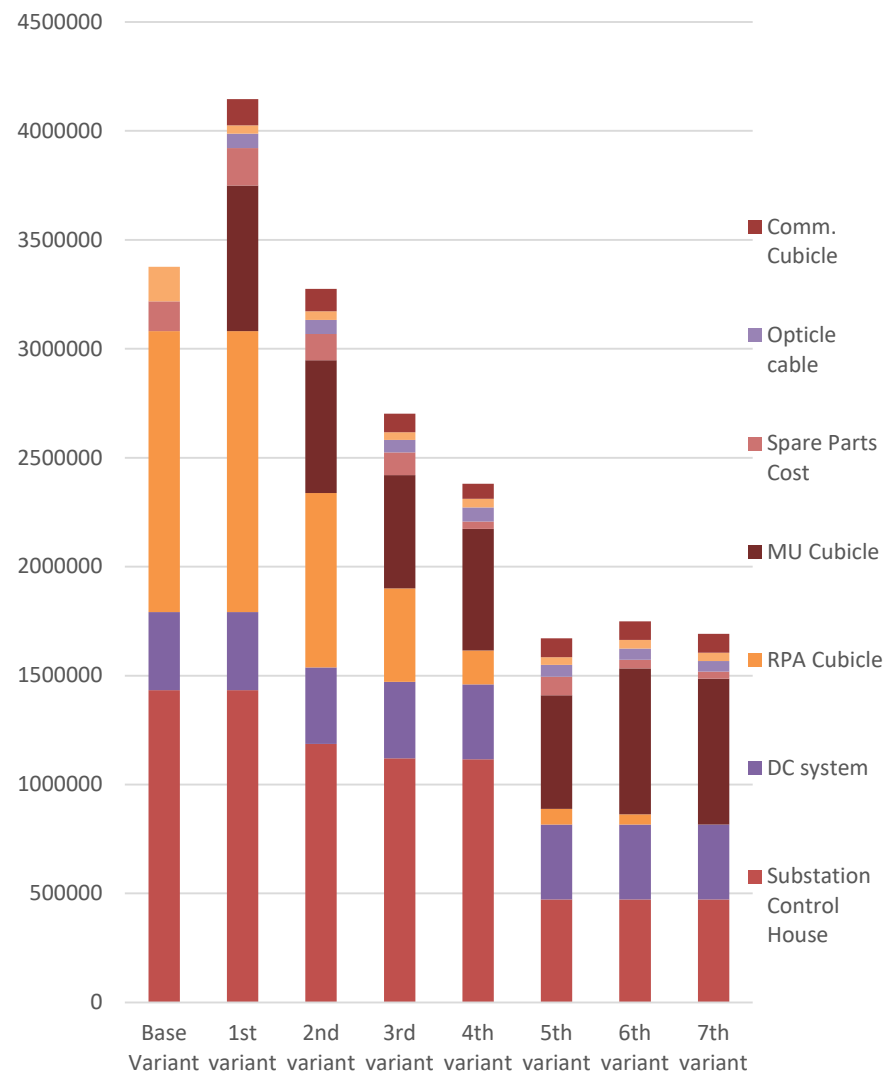
- There isn't reference architecture of PACS for digital substation;
- It is necessary to implement technical and economic analysis of different variants of PACS;
- Complexity of LAN structure designing.

ANALYZED VARIANTS OF DIGITAL SUBSTATION ARCHITECTURES

- | | |
|--------------|---|
| Base variant | – Installation of intelligent electronic devices (IED) and implementation protection functions in them in accordance with legacy engineering without ‘process bus’. |
| 1 variant | – Installation of intelligent electronic devices (IED) and implementation protection functions in them in accordance with legacy engineering with ‘process bus’. |
| 2 variant | – Installation of two identical hot standby IED for each primary equipment unit with functional integration all protections (main and backup) of one unit in each device. |
| 3 variant | – Installation of one IED for each primary equipment unit with functional integration all protections and one centralized back up system of all digital substation’s protections based on high-performance server. |
| 4 variant | – Installation of one IED based on Specialized Industrial Computers (SIC) for each primary equipment unit performing all main and backup protection functions and automatic reallocation of functions for devices in operation. |
| 5 variant | – Installation of centralized system for all digital substation’s protections based on redundant high-performance servers. |
| 6 variant | – Installation of intelligent merging Units (MU) for each primary equipment unit with functional integration main and backup protection functions and one centralized backup system for all digital substation’s protection functions based on high-performance server. |
| 7 variant | – Installation of intelligent merging unit for each primary equipment unit performing all main and backup protection functions and automatic reallocation of protection functions between merging units in operation. |

COMPARISON OF DIFFERENT VARIANTS OF DIGITAL SUBSTATION ARCHITECTURES (CAPEX)

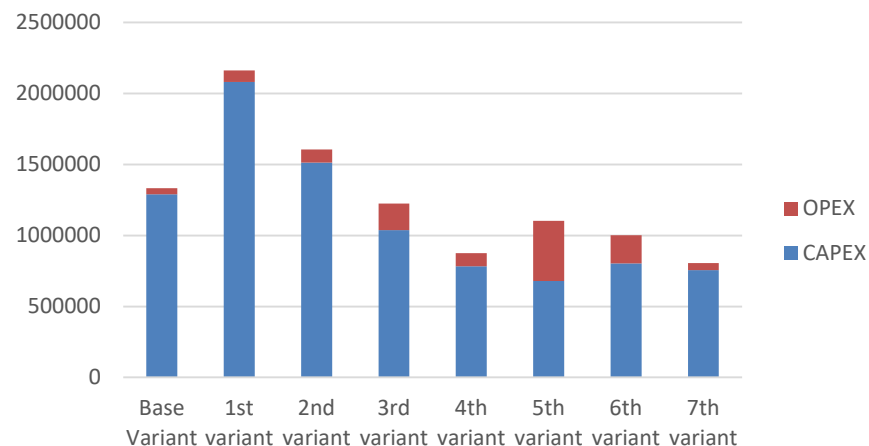
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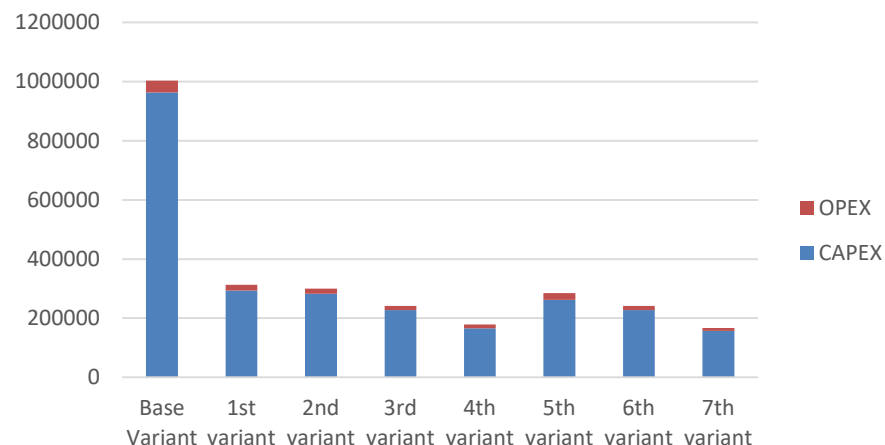
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PACS



SAS



RELATIVE EVALUATION OF RELIABILITY INDEXES (AVAILABILITY FUNCTION)

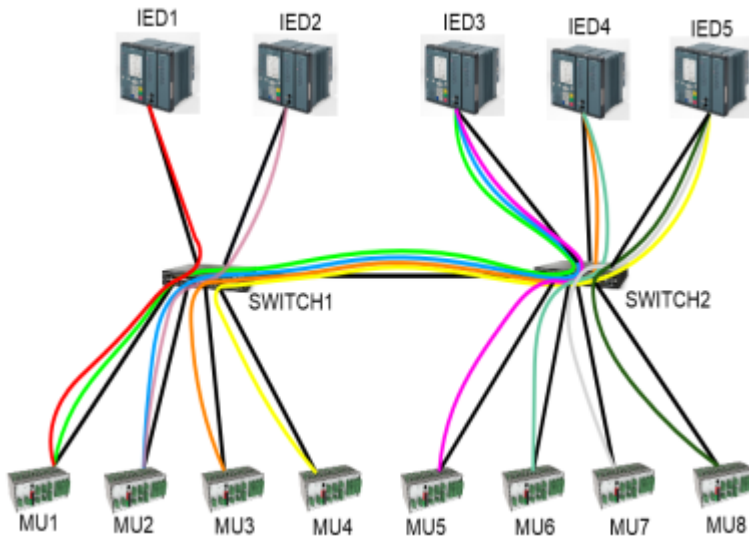
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LAN OPTIMAL STRUCTURE SYNTHESIS ALGORITHM

- reducing the time of LAN designing;
- choice of LAN topology on the basis of genetic algorithm;
- reducing the probability of error due to human factor;
- visualization of LAN structure.

Intermediate LAN structure
(non optimal)



Optimized LAN structure

