

COMPARISON OF DIFFERENT ARCHITECTURES OF DIGITAL SUBSTATION PS 2 Natalia P. Gracheva (Russia)

SESSION

PARIS

2018

SC 85

SC B5 Discussion Group Meeting – 29/08/2018

DEVELOPMENT OPERATION OF DIGITAL SUSTATION

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.





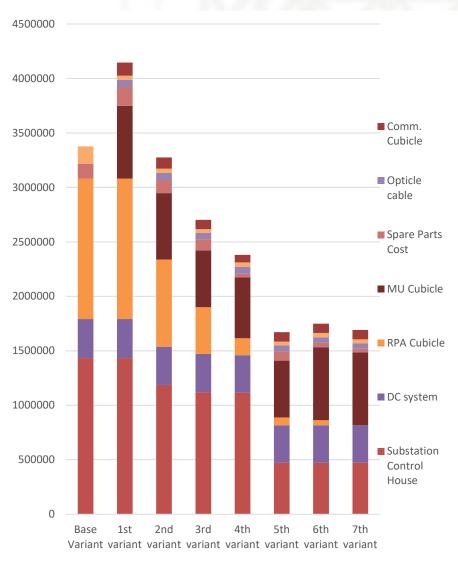
ANALYZED VARIANTS OF DIGITAL SUBSTATION ARCHITECTURES

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 Cogree DIGITAL SUBSTATION ARCHITECTURES (CAPEX)

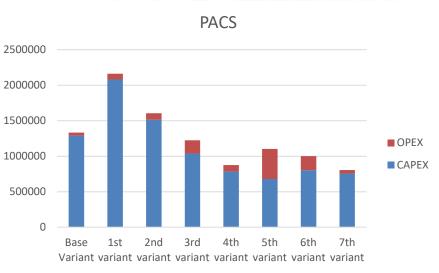
2	Base	- installation of intelligent electronic devices (IED) and
	variant	implementation protection functions in them in
2		accordance with legacy engineering without 'process
2		bus'.
	1 variant	 installation of intelligent electronic devices (IED) and
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_		accordance with legacy engineering with 'process bus'.
п	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.
7	3 variant	– installation of one IED for each primary equipment unit
2		with functional integration all protections and one
7		centralized back up system of all digital substation's
ノ		protections based on high-performance server.
	4 variant	 installation of one IED based on Specialized Industrial
J		Computers (SIC) for each primary equipment unit
-		performing all main and backup protection functions and
		automatic reallocation of functions for devices in
))		operation.
IJ	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.



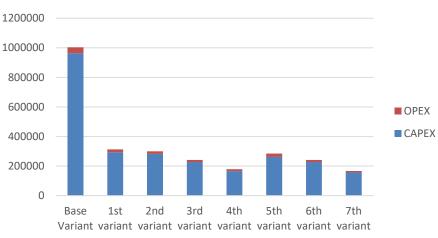
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COMPARISON OF DIFFERENT VARIANTS OF COMPARISON O

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RELATIVE EVALUATION OF RELIABILITY INDEXES (AVAILABILITY FUNCTION)

2	Base	– installation of intelligent electronic devices (IED) and	
	variant	implementation protection functions in them in	
2		accordance with legacy engineering without 'process	9
)		bus'.	
	1 variant	 installation of intelligent electronic devices (IED) and 	
		implementation protection functions in them in	9
		accordance with legacy engineering with 'process bus'.	
1	2 variant	 installation of two identical hot standby IED for each 	
		primary equipment unit with functional integration all	9
		protections (main and backup) of one unit in each device.	
1	3 variant	- installation of one IED for each primary equipment unit	9
		with functional integration all protections and one	
		centralized back up system of all digital substation's	
"		protections based on high-performance server.	9
	4 variant	- installation of one IED based on Specialized Industrial	
ッ		Computers (SIC) for each primary equipment unit	
		performing all main and backup protection functions and	9
		automatic reallocation of functions for devices in	
		operation.	9
J	5 variant	– installation of centralized system for all digital	
		substation's protections based on redundant high-	
		performance servers.	9
	6 variant	 Installation of intelligent merging Units (MU) for each 	
		primary equipment unit with functional integration main	9
		and backup protection functions and one centralized	
		backup system for all digital substation's protection	9
		functions based on high-performance server.	
	7 variant	 Installation of intelligent merging unit for each primary 	
		equipment unit performing all main and backup protection	9
		functions and automatic reallocation of protection	
		functions between merging units in operation.	





LAN OPTIMAL STRUCTURE SYNTHESIS ALGORYTHM

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- 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.

