Study Committee B5

Protection and Automation

Paper ID_10266

GE Renewable Energy Grid Automation

Centralized Protection and Control (CPC) Architectures for Small Distribution Substations

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Motivation

- This paper is written as a way to show readers how new technology trends, like IEC61850 and digital S/S with process bus, may enable the next level of optimization of P&C schemes for primary distribution
- CPC schemes enable a number of benefits when compared to existing conventional ones. Reduced CAPEX and OPEX is one of them, but also touches the process around the life-cycle of P&C devices like homologation/validation, asset management flexibility and speed of deployment.

Method/Approach

- Documentation exercise based on professional experience on applications and products, other papers
- Benefits quantification done together with project tendering teams

Objects of investigation

- Primary distribution substations
- Air Isolated Substation
- Metalclad
- Small, large and double

Experimental setup & test results

- This is a documentation exercise that explores architectures and benefits of implementing CPC schemes
- Capex: Up to 20%, Homologation up to 50%, Asset management BOM up to 80%, time savings of up to 35%
- Capex: Cost of project (# of devices, testing, deployment), Homologation (all P&C elements in one device), Asset management (BOM for project and spare parts
- AIS single feeder PIU, Metalclad two feeders PIU

Discussion

- CPC schemes is that installing them is faster and requires less labor, especially during commissioning
- CPC is one device that includes all P&C elements; the validation effort of protection elements in a common control and logic environment opens the door to be more efficient.
- Less devices and shorter BOM optimize efforts when selecting and procuring them.
- CPC architecture biased by type of primary equipment

Conclusion

- CPC Schemes are based on current and standard technologies
- CPC schemes require careful thought when designing to satisfy user's priorities (cost, performance, reliability, maintenance, etc.)
- Type of primary equipment influences the CPC architecture (feeder per PIU, redundancy type), more than one architecture may be needed to materialized CPC benefits.
- Benefits surpass challenges, CPC schemes are worth considering

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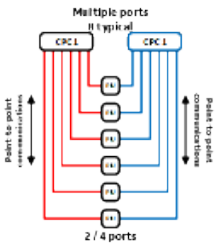
What is CPC and why?

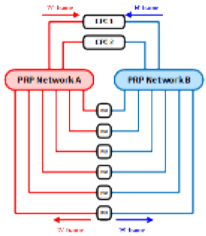
CPC?

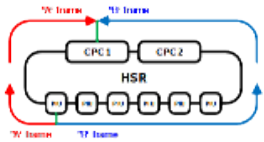
*System comprised of a high-performance computing platform capable of providing protection, control, monitoring, communications and asset management functions by collecting the data those functions require using high-speed, time synchronized measurements within a substation… * IEEE PES PSRCC*

Building Blocks

- PIU, P&C device (redundant)
- Network: Poit-to-point, PRP, HSR

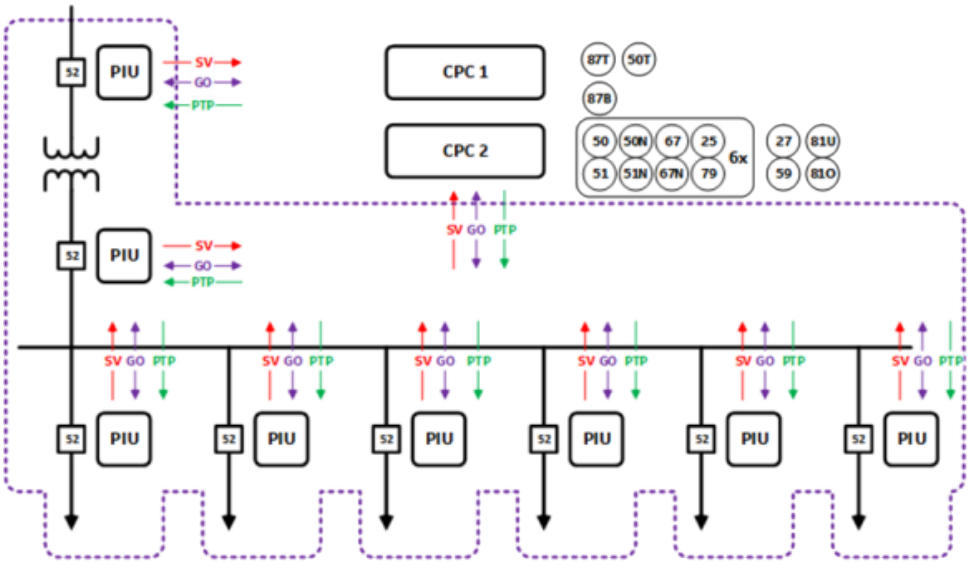






Benefits

- Deployment: simpler, less devices and wiring
- Homologation: validation of one P&C device
- Asset management: Procurement, spares, expansion, maintenance & testing



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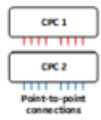
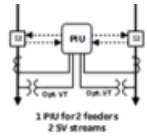
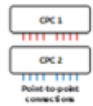
CPC for Primary Distributions S/S

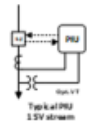
Primary Equipment

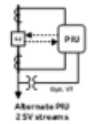
- AIS
- Metalclad





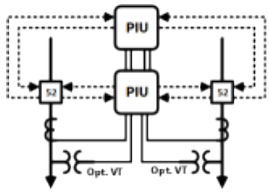


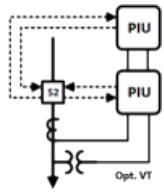




Redundancy

- description/figure
- description/figure





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