

252-Research on Non-Communication Protection of Distribution Line Considering New Energy Access

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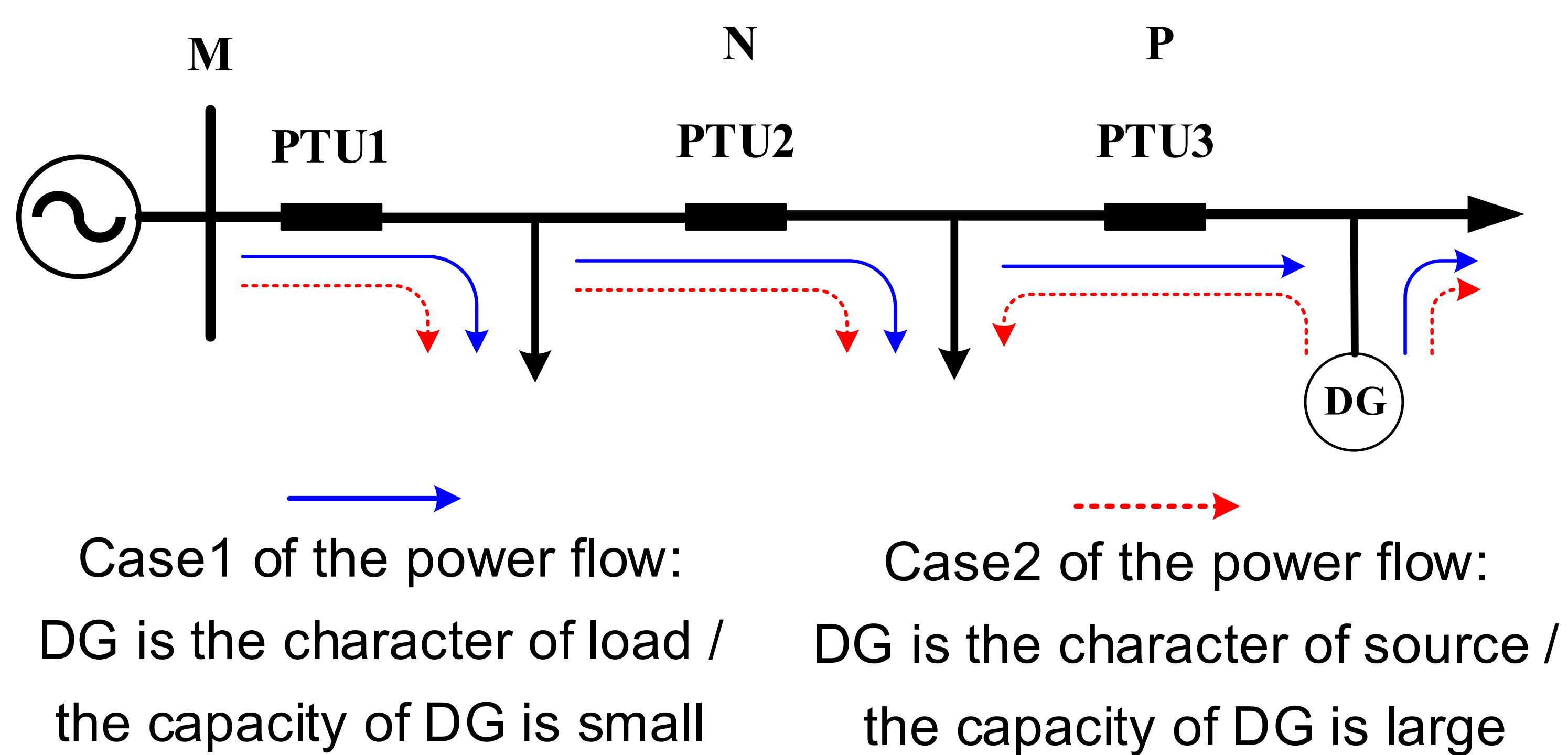
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1. Introduction

The large-scale access to new energy sources leads to :

- ◆ The traditional single-supply radial distribution lines become double-ended or multi-ended power supplies.
- ◆ The size, direction and distribution of the short-circuit current of the distribution line are influenced by the fault characteristics of the distributed generation.



2. Fault Analysis and Protection Scheme

- ◆ Based on the power flow direction and fault direction, Distribution-line Non-Communication Protection (DNCP) judges that the device is located at the source side or the load side.

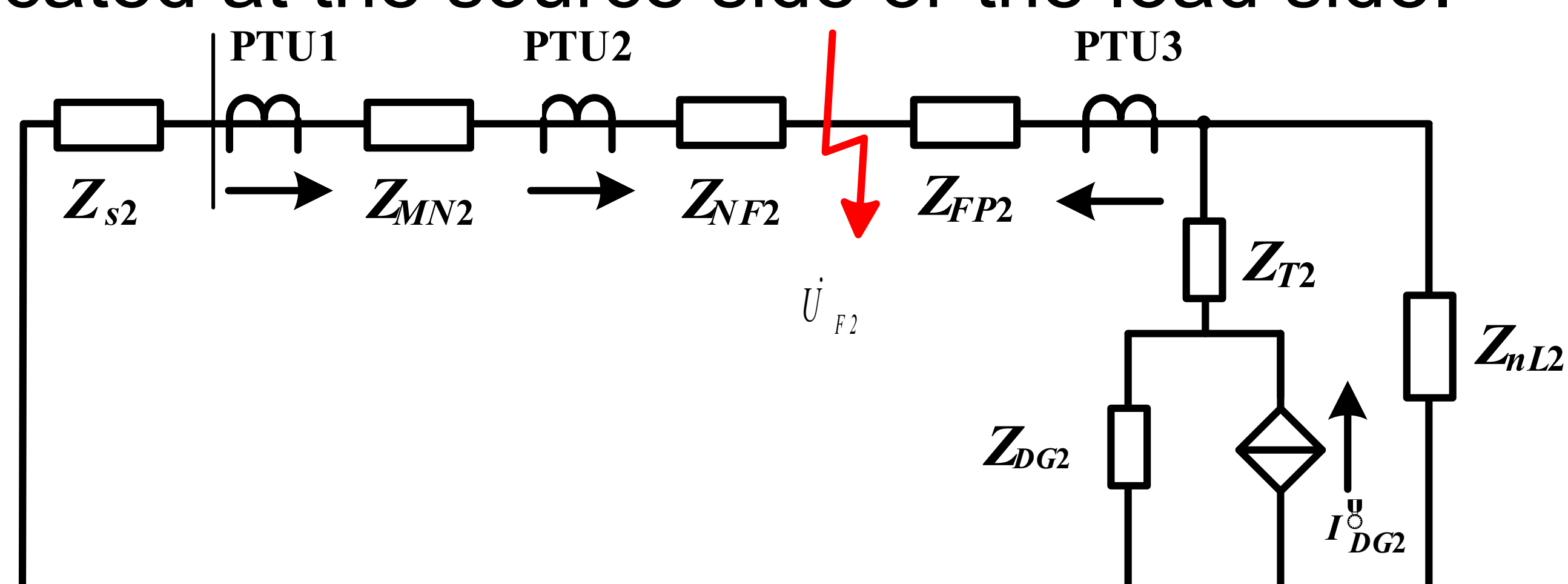
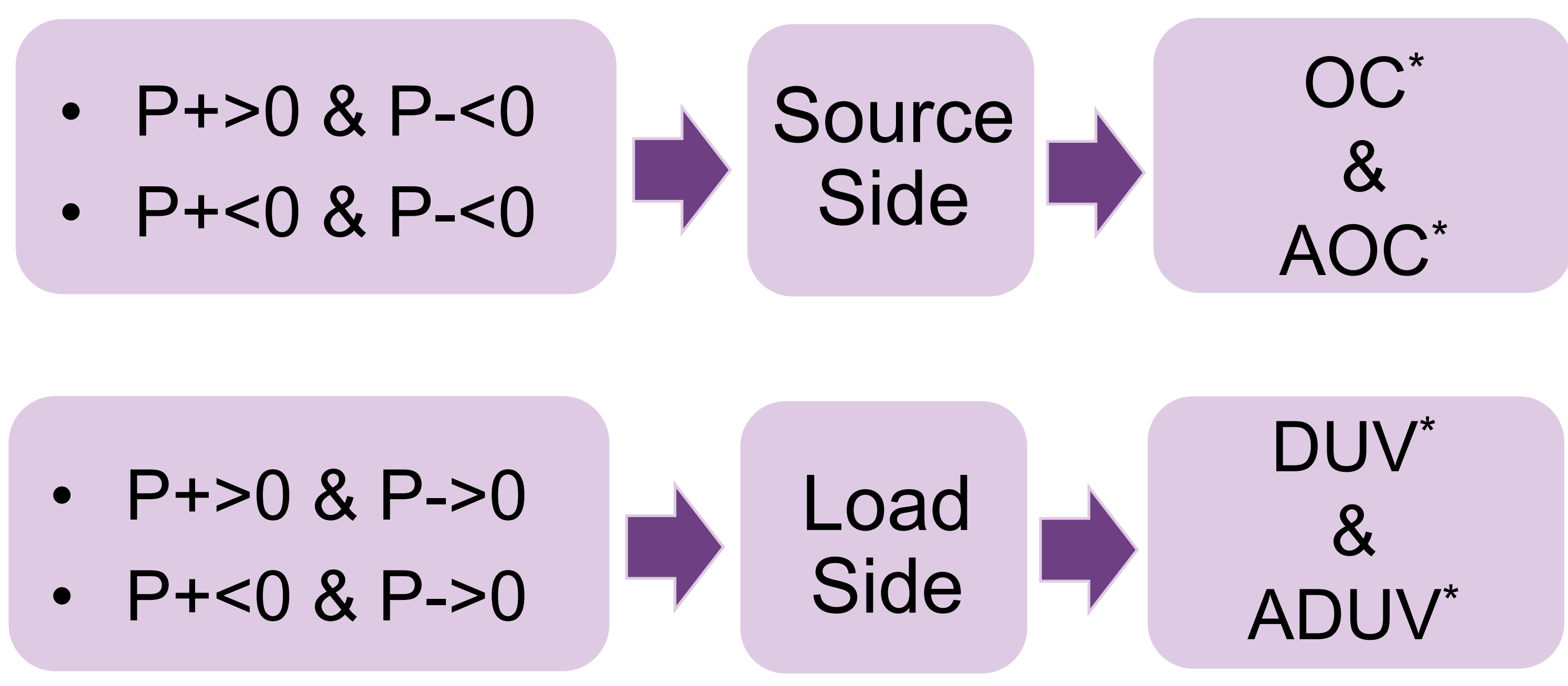


Figure 1. Negative sequence network

PTU1	PTU2	PTU3
<ul style="list-style-type: none"> • Forward Power Flow $P_+ = U_{1r} I_{1r} \cos \varphi_{1r} > 0$ • Forward Fault $P_- = U_{2r} I_{2r} \cos(\varphi_r - \varphi_{sen}) < 0$ 	<ul style="list-style-type: none"> • Forward Power Flow $P_+ = U_{1r} I_{1r} \cos \varphi_{1r} > 0$ • Forward Fault $P_- = U_{2r} I_{2r} \cos(\varphi_r - \varphi_{sen}) < 0$ 	<ul style="list-style-type: none"> • Forward/Reversal Power Flow • Reversal Fault



*OC: Over-Current Protection
AOC: Accelerated Over-Current Protection
DUV: Directional Under-Voltage Protection
ADUV: Accelerated Under-Voltage Protection

3. Example Analysis

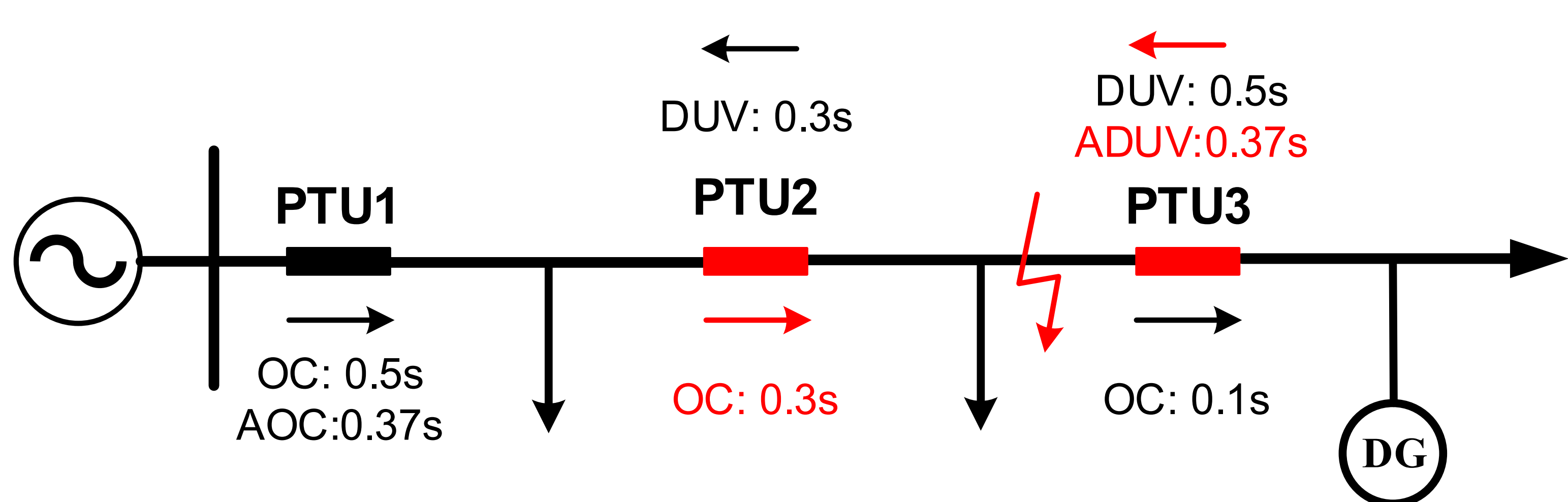


Figure 2. Protection configuration and results

- ◆ Build the simulation model in Matlab/Simulink. When a fault occurs between PTU2 and PTU3, PTU2 detects as source side and input OC, PTU3 detects as load side and input ADUV.

4. Conclusion

- ◆ The DG PCC is set up as a protection segmentation point, and the protection terminal unit detects its power flow direction and fault direction in real-time.
- ◆ If the PTU detects forward power flow and forward fault OR reversal power flow and forward fault, it inputs OC and AOC corresponding to the source side of DNCP.
- ◆ If the PTU detects forward power flow and reversal fault OR reversal power flow and reversal fault, it inputs DUV and ADUV corresponding to the load side of DNCP.