# Research on the Impact of Photovoltaic Power Generation Systems on Pipeline AC/DC Interference Based on Numerical Simulation

Li Zhenjun[1], Chen Hongyuan[2], Chen Zhenhua[3], Zhang Shuhui[3], Sun Leifeng[3], Lv Hongwei[3]，**Wang Xiuyun[4]**

[1]*Western Pipeline Company of National Pipeline, Urumqi 830000, China*

[2]*PipeChina North Pipeline Company, Langfang 065000, China*

[3]*PipeChina Institute of Science and Technology, Langfang 065000, China*

[4]*Safetech Research Institute,Beijing,102209,China*

*Presenter's e-mail address: wxy@ankosri.com*

**Abstract** With the rapid growth and widespread adoption of photovoltaic (PV) power generation, the intersection and parallel proximity between photovoltaic modules, power lines, and pipeline systems have becomed increasingly prominent, leading to AC or DC interference challenges for pipeline systems. This study aims to explore the electromagnetic interference mechanisms exerted by PV power generation systems on pipeline systems. Numerical simulations were employed to investigate the patterns of electromagnetic interference from PV systems on nearby pipelines. In the instance of a 160 MW PV power plant, the interference risks to pipelines were assessed. The research results show that the leakage current of photovoltaic modules has less DC interference on pipelines. The steady-state electromagnetic coupling interference intensity of buried cables and overhead lines of the PV power generation system on pipelines is influenced by multiple factors，including the phase current imbalance degree, phase current size, parallel length, and parallel distance. The risk of pipelines caused by single-phase fault current and lightning current decreases as the scale of the grounding body increases，the safe distance between pipelines and grounding bodies must exceed the continuous arc distance of lightning current. In the actual case, the DC potential deviation of the pipeline caused by a 160MW photovoltaic power plant was less than 5mV, while the maximum AC interference current density of the pipeline reached 67A/m$^2$.

**Keywords** Photovoltaic power generation system; Leakage current; Electromagnetic interference; Numerical simulation; Interference laws; safety distance