

Paris Session 2022



Helen's full digital substation study

Protection and automation, B5

PS2 Q2.01 What are the challenges in the development of digital substations and how to address the problems caused by the digitalisation

Mika Loukkalahti, Finland



Group Discussion Meeting

© CIGRE 2022

1

© CIGRE 2021

Helen's full digital substation study

Helen as a DSO

- City DSO in Helsinki with low SAIDI (< 3 mins), low fault- and maintenance costs.
- 15 years good experience on IEC 61850 station bus, all primary substations automated, at least with serial station bus with numerical IED's.
- Interest only in HV Gas Insulated Substations and MV Substations.
- Two small MV full digital substations in use since 2018, Unigear Digital, OK, one small HV pilot also in use.

Internal research about full digital substation (LPIT's + IEC 61850 process bus)

- Interest in new substation full digital HV GIS and MV possibilities, turnkey projects
- Discussions with GE, Hitachi and Siemens Energy and ABB, Schneider and Siemens
- Realised in 2021-2022

Helen's full digital substation study

Result of the research

HV GIS IEC61850 process bus

- There are technical solutions, PRP-redundancy protocol needed for Helen, functional integration improvements needed.
- Solutions and devices are different depending on manufacturer
- IEC 61850 process bus does not bring economical advantages
- Process bus is complicated, in Finland no yet experience on projects among service providers

HV LPIT solutions

- LPIT's can bring economical and technical advantages (space saving, less gas, wider dynamic CT range, significant safety issues, less cables...). LPIT leads to process bus.
- Manufacturers have different solutions: LPIT as a gas compartment or partitioner/bushing
- IEC 61869 instrument transformer standard implementation

Group Discussion Meeting

Helen's full digital substation study

Result of the research

MV process bus

- Only one manufacturer has MV process bus solution for voltage distribution or for centralised MV protection
- Other manufacturers are developing LPIT-switchgears without process bus

MV LPIT's

- With MV LPIT's busbar measurement bays can be avoided (4 bays in Helen)
- Some manufacturers are developing combined CT+VT LPIT's, no need for voltage distribution
- IEC 61869 instrument transformer standard implementation

Helen's full digital substation study

Conclusion of the research

- There are technologies for HV GIS and MV process bus, HV process bus can be complicated, the market is not yet ready.
- LPIT's would bring economical feasibility for digital substation and lead using HV process bus, the market is not yet ready. LPIT development is a key element for us.
- It is not possible for Helen to specify for open competition full digital substation (LPIT's + IEC 61850 process bus) for next greenfield HV/MV projects, only optional choice. We are hoping the fast market development.