

The Need for In-service Control Replicas

SC B4

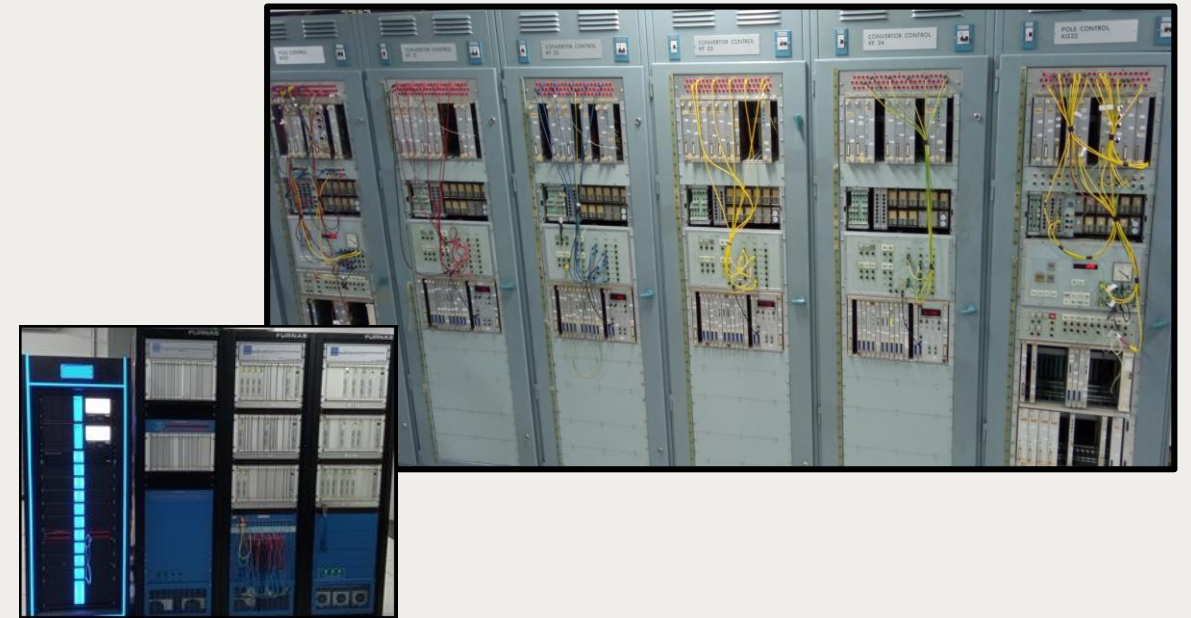
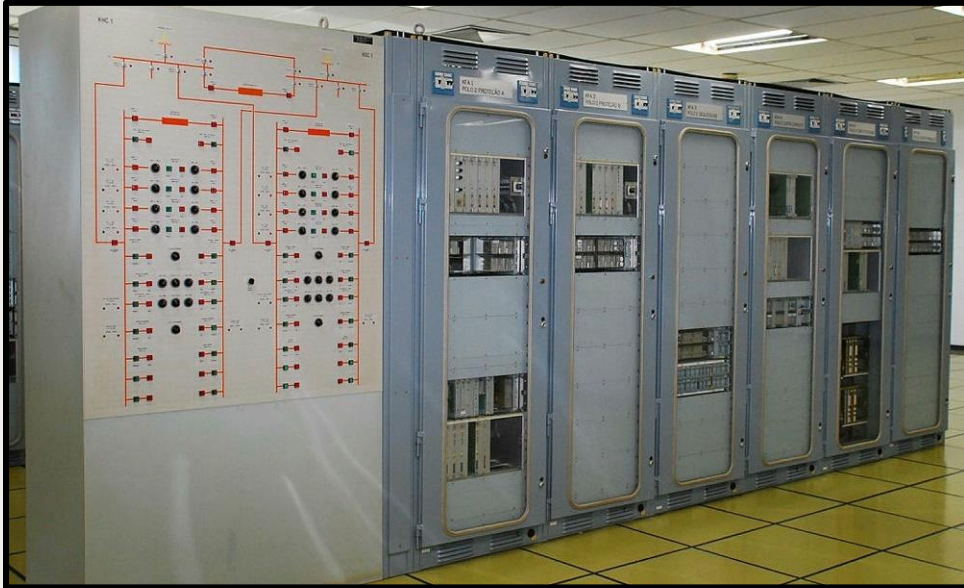
PS1-8 – HVDC Multi-Vendor Issues
Question 1.14

Sergio do ESPIRITO SANTO*
Trevor DOBBIN
Brazil

Furnas Itaipu HVDC System – 6300 MW / ± 600 kV

*Station Control Room
(Rectifier)*

Real-time Simulator + Control Systems Replicas



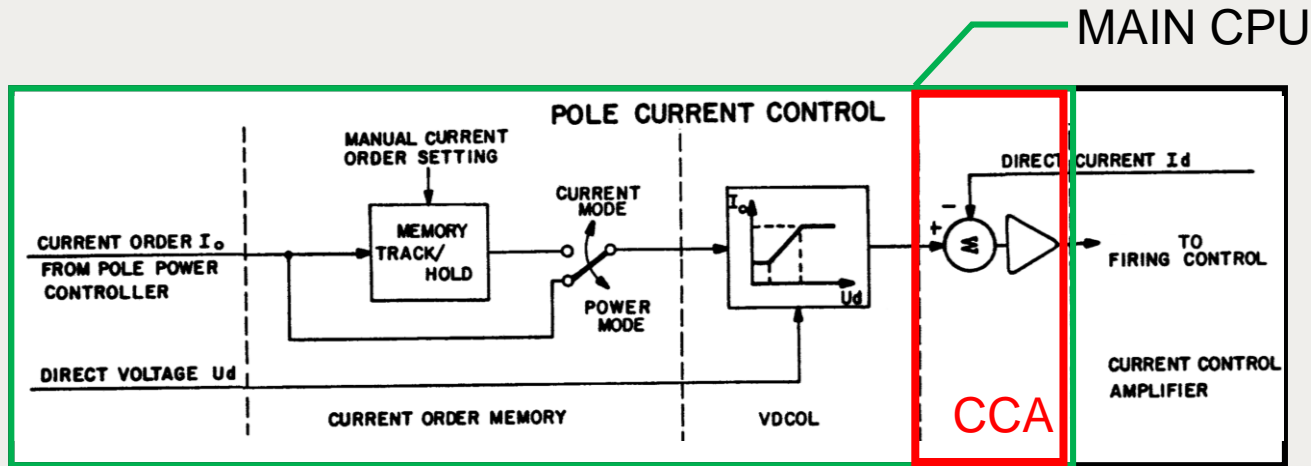
System in-service since 1984

Hybrid control systems
(analogue / digital)

Group Discussion Meeting

It has been used in studies
(FST⁽¹⁾ , DPS⁽²⁾ , PCS⁽³⁾ commissioning tests, etc.)
since 1980 in Sweden and 1982 in Brazil

Success Case – Improvements of the Original CCA⁽¹⁾

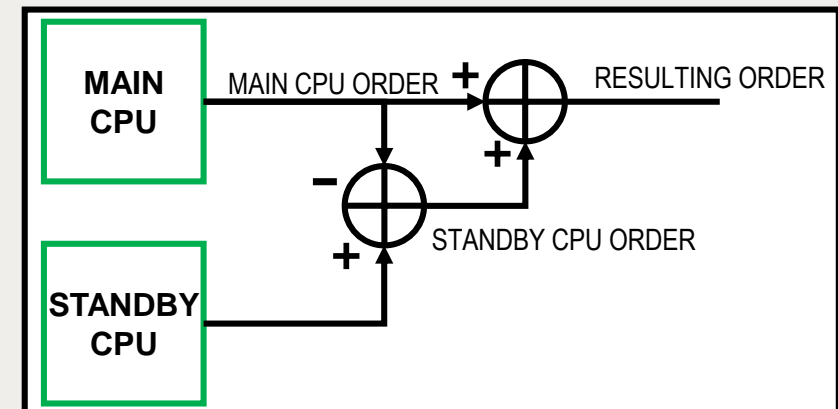


- Intermittent CCA failure causing the order output to become frozen.
- In order to solve this matter, a CPU reset was required.
- As it was a maintenance action, there was a (small) risk of converter outage.
- As time went by, failure frequency increased to unacceptable levels.

Group Discussion Meeting

In 2011 FURNAS decided to mitigate this problem:

- A supplementary hot-standby controller was designed and installed (bumpless).
- Was tested using the control systems replicas.
- Interfaced with the real-time simulator.
- Implemented on site in 2012.
- Continuously in use since then in all poles.



Conclusions

- *The improvement is a success, as no additional problem regarding the matter has been observed.*
- ***Serviceable control systems replicas were crucial in this case allowing safe and reliable testing before implementing the control improvements on site.***
- *Besides, serviceable (up-to-date) replicas are also very useful for several tasks, like disturbance investigation and analysis, offline EMT and RMS models validation, training and others.*

Keeping C & P replicas in serviceable conditions is essential