

Paris Session 2022



Adjustment of AC voltage at converter station during commissioning test

SC B4/ PS1/ Q1.15



When the specified system performance is not met during the commissioning tests, some alternative solutions are normally developed to allow them to comply with the specifications. What is the worldwide experience of design modifications during commissioning works of VSC-HVDC systems to comply with the specifications?

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- Hida-Shinano HVDC link is LCC-HVDC system that started commercial operation in March 2021.
- The converter in Hida-Shinano HVDC link is connected to the AC grid via 2 transformers (step-down transformer and converter transformer).
- We planned the adjustment of AC voltage using 2 types of tap changers on each transformer(Figure 2) to adjust the commutation margin angle during commissioning test at Hida converter station.

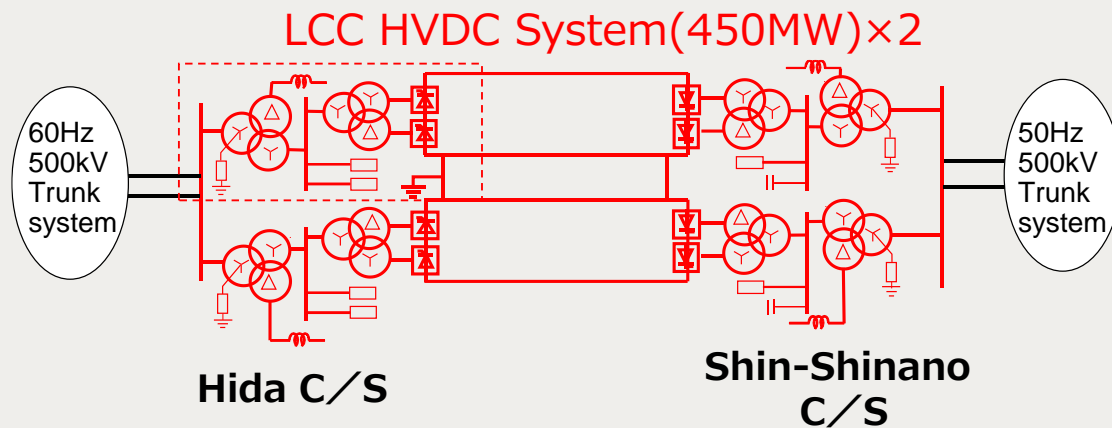


Figure 1. Over view of Hida-Shinano HVDC Link

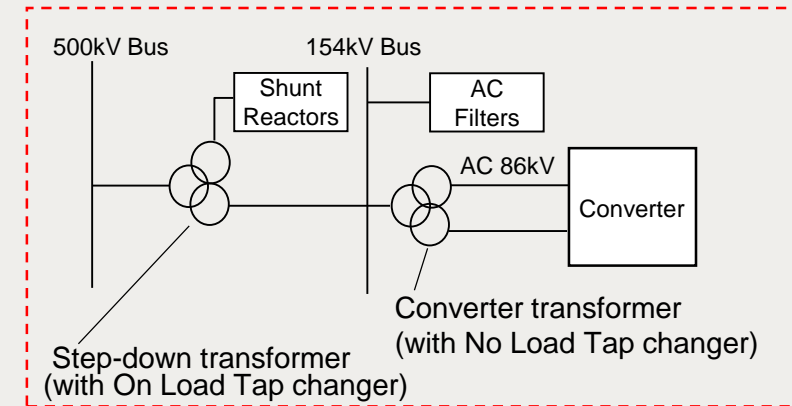


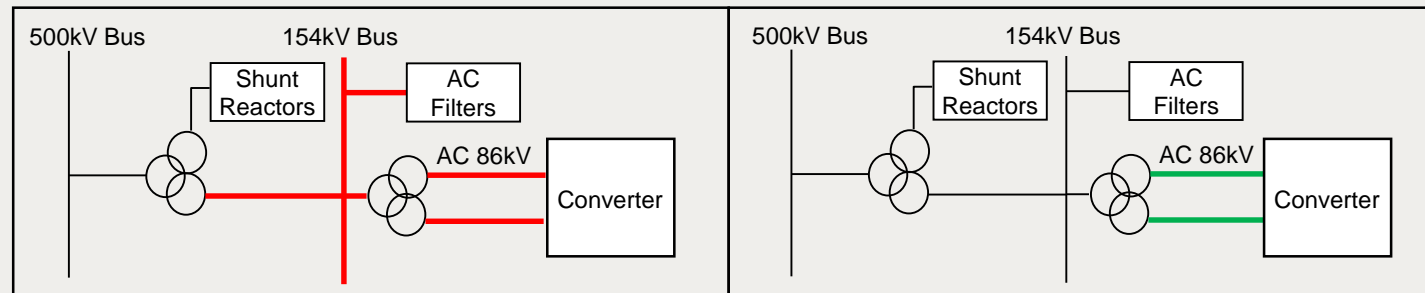
Figure 2. Over view of Hida Converter Station (Pole1)

Table 1. Comparison of methods to increase the commutation margin angle

	Method 1 Step-down transformer	Method 2 Converter transformer
Type of tap changer	On Load Tap changer (OLTC)	No Load Tap changer (NLTC)
Adjustment	Raise the target voltage of OLTC	Reduce the turn ratio with NLTC (e.g. 154kV/86kV → 152.46kV/86kV)
Reactive power from AC filters	UP	Almost the same (or slightly DOWN)
Reactive power from converter	UP	UP
Note	OLTC can adjust the turn ratio during operation	NLTC must be de-energized before the turn ratio is adjusted

■ Scope of step down transformer (Method 1)

■ Scope of converter transformer (Method 2)



Summary

- We prepared 2 methods using 2 types of tap changers on each transformer to adjust AC voltage (and commutation margin angle) during commissioning test.
- As a result of comparison, the solution using OLTC was selected.
- Although this experience is for LCC HVDC system, our methods are also useful for VSC HVDC systems with similar configurations as shown in Figure 2.