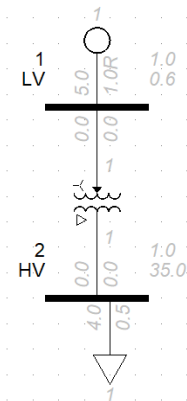
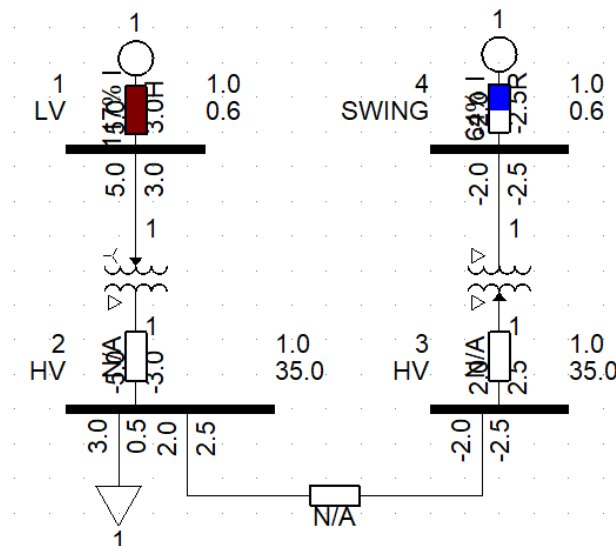


## Simple electrical power system for learning on PSS/E

- A simple power system is designed, and its one line drawing on PSS/E is shown below.
  - The power generator has 5MVA rated power with 5MW active power and 1MVAR reactive power capability. A transformer is applied to connect the 0.6KV LV side and the 35kV high voltage side. And at the end there is a load with 4MW power consumption.



- Load flow analysis in PSSE



- For the above power system
  - ◆ The bus 1 is a generator bus, bus 2 & 3 are non-generator bus, and bus 4 is swing bus
  - ◆ The left generator can produce rated 5MW active and 0.25MVAR reactive power to the load, and the swing bus with the attached right generator makes the compensation.
  - ◆ The load consumes 3MW active power and 0.5MVAR reactive power
- Q: the function of a swing bus?
  - ◆ A swing bus keeps the whole system balanced, and it automatically adds or absorbs active and reactive power so that the system does not fall out of balance
- Operate load flow analysis through Full Newton-Raphson method
  - ◆ As shown in the above, the right swing bus absorbs the extra 2MW active power and 2.5MVAR reactive power.
  - ◆ The red block on the left side indicates the generator is operating under full load, and the blue block on the right side indicates the swing bus is absorbing the extra power.
- Short circuit study on PSS/E

- Short circuit study: applying IEC 60909 fault calculations (three phase). The result for the one line power diagram is shown below:

X----- BUS -----X				THREE PHASE FAULT VOLTAGE		
				RE (I+)	IM(I+)	FACTOR
1	[LV	0.6000]	PU	0.0315	-0.1052	1.05
2	[HV	35.000]	PU	0.0330	-0.1103	1.10
3	[HV	35.000]	PU	0.0330	-0.1103	1.10
4	[SWING	0.6000]	PU	0.0315	-0.1052	1.05

- ◆ RE(I+) and IM(I+) indicate the real and imaginary parts of the fault current separately. The larger the value the stronger the current flows into the fault
- ◆ The Factor indicates the value that the higher the value is the closer the bus is to the fault.

From the above result, we can locate the fault is located on HV line that is between the bus 2 and bus 3 based on the larger value of the voltage factor.