#1，#2，G-T UNIT Protection Setting Calculations for Buon Tua Srah Hydro Power Plant

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1. Main equipment parameters

1.1 220kV system parameters：

NO	Parameter name	Parameter value
2	Capacity that three phases fault	Maximum： 1996.5MVA Minimum： 1996.5MVA
3	Basic capacity	100MVA
4	Basic voltage	220kV

1.2 Parameters of generator (H1, H2) ：

No	Parameter name	parameter value
1	rated capacity	50.6MVA
2	rated voltage	13.8kV
3	rated current	2116.5A
4	PT ratio of the terminal of the generator	$\frac{13.8}{\sqrt{3}} / \frac{0.11}{\sqrt{3}} / \frac{0.11}{\sqrt{3}} / 0.11$
5	CT of the terminal of the generator	2500/1
6	natural CT ratio	2500/1
7	rated current secondly(Irate sec)	0.8466A
8	synchronous reactance X_d	99.28%
9	Transient reactance X'_d	28.27%
10	Sub Transient reactance X''_d	20.93%
11	synchronous reactance X_q	62.88%
12	Negative reactance X2	23.60%
13	Static negative current $I_{2\infty}$	$I_{2\infty}$=250A
14	Transient negative current $I_2^2 t$	40s

1.3 Parameters of main transformer (T1, T2)：

No	parameter	High voltage side	low voltage side

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1	rated capacity	51MVA	51MVA
2	rated voltage	230kV	13.8KV
3	rated current	128A	2133.7A
4	vector group	Yn	d11
5	CT ratio	200/1	2500/1
6	rated current secondly	1A	1A
7	Shout circuit of impedance	12.50%	

1.4 Parameters of excitation transformer (TE1, TE2) :

No	parameter	HV side	LV side
1	rated capacity	0.95MVA	0.95MVA
2	rated voltage	13.8kV	0.62kV
3	rated current	39.75A	884.7 A
4	vector group	D	Y11
5	CT ratio	100/1A	
6	rated current secondly	1A	1A
7	Shout circuit of impedance	6%	

1.5 Parameters of the auxiliary transformer(TD1, TD2) :

No	parameter	HV side	LV side
1	rated capacity	0.63MVA	0.63MVA
2	rated voltage	13.8kV	0.4kV
3	ated current	26.36A	909.35A
4	vector group	D	yn11
5	CT ratio	2500/1	
	CT ratio		
6	rated current secondly	1A	1A
7	Shout circuit of impedance	6%	

2. Generator transformer unit protection system A（REG670,）

2.1 Differential function of Generator （87G, GDP1）

2.1.1 calculation of the pick-up value --- Idmin ：

dodging the unbalance current of generator(based on rated current)：

$$I_{dMin} = K_{rel} \times I_{er.n} \times I_{G.N} = 1.5 \times 0.02 \times 2116.5 = 63.495A$$

where： K_{rel} ———reliable constant , set to 1.5,

Reliable constant, set as 1.5；

$I_{er\cdot n}$ ———error of TA, 0.06 for 10P, 0.02 for (5P).

$I_{G\cdot N}$ ———rated current of generator；

set Idmin = $0.2 I_{G\cdot N}$ =423.3A

2.1.2 breakpoint 1

set to experience value, EndSection1 = $0.5 I_{G\cdot N}$ =1058.25A

2.1.3 slope 2

principle based on the increased unbalanced current in the case of through fault,

SlopeSection2 = 30%

2.1.4 breakpoint 2

set to experience value, EndSection2 = $3 I_{G\cdot N}$ =6349.5A

2.1.5 slope 3

recommanded default value, SlopeSection3 = 80%

2.2 Stator grounding function （64S, TRV1）

2.2.1 95% stator grounding fault pickup value：

terminal voltage, TRV1）：

set operating value to 5V (secondary value), and VT ratio of the open delta winding is $\frac{U_{G.N}/\sqrt{3}}{100/3}$, so we get the primary operating value:

$3U_0$ = 0.05 x 1.732x $U_{G.N}$ =0.05 x 1.732 x 13.8kV = 1195.08V

where:

$U_{G.N}$ --- rated voltage of generator.