

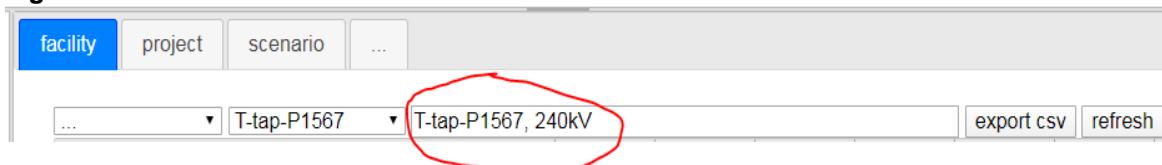
## Create estimate of facility (one per site)

The cost estimate tool organizes technical & cost details of large number of transmission components. The detail hierarchy follows the order: Components → Facility → Project → Scenario (planning)

Transmission cost estimate can be developed by the following steps:

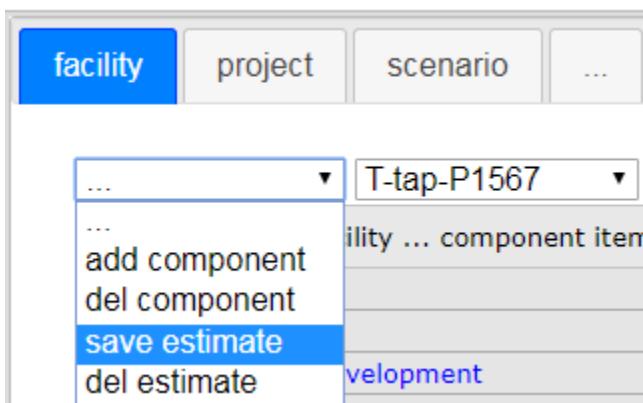
1. Open the application by Google Chrome: <http://prodhpcts01/tce/>
2. Under facility tab, create facility (with project information if available) name in the blank space, see Figure 1:

**Figure 1**



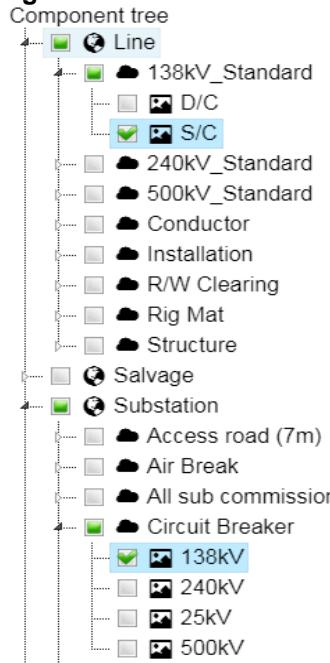
3. Save your estimate:

**Figure 2**



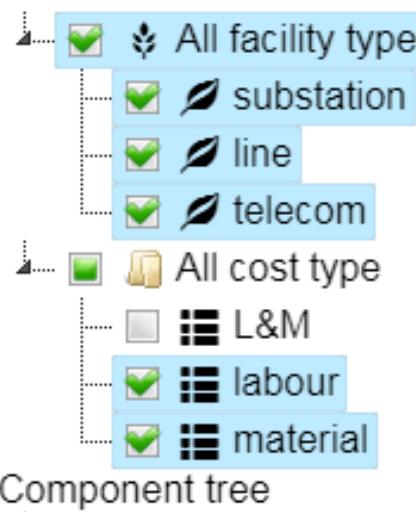
4. In the component tree, choose the items you need according to your proposed scope of work.  
E.g. if you need a 138kV, S/C line and a 138kV circuit breaker, see Figure 3:

**Figure 3**



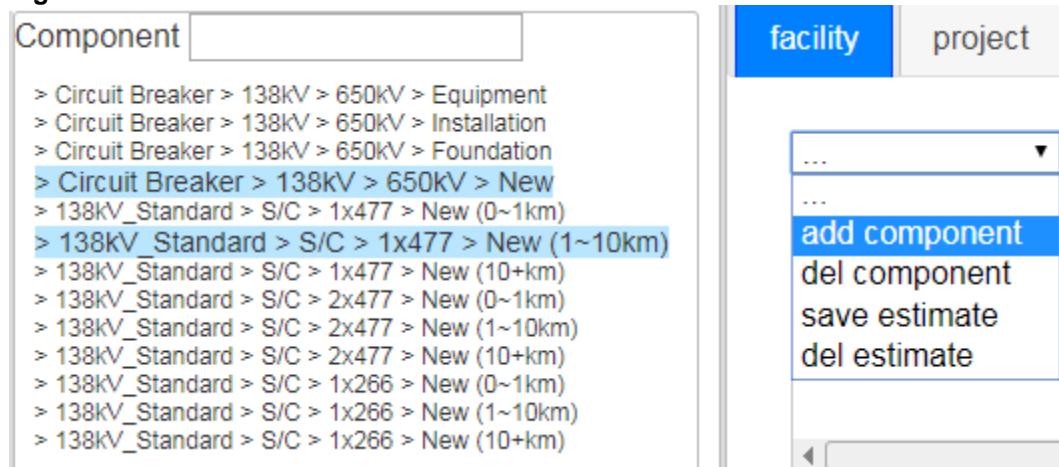
5. In case you have scope that requires either equipment (material) or labor (installation) only, go to the “All cost type tree”, which is above “Component tree”, then check “labor” or “material” and uncheck the “L&M” (labor and material), see Figure 4:

**Figure 4**



6. Add the chosen components by selecting items shown in the “Component\*” view as Figure 5:  
A searching function is available to help filtering items by their key parameters, such as circuit breaker, s/c, 1~10, etc., see Figure 6 ~ Figure 8:

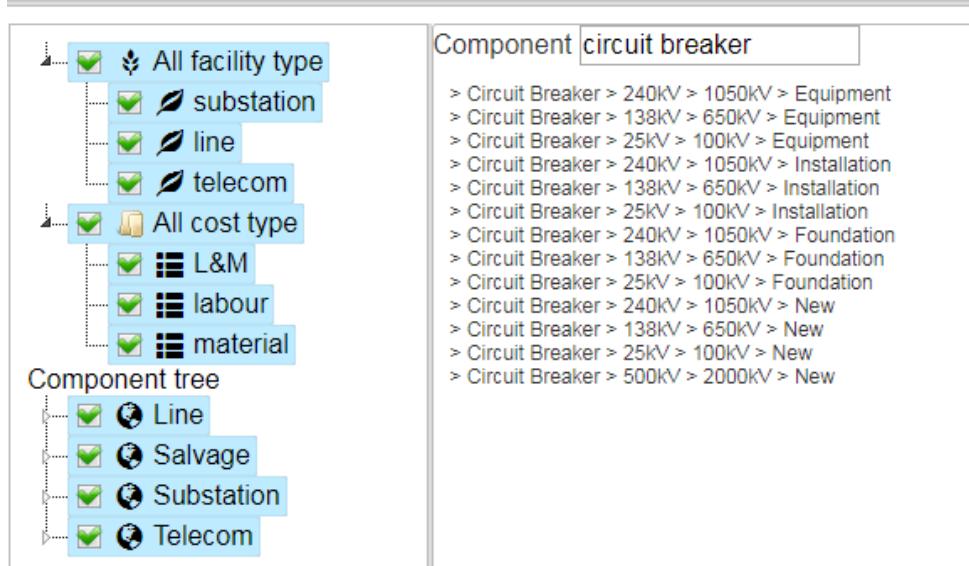
**Figure 5**



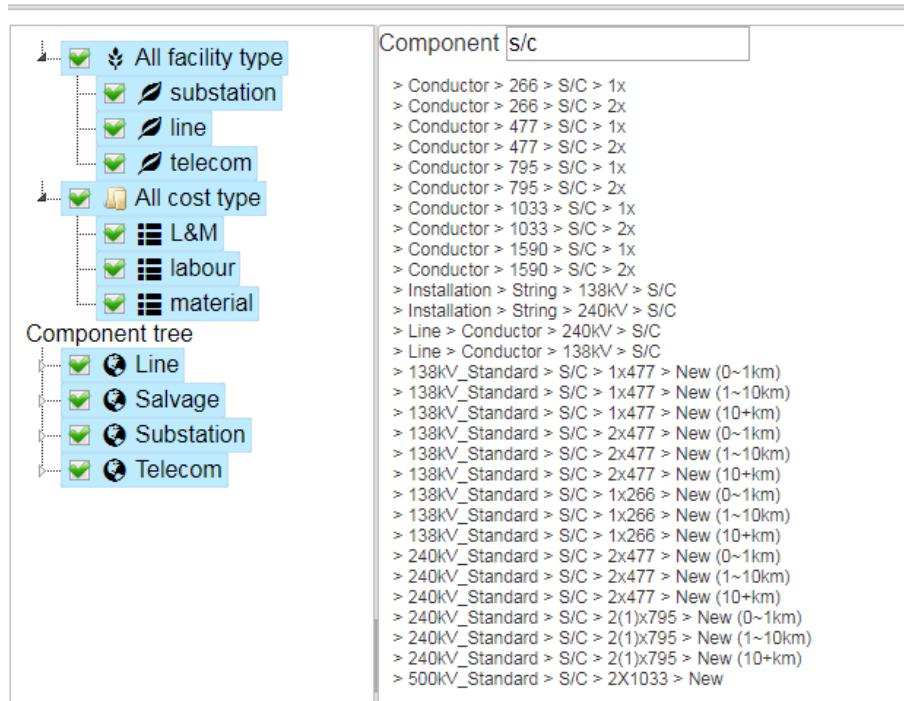
\*in the Component list, items end with "New" refer to scope of new build, which includes both labor and material; items end with "Equipment" or "Installation" refer to scope of either material only or labor only

**Figure 6**

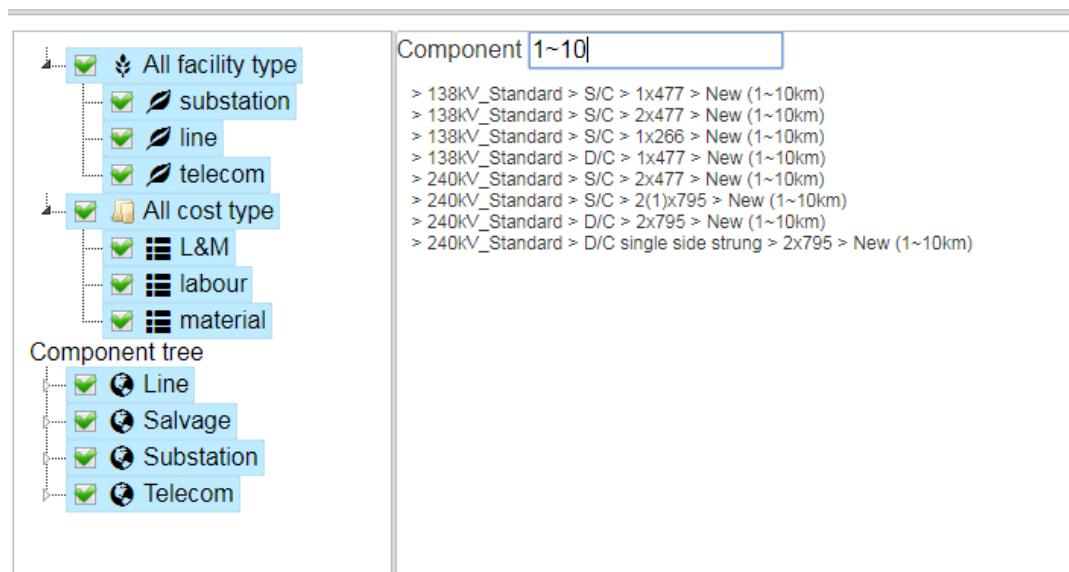
### Transmission Project Cost Estimate



**Figure 7**  
Transmission Project Cost Estimate



**Figure 8**  
Transmission Project Cost Estimate



7. Work on the estimate report table by verifying or adjusting quantity and unit cost, there is note column for commenting purpose. Save estimate again once the estimate report is ready. Note that only the last three columns are allowed to be modified and users are expected to update Qty and Note. If changes are required in "Adjusted Unit Cost", please contact Yan Wang to confirm the reasonableness.

**Figure 9**

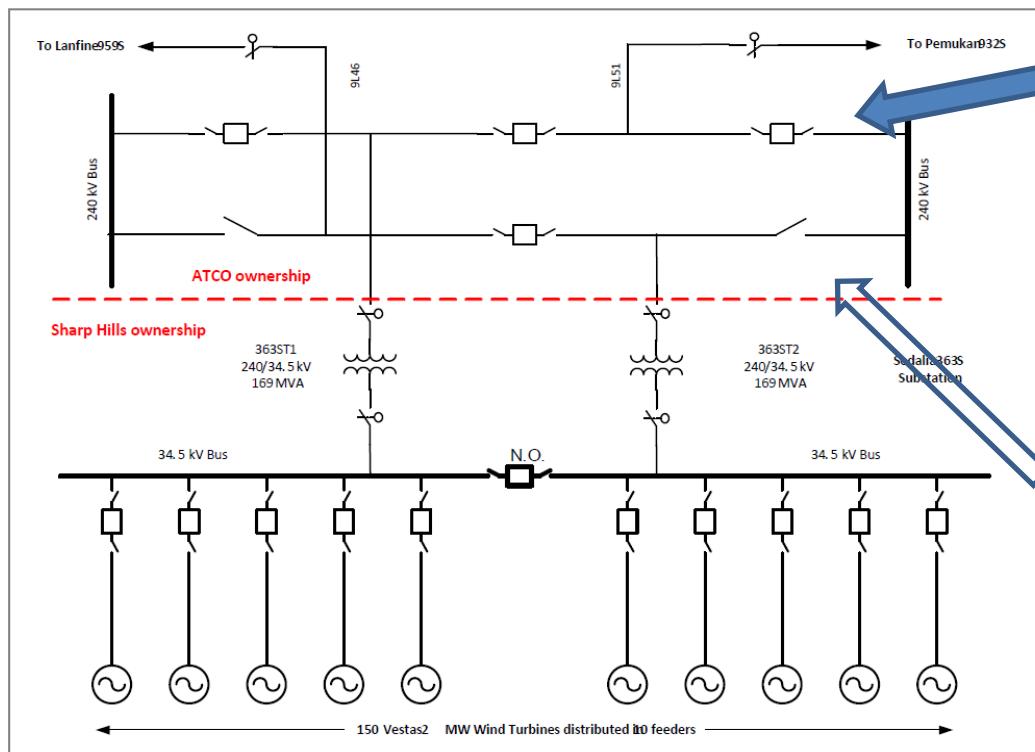
facility	project	scenario	...	export csv	refresh		
Facility ... component item	Material	Labor	SubTotal	Unit Cost	Unit	Adjusted Qty	Note
facility	\$2,205,657	\$2,205,657	\$4,411,313				
Substation	\$206,344	\$206,344	\$412,688				
Circuit Breaker 138kV 650kV New	\$206,344	\$206,344	\$412,688	\$206,344	each	\$206,344	2 one for bus tie one for line
Line	\$1,999,313	\$1,999,313	\$3,998,625				
138kV_Standard S/C 1x477 New (1~10km)	\$1,999,313	\$1,999,313	\$3,998,625	\$799,725	/km	\$799,725	5

### Sample of quantity take-off:

Connection Proposal  
Sharp Hills Wind Farm New Facility Generator Capacity



**Figure 2-2 Single Line Diagram of New Switching Station and Sedalia 363S Substation**

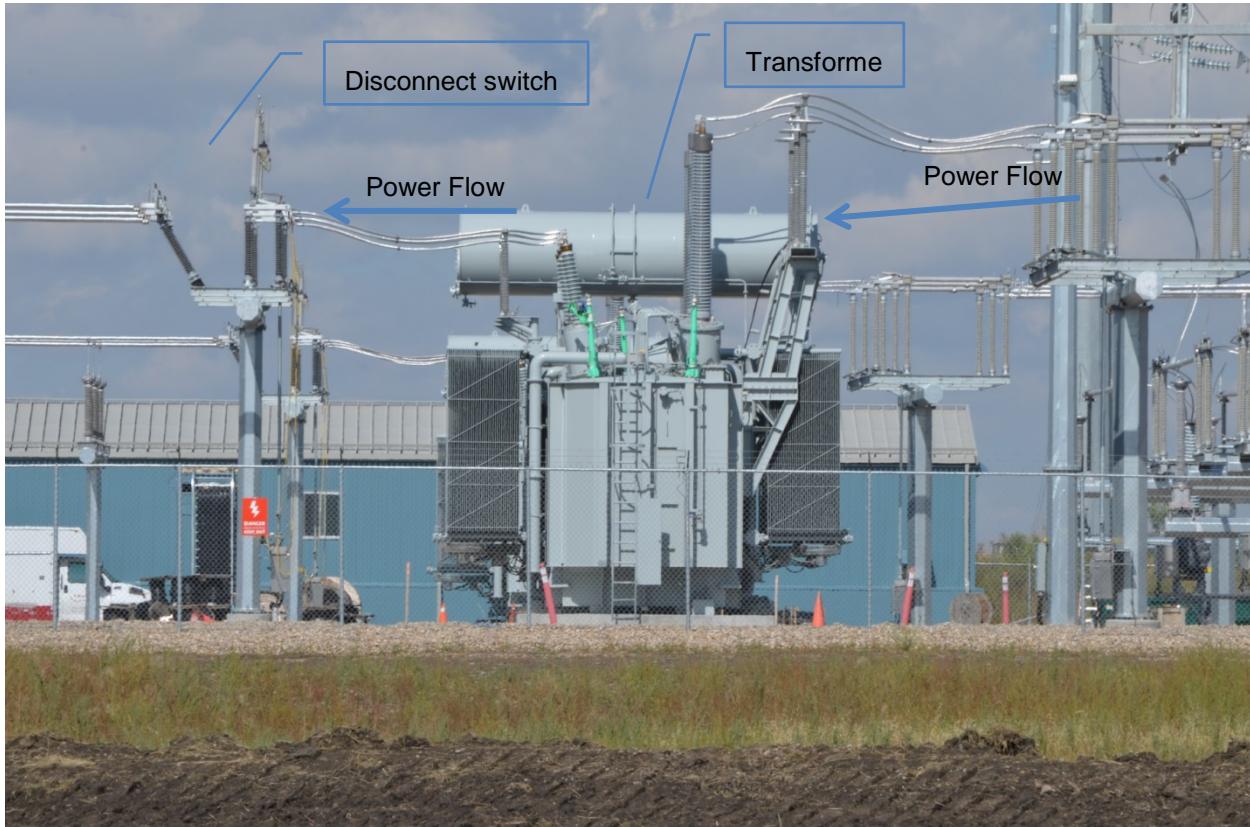


Items in SLD	Qty	Unit
240kV CB	4	ea
240kV line termination	2	ea
240kV AB	12	ea
Main bus	6	ea

Items beyond SLD	Qty	Unit
240kV CT	4	ea
240kV VT	2	ea
240kV PT	2	ea
P&C relay/module	8	ea
Control cables	4800	m
Cable trench	200	m
Site development	10000	m <sup>2</sup>
Access road	100	m
Control building	1	ea
Station service Tx	1	ea

## Sample transmission facility views:

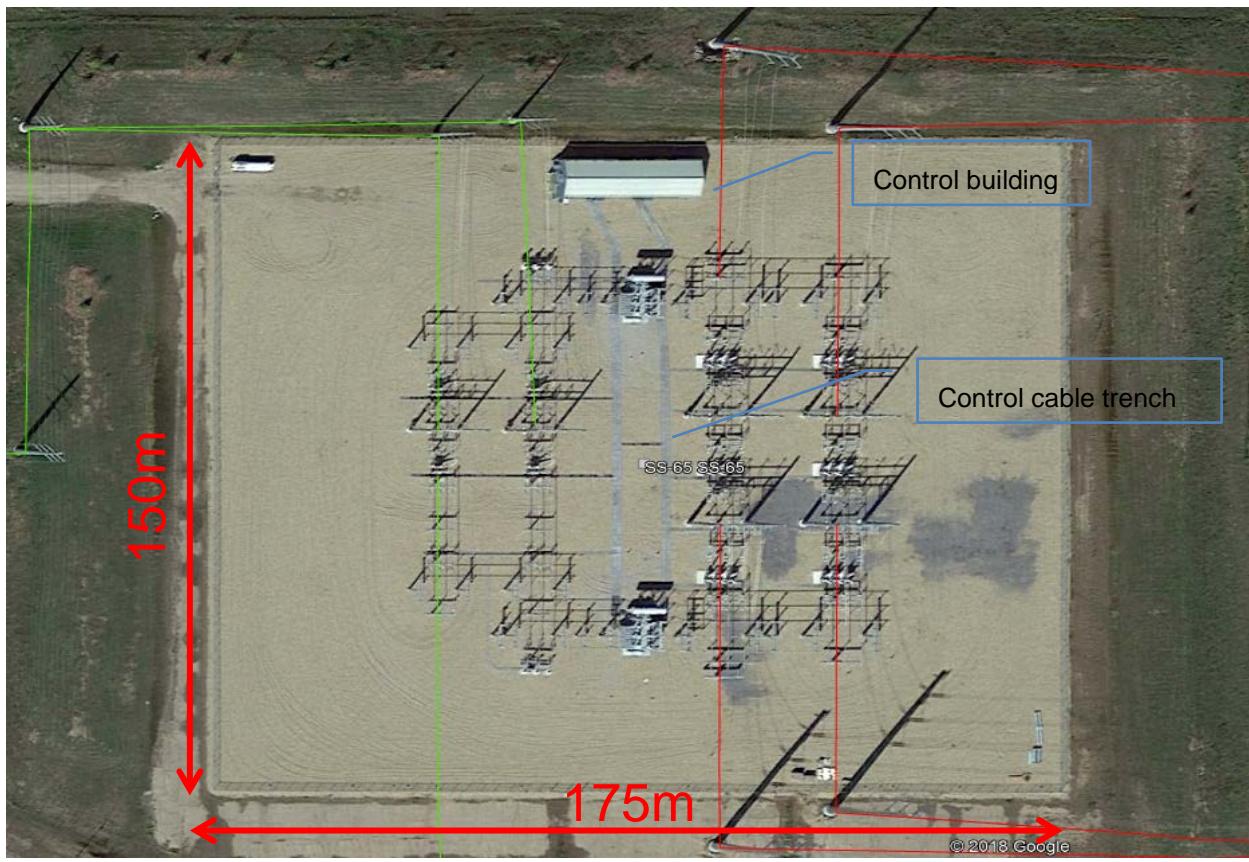
1. Substation – Side view ( Enmax SS-65)



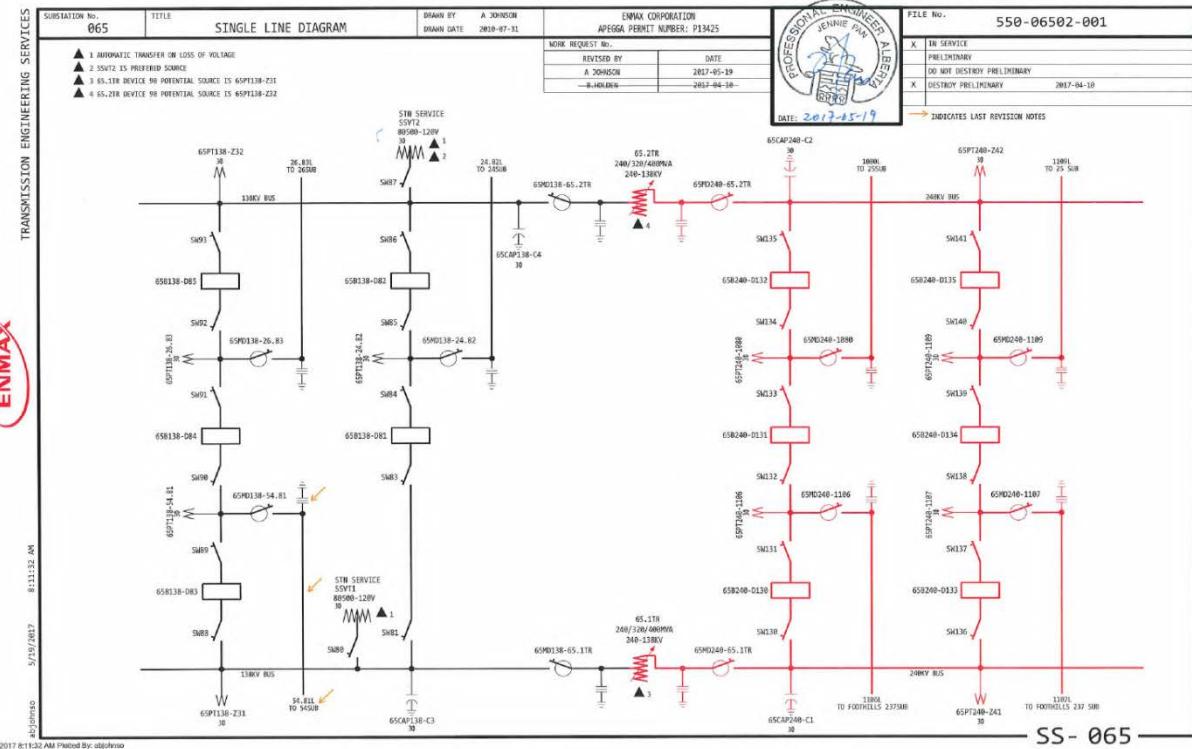
2. Substation – Bus ( Enmax SS-65, view from 22X Hwy east)



### 3. Substation – Layout (sky view Enmax SS-65)



SLD (Enmax SS-65)



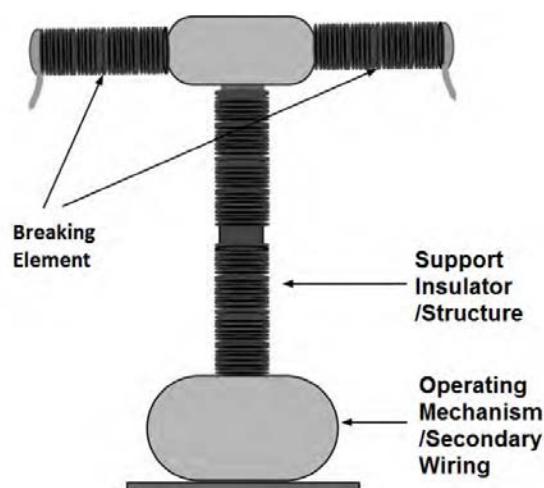
#### 4. Substation – Electrical equipment

## Transformers



1. Tank
2. HV bushing
3. LV bushing
4. Radiator
5. Fan
6. Conservator
7. Ground terminal
8. Drain valve
10. Pressure gauge
11. CT
12. Control panel

## Circuit Breaker – Three Parts



## Circuit Breaker vs. Circuit Switcher



circuit breaker  
(since 1898)



circuit switcher  
(since 1940s)

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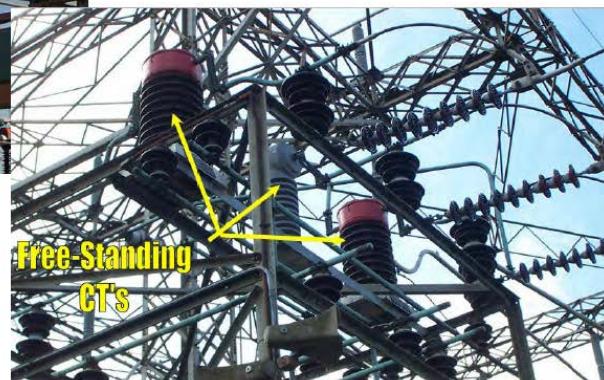
## Capacitor bank



Shunt reactor



## CT



## VT



capacitive voltage transformer

SF6 insulated, magnetic core

## 5. Protection & Control

### Control panels and cabinets

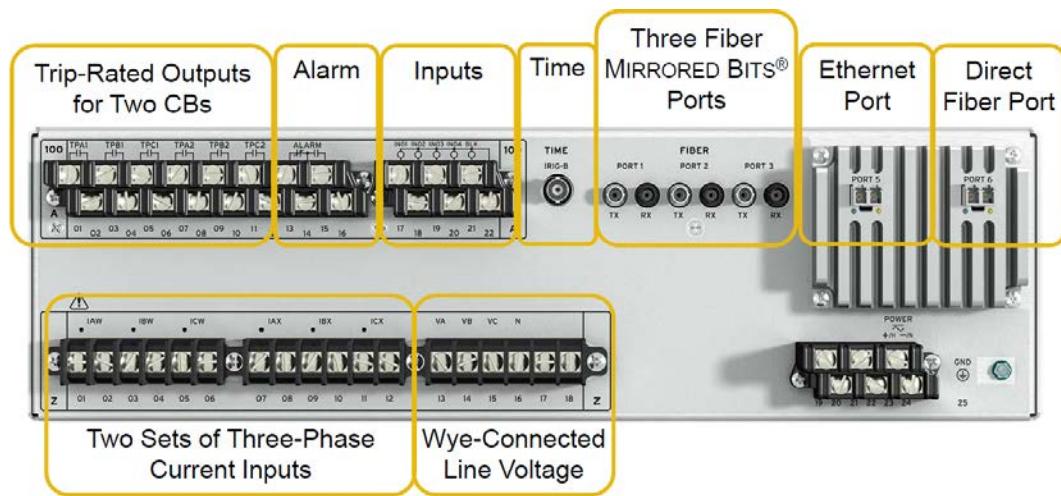


## Protection relay

### Front view



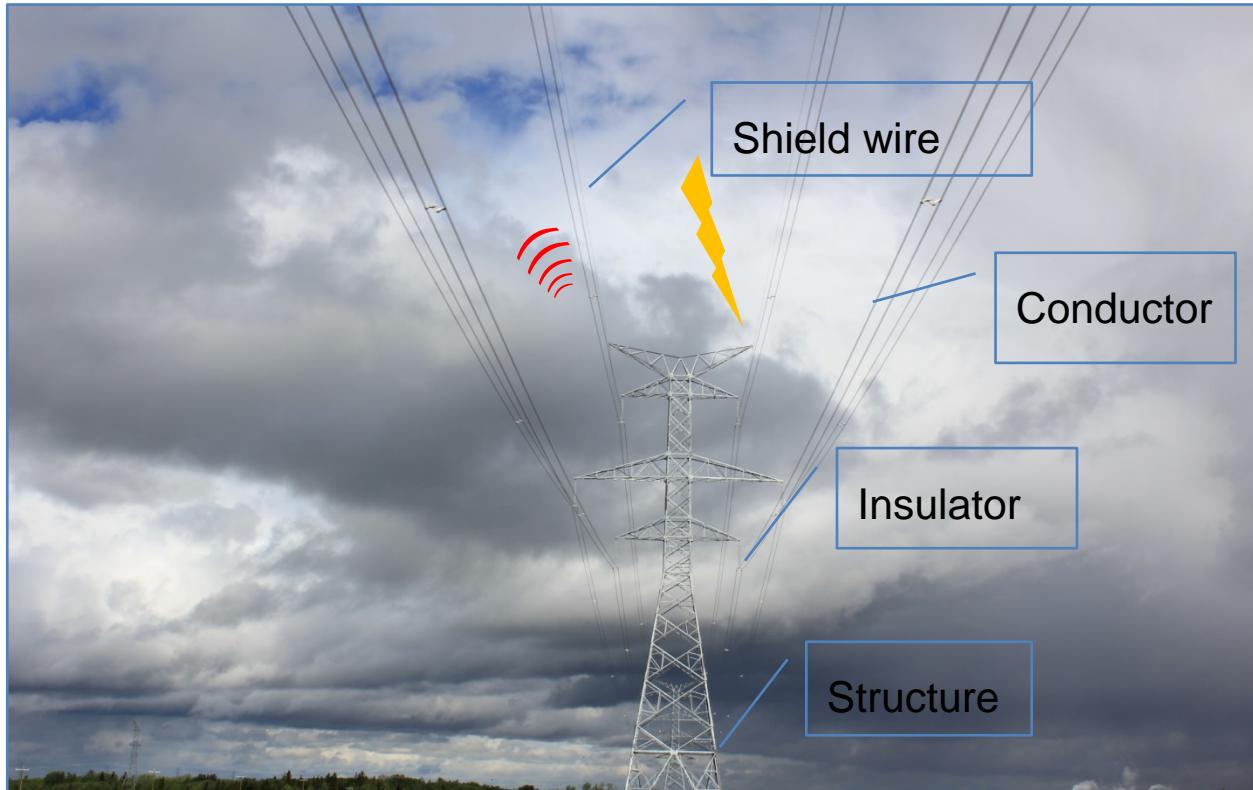
### Back review



## 6. Telecom - Radio



7. Transmission Line – Overhead



## 8. Transmission Line - Foundation



9. Transmission Line - Installation





## 10. Transmission Line – Underground cable

