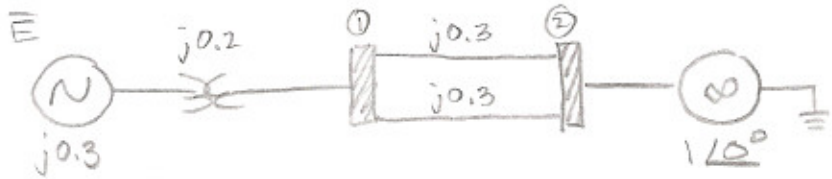
EX: given the power system shown below



The ∞ bus recieves $P_e = 0.8$ P.U. $Q = 0.074$ P.U.

A temperary 3Ø fault occurs at the sending end of the line at point F. When the fault is cleared, both lines are intact. Determine the critical clearing angle.

SOL:

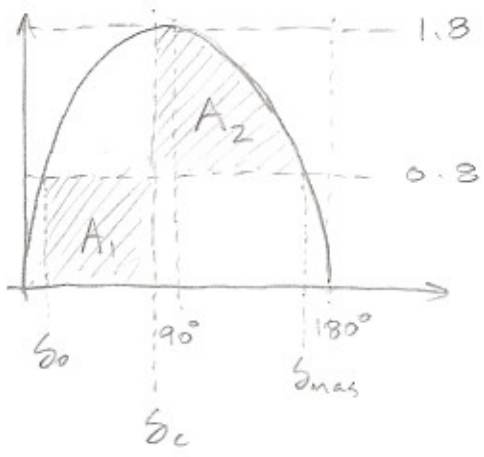
$$\bar{I} = \frac{\bar{S}^*}{\bar{V}^*} = \frac{0.8 - j0.074}{1\angle 0^\circ} = 0.8 - j0.074 \text{ P.U.}$$

$$\bar{X}_{tot} = 0.3 + 0.2 + \frac{0.3}{2} = 0.65$$

$$\bar{E} = |\bar{V}_\infty|\angle 0^\circ + jX\bar{I} = 1.17\angle 26.39^\circ$$

Since both lines are intact when the fault is cleared, then

$$P_e = \frac{(1.17)(1.0)}{0.65}\sin\delta = 1.8\sin\delta$$



$1.8\sin\delta_0 = 0.8$

$\delta_0 = 26.4^\circ$

$= 0.46055$

$\delta_{max} = 53.6^\circ$

$= 2.681$ rad.

$$A_1 = 0.8(\delta_c - \delta_0)\pi/180$$

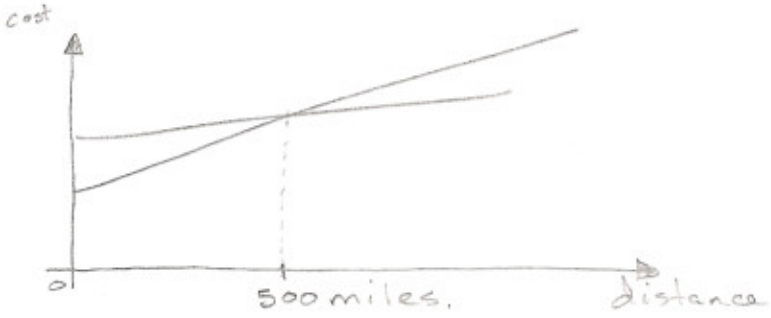
$$A_2 = \int_{\delta_c}^{\delta_{max}} 1.8 \sin\delta \, d\delta - 0.8(\delta_{max} - \delta_c)\frac{\pi}{180^\circ}$$

For stability $A_1 = A_2$

$\therefore$ $\underline{\delta_c = 84.775^\circ}$

HIGH VOLTAGE DC TRANSMISSIONS

Most of the worlds electrical energy is generated an shipped as 3ϕ A.C. with the introduction of high voltage solid state devices, AC/DC and DC/AC conversion has become very practical. In DC transmission to long distances or for special purposes is fairly attactive. For short distances 3ϕ is still more practical, if we plot the cost of A/DC power transmission to distance, we obtain the following.



In AC transmission, basically we have

$$P_{3\phi} = \frac{3EV}{X}\sin\delta$$

Stability conditions require that δ be limited to a max value of aprox. 30°, which in turn limits the power to about 50% of max.

In DC, however, There is no reactance and angle constraints. The same greater power

DC/AC COMPARISON

- capacitor reactance of underground/underwater cables are factors that limit AC power transfer

- DC link is easier to control
- DC is insensitive to frequency variations and stability margin is improved.
- DC link produces harmonics in the current which must be filtered out at considerable cost.