

Rock Island Exhibit 2.12

Cost Comparisons of 3500 MW Transmission Links

Series compensation used to load each circuit 2 x SIL

No SC needed

Note: may not meet N-1

Alternative	345 kV AC		500 kV AC		765 kV AC		± 600 kV
	Five Single Circuits	Two Double Circuits + 1 Single	Two Single Circuits	One Double Circuit	One Single Circuits	One HVDC Bipole	
Capital Cost							
Line voltage (kV)	345	345	500	500	765	600	
Rated Power (MW)	3500	3500	3500	3500	3500	3500	
No of lines required	5	3	2	1	1	1	
No. of circuits	5	5	2	2	1	2	
No. of ac line segments per circuit	2	2	2	2	2		
No. of series capacitors per line segment	2	2	2	2	0		
Total No. Series Capacitors	20	20	8	8	0		
Total No. AC or DC Sub/Sw/Stations	3	3	3	3	3	2	
No. Shunt Reactors per ac line segment	2	2	2	2	4		
Total No. Shunt Reactors	20	20	8	8	8		
No of transformer banks per S/S	2	2	2	2	2		
Total No. Transformers	6	6	6	6	6		
Tot no. of SVC's	1	1	1	1	1	5	
No. of shunt caps per S/S	2	2	1	1	0		
Total no. Shunt Capacitors	6	6	3	3	0		
HVDC stations & AC substations incl reactive comp	\$454,000,000	\$454,000,000	\$362,000,000	\$362,000,000	\$358,000,000	\$694,000,000	
Transmission Line (cost/mile)	\$1,687,400	\$2,700,100	\$2,781,000	\$4,450,500	\$3,300,000	\$2,226,000	
Transmission Line R/W & permitting (cost/mile)	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	\$300,000	
Transmission path distance (miles)	500	500	500	500	500	500	
Total sum line distance (miles)	2,500	1,500	1,000	500	500	500	
Transmission Line Cost	\$4,968,500,000	\$4,500,150,000	\$3,081,000,000	\$2,375,250,000	\$1,800,000,000	\$1,263,000,000	
Total Transmission Cost + 10% contingency	\$5,964,750,000	\$5,449,565,000	\$3,787,300,000	\$3,010,975,000	\$2,373,800,000	\$2,152,700,000	
Annual Payment, 30 years @ rate of	10%	\$632,736,196	\$578,085,759	\$401,753,937	\$319,401,965	\$251,810,920	\$228,356,798
Cost per kW-Yr		\$180.78	\$165.17	\$114.79	\$91.26	\$71.95	\$65.24
Cost per MWh @ Utilization Factor of	65%	\$31.75	\$29.01	\$20.16	\$16.03	\$12.64	\$11.46
Losses							
No of conductors/pole/phase		2	2	2	2	6	3
Conductor (ohms/mile) ac or dc @ oper temp		0.0736	0.0736	0.0550	0.0550	0.1411	0.0509
Line/Pole Current (Amps)		1246	1246	2150	2150	2810	2917
Conductor current density (A/mm^2)		0.774	0.774	0.918	0.918	1.163	0.890
Losses @ full load		449	449	402	402	300	197
Losses at full load in %		12.84%	12.84%	11.50%	11.50%	8.56%	5.63%
Cost of losses @ UF & \$/kW of:	65% \$3,000	\$876,388,537	\$876,388,537	\$784,701,208	\$784,701,208	\$584,156,521	\$383,988,719

Parameters:

Interest rate %	10%
Capitalized cost of losses \$/kW	\$3,000
Utilization factor	65%
Transmission distance	500

Note:

AC current assumes power factor of:	94.00%
Full load converter losses per station	0.75%
AC substation losses per station	0.20%

Substation unit costs M\$

	345 kV	500 kV	765 kV
Series capacitor bank	8.0	10.0	15.0
Shunt reactor cost	5.0	7.5	12.0
Transformer (1500MVA bank)	15.0	16.5	20.0
AC term equip per s/s - cb's, disc, inst trans	12.0	16.0	24.0
Shunt capacitor banks	3.0	5.0	8.0
New S/S development cost	10.0	10.0	10.0
Static Var Compensator	20.0	30.0	40.0

Converter station cost M\$

	500 kV	600 kV
3500 MW Converter Station	275	297

AC Line Costs M\$/mi

	345 kV	500 kV	765 kV
ac line construct cost (single ckt)	\$1.69	\$2.78	\$3.30
ac line construct cost (double ckt)	\$2.70	\$4.45	-
ac line R/W and permitting cost	\$0.30	\$0.30	\$0.30
Conductor type	ACSR	ACSR	ACSR
Conductor area (kcmil)	1,590	2,312	795
Cond ac res @ 25 C (ohms/mi)	0.0611	0.0457	0.1172
No. of conductors per phase	2	2	6
Conductor operating temp deg C	75	75	75
Cond ac res at oper temp (ohms/mi)	0.0736	0.0550	0.1411

DC Line Costs M\$/mi

	600 kV
bipolar dc line construct cost	\$2.23
dc line R/W and permitting costs	\$0.30
Conductor type	ACSR
Conductor area (kcmil)	2156
Cond dc res @ 25 C (ohms/mi)	0.0423
No. of conductors per pole	3
Conductor operating temp deg C	75
Cond dc res at oper temp (ohms/mi)	0.0509

*Line costs taken from B&V study, assume monopole. Costs are not necessarily indicative of actual Rock Island Pricing, but rather intended as a comparison. Deltas across the type of line should remain relatively consistent.