

Transmission Line Upgrade

Initial Data

Cost per mile of line	140,000	milecost
Miles needed	30	miles
Maintenance rate	1%	maint
Phase 1 capacity, MW	50	p1cap
Phase 2 capacity, MW	100	p2cap
Capacity factor	20%	capfac
Price per MWh	4	price
Interest rate	5%	intrate

Results

NPV 3,221,675

Construction and Maintenance Costs

Initial cost, \$	4,200,000	buildcost = milecost*miles
Annual maintenance, \$	42,000	annualcost = maint*buildcost

Intermediate Calculations

Annual hours	8,760	hours = 365*24
Phase 1 annual values		
Generation, MWh	87,600	p1gen = hours*p1cap*capfac
Revenue, \$	350,400	p1rev = price*p1gen
Profit, \$	308,400	p1profit = p1rev-annualcost
Phase 2 annual values		
Generation, MWh	175,200	p2gen = hours*p2cap*capfac
Revenue, \$	700,800	p2rev = price*p2gen
Profit, \$	658,800	p2profit = p2rev-annualcost

Full Stream of Annual Cash Flows on Back...

Present Value Calculation

Year	Profit \$	Present Value \$
0	-4,200,000	-4,200,000
1	308,400	293,714
2	308,400	279,728
3	308,400	266,408
4	308,400	253,721
5	308,400	241,639
6	308,400	230,133
7	308,400	219,174
8	308,400	208,737
9	308,400	198,797
10	308,400	189,331
11	658,800	385,187
12	658,800	366,844
13	658,800	349,376
14	658,800	332,739
15	658,800	316,894
16	658,800	301,804
17	658,800	287,432
18	658,800	273,745
19	658,800	260,710
20	658,800	248,295
21	658,800	236,471
22	658,800	225,211
23	658,800	214,486
24	658,800	204,273
25	658,800	194,545
26	658,800	185,281
27	658,800	176,458
28	658,800	168,056
29	658,800	160,053
30	658,800	152,431
	NPV	3,221,675

Expected Value

Net Present Values

		Capacity Factor		
		15%	20%	25%
Price	3	-307,777	1,204,845	2,717,467
	4	1,204,845	3,221,675	5,238,504
	5	2,717,467	5,238,504	7,759,541

Probabilities of each case:

		Probability	Capacity Factor		
			15%	20%	25%
Price	3	40%	16%	20%	4%
	4	50%	20%	25%	5%
	5	10%	4%	5%	1%

Product of NPV and probability (intermediate step):

		Capacity Factor		
		15%	20%	25%
Price	3	-49,244	240,969	108,699
	4	240,969	805,419	261,925
	5	108,699	261,925	77,595

Expected NPV

2,056,956