

Generic NPV Model for Distribution Asset End of Life Replacement Analysis of Alternatives

Version 1.0 September 2007

| | |
|------------------------------------|------|
| Time Frame of Analysis (Years) : | 40 |
| Inflation Rate (Escalation -%) : | 2.1% |
| Discount Rate (Interest Rate -%) : | 7.0% |

| Alt. # | Alternative Description |
|--------|--------------------------------------|
| 1 | Replace with new DS near existing DS |
| 2 | New transformer in Desbarats DS |
| 3 | |

| | Alternative #1 | Alternative #2 |
|------|--------------------------------------|---------------------------------|
| | Replace with new DS near existing DS | New transformer in Desbarats DS |
| NPV: | -\$2,128 | -\$1,877 |

| PV Factor | Year | Alternative #1 | | | | Alternative #2 | | | |
|-----------|------|--------------------|----------------------|----------------------------|----------|--------------------|----------------------|----------------------------|----------|
| | | Annual Cost (-\$k) | Annual Savings (\$k) | Total C&S (Cost + Savings) | PV C&S | Annual Cost (-\$k) | Annual Savings (\$k) | Total C&S (Cost + Savings) | PV C&S |
| 1.0000 | 1 | -1903.31 | 0.00 | -1903.31 | -1903.31 | -1861.16 | | -1861.16 | -1861.16 |
| 0.9542 | 2 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.61 |
| 0.9105 | 3 | -236.05 | 0.00 | -236.05 | -214.92 | -3.86 | 3.22 | -0.64 | -0.58 |
| 0.8688 | 4 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.55 |
| 0.8290 | 5 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.53 |
| 0.7911 | 6 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.50 |
| 0.7548 | 7 | -4.00 | 0.00 | -4.00 | -3.02 | -5.60 | 3.22 | -2.37 | -1.79 |
| 0.7203 | 8 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.46 |
| 0.6873 | 9 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.44 |
| 0.6558 | 10 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.42 |
| 0.6258 | 11 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.40 |
| 0.5971 | 12 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.38 |
| 0.5698 | 13 | -4.00 | 0.00 | -4.00 | -2.28 | -5.60 | 3.22 | -2.37 | -1.35 |
| 0.5437 | 14 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.35 |
| 0.5188 | 15 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.33 |
| 0.4950 | 16 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.31 |
| 0.4724 | 17 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.30 |
| 0.4507 | 18 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.29 |
| 0.4301 | 19 | -4.00 | 0.00 | -4.00 | -1.72 | -5.60 | 3.22 | -2.37 | -1.02 |
| 0.4104 | 20 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.26 |
| 0.3916 | 21 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.25 |
| 0.3737 | 22 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.24 |
| 0.3566 | 23 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.23 |
| 0.3402 | 24 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.22 |
| 0.3246 | 25 | -4.00 | 0.00 | -4.00 | -1.30 | -5.60 | 3.22 | -2.37 | -0.77 |
| 0.3098 | 26 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.20 |
| 0.2956 | 27 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.19 |
| 0.2821 | 28 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.18 |
| 0.2691 | 29 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.17 |
| 0.2568 | 30 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.16 |
| 0.2451 | 31 | -4.00 | 0.00 | -4.00 | -0.98 | -5.60 | 3.22 | -2.37 | -0.58 |
| 0.2338 | 32 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.15 |
| 0.2231 | 33 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.14 |
| 0.2129 | 34 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.14 |
| 0.2032 | 35 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.13 |
| 0.1939 | 36 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.12 |
| 0.1850 | 37 | -4.00 | 0.00 | -4.00 | -0.74 | -5.60 | 3.22 | -2.37 | -0.44 |
| 0.1765 | 38 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.11 |
| 0.1684 | 39 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.11 |
| 0.1607 | 40 | 0.00 | 0.00 | 0.00 | 0.00 | -3.86 | 3.22 | -0.64 | -0.10 |

NPV Model Inputs

Option 1 - Replace with new DS near existing DS

| <u>Description</u> | <u>Cost (-) or Savings (+)</u> | <u>Year incurred</u> | <u>Details</u> |
|------------------------------|--------------------------------|----------------------|--|
| Station Construction | -\$1,603,309 | 1 | Costs from Option 2, increased by percentage below to account for increased excavation/backfill, fencing, structures, ground grid, construction of access roads, etc. |
| Land Acquisition | -\$150,000 | 1 | Costs to acquire land and perform environmental assessment. |
| Line Extension | -\$150,000 | 1 | Estimate for extending/rerouting 34.5 kV line to new DS location - assuming land available within ~ 1km. |
| ROW mtc. on line ext. | -\$4,000 | every 6th year | Estimate based on 1 extra km of ROW maintenance, every 6 years. (Assuming 1km add'l 34.5 kV line, 50% new ROW). |
| Desbarats Voltage Conversion | -\$236,046 | 3 | Not required prior to construction of the new station, though this project would be completed on its own merits in the short term to achieve the benefits of decommissioning the Old Desbarats DS. |

Option 2 - New transformer located in Desbarats DS.

| <u>Description</u> | <u>Cost (-) or Savings (+)</u> | <u>Year incurred</u> | <u>Details</u> |
|---|--------------------------------|----------------------|--|
| Station Construction | -\$1,394,182 | 1 | Costs to purchase power transformer, and retrofit New Desbarats DS to install 2nd supply to St. Joseph Island. |
| Voltage Regulators, Installation | -\$230,936 | 1 | Regulators required near existing F&G sub location, 4 regulators (1 spare) + installation. |
| Line losses | -\$3,857 | 2 to 30 | Difference in annual line losses by running feeder from Desbarats to F&G line at 25 kV rather than 34.5 kV. |
| 6 year regulator maintenance | -\$1,738 | every 6th year | Maintain Regulators every 6 years. |
| Substation / Oil Cont Inspections | \$1,821 | 2 to 30 | Locating in Desbarats saves on average 2 man-hours, plus vehicle, per month (driving time, set up and job planning). |
| Reduced Veg Control DS Yard | \$1,400 | 2 to 30 | Annual herbicide application to control vegetation in the yard. |
| Desbarats Voltage Conversion | -\$236,046 | 1 | Required to be complete prior to energizing the new supply for Option 2. |
| % increase in up-front construction costs for Option 1: | | 15% | Estimate of additional costs involved in new station construction (see details under Option 1) |

Line Loss Calc

| | |
|----------------|--------|
| Peak Load (kW) | 4000 |
| Load Factor | 0.5 |
| Loss Factor | 0.2875 |

| | |
|---|---------|
| Average Cost of Power (\$/kWh) | 0.07 |
| Capacity Cost (\$/kW) | 4.89 |
| Line Current (Amps at 34.5 kV) | 66.9 |
| Line Current (Amps at 25 kV) | 92.4 |
| Line Resistance (ohms/phase) | 1.6425 |
| Peak Loss (kW at 34.5 kV) | 22 |
| Peak Loss (kW at 25 kV) | 42 |
| Incremental Peak Loss (kW) | 20 |
| Incremental Avg Loss (kW) | 6 |
| Incremental Annual Losses (kWh) | 50290 |
| Incremental Annual /kW costs | 336.87 |
| Incremental Annual /kWh costs | 3520.30 |
| Total Annual Incremental Cost of Losses | 3857.17 |