**Re: Page B-120, Diesel Plant Automation, $516,200 (2008), $379,200 (2009)**

Q. Please provide a detailed cost benefit analysis that has been undertaken in considering the possibility of automating each of these plants.

A. The results of a net present worth analysis of automating the Makkovik and Rigolet Diesel Plants are attached. Please note that the analysis is based on improvement of fuel efficiency of 0.2 kWh/litre. This is a very conservative figure as Hydro's experience with plant automation indicates that fuel efficiency improvements of 0.3 to 0.4 kWh/litre are typical. The analysis does not include other benefits which are more difficult to quantify. These include:

- Production of more energy between engine overhauls. With the diesel engine operating at higher average outputs, more kWh of electricity are produced between engine overhauls, thus the maintenance cost per kWh is reduced.
- With the diesel engine operating at higher average outputs, less air emissions per kWh are produced.
- With the diesel engine operating at higher average outputs, less lubricating oil per kWh is consumed.
- With the diesel engine operating at higher average outputs, engine fouling is reduced, reducing maintenance costs.
- The number and duration of outages to customers is reduced as the automated plant can respond to equipment failures more quickly than an operator can, especially outside normal working hours.
- Automation also provides data acquisition which can be used by operators, maintenance and engineering personnel for trouble diagnosis and optimizing maintenance planning.

**PROJECT COST / BENEFIT ANALYSIS TEMPLATE**

**Makkovik Diesel Plant Automation**

**Status Quo**

**Status Quo**

***Note: Costs are shown as positive values;Benefits as negative values***

| | |
|---|---|
| Current Year | **2007** |
| Present Worth Year | 2007 |
| Number of Years in Study | 26 |
| Discount Rate | 7.0% |
| Total In-service Project Cost | $ - |
| In-service Year | 2009 |
| Other Project Cost ***after*** In-service (if applicable) | $ - |
| Other Project Year (if applicable) | |
| Replacement Cost (if applicable) | $ - |
| Replacement Year (if applicable) | |
| Project cost in Ending (**E**) or Beginning (**B**) Year $$ | |
| O&M costs - 75% Materials, 25% Labour (**75**) or 50% Materials, 50% Labour (**50**) or User (**U**) | |

| A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | | Annual O&M Cost $ | Annual Fuel Price $cdn/l | Annual Fuel Cost $ | Other Cost $ | Total Costs $ | Benefit 1 *(specify)* $ | Benefit 2 *(specify)* $ | NET $ | P.W. January 2007 | Cumulative Present Worth |
| 0 | 2007 | - | | - | - | - | - | - | - | - | - |
| 1 | 2008 | - | | - | - | - | - | - | - | - | - |
| 2 | 2009 | - | 0.68 | 741,050 | - | 741,050 | - | - | 741,050 | 604,918 | 604,918 |
| 3 | 2010 | - | 0.68 | 753,440 | - | 753,440 | - | - | 753,440 | 574,796 | 1,179,713 |
| 4 | 2011 | - | 0.70 | 798,150 | - | 798,150 | - | - | 798,150 | 569,070 | 1,748,784 |
| 5 | 2012 | - | 0.73 | 841,530 | - | 841,530 | - | - | 841,530 | 560,747 | 2,309,531 |
| 6 | 2013 | - | 0.75 | 893,077 | - | 893,077 | - | - | 893,077 | 556,163 | 2,865,694 |
| 7 | 2014 | - | 0.77 | 940,682 | - | 940,682 | - | - | 940,682 | 547,485 | 3,413,179 |
| 8 | 2015 | - | 0.79 | 987,492 | - | 987,492 | - | - | 987,492 | 537,130 | 3,950,309 |
| 9 | 2016 | - | 0.81 | 1,034,657 | - | 1,034,657 | - | - | 1,034,657 | 525,967 | 4,476,276 |
| 10 | 2017 | - | 0.84 | 1,084,729 | - | 1,084,729 | - | - | 1,084,729 | 515,347 | 4,991,623 |
| 11 | 2018 | - | 0.85 | 1,133,849 | - | 1,133,849 | - | - | 1,133,849 | 503,443 | 5,495,066 |
| 12 | 2019 | - | 0.88 | 1,187,308 | - | 1,187,308 | - | - | 1,187,308 | 492,690 | 5,987,756 |
| 13 | 2020 | - | 0.90 | 1,241,158 | - | 1,241,158 | - | - | 1,241,158 | 481,343 | 6,469,099 |
| 14 | 2021 | - | 0.91 | 1,293,932 | - | 1,293,932 | - | - | 1,293,932 | 468,980 | 6,938,079 |
| 15 | 2022 | - | 0.93 | 1,351,271 | - | 1,351,271 | - | - | 1,351,271 | 457,722 | 7,395,802 |
| 16 | 2023 | - | 0.95 | 1,409,253 | - | 1,409,253 | - | - | 1,409,253 | 446,133 | 7,841,935 |
| 17 | 2024 | - | 0.97 | 1,470,561 | - | 1,470,561 | - | - | 1,470,561 | 435,086 | 8,277,021 |
| 18 | 2025 | - | 0.99 | 1,533,785 | - | 1,533,785 | - | - | 1,533,785 | 424,104 | 8,701,125 |
| 19 | 2026 | - | 1.01 | 1,600,852 | - | 1,600,852 | - | - | 1,600,852 | 413,690 | 9,114,816 |
| 20 | 2027 | - | 1.04 | 1,671,605 | - | 1,671,605 | - | - | 1,671,605 | 403,714 | 9,518,530 |
| 21 | 2028 | - | 1.06 | 1,744,426 | - | 1,744,426 | - | - | 1,744,426 | 393,740 | 9,912,270 |
| 22 | 2029 | - | 1.08 | 1,820,232 | - | 1,820,232 | - | - | 1,820,232 | 383,972 | 10,296,242 |
| 23 | 2030 | - | 1.10 | 1,899,470 | - | 1,899,470 | - | - | 1,899,470 | 374,474 | 10,670,716 |
| 24 | 2031 | - | 1.12 | 1,981,925 | - | 1,981,925 | - | - | 1,981,925 | 365,168 | 11,035,884 |
| 25 | 2032 | - | 1.15 | 2,068,065 | - | 2,068,065 | - | - | 2,068,065 | 356,111 | 11,391,996 |
| 26 | 2033 | - | 1.17 | 2,158,032 | - | 2,158,032 | - | - | 2,158,032 | 347,293 | 11,739,288 |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |

Assumptions & Notes:

Date Revised

Date Printed 11-Sep-2007 4:11 PM

## Scratch Pad area for Annual Fuel costs

This area is used to enter Fuel costs associated with the project. ***NOTE: Fuel Prices are to be entered in Column D in Main Table***
Economic Analysis section of System Planning prepares various fuel price forecasts for numerous delivery points.
Please reference the appropriate forecast and enter the values ***in Column D in Main Table***.
Columns 3 below picks up the fuel prices from the main table. Columns 4 & 5 can be used to do some calculations if preferred.
Necessary calculations can be performed to determine each current year dollar value of the annual fuel costs.
The respective annual costs are to be entered in column 6.
***NOTE: Annual Fuel costs (if applicable) may start in the in-service year .***

RETURN

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Year | | Annual Fuel price $cdn/l | Fuel Efficiency 3.25kwh/l Energy Forecast (MWh) | | Annual Fuel costs (Current $$) | Comments / Explanations |
| 0 | 2007 | - | | | | |
| 1 | 2008 | - | | | | |
| 2 | 2009 | 0.68 | 3.25 | 3547 | 741,050.15 | |
| 3 | 2010 | 0.68 | 3.25 | 3601 | 753,440.00 | |
| 4 | 2011 | 0.70 | 3.25 | 3711 | 798,150.46 | |
| 5 | 2012 | 0.73 | 3.25 | 3762 | 841,530.46 | |
| 6 | 2013 | 0.75 | 3.25 | 3870 | 893,076.92 | |
| 7 | 2014 | 0.77 | 3.25 | 3955 | 940,681.54 | |
| 8 | 2015 | 0.79 | 3.25 | 4042 | 987,491.69 | |
| 9 | 2016 | 0.81 | 3.25 | 4131 | 1,034,656.62 | |
| 10 | 2017 | 0.84 | 3.25 | 4222 | 1,084,729.23 | |
| 11 | 2018 | 0.85 | 3.25 | 4315 | 1,133,849.23 | |
| 12 | 2019 | 0.88 | 3.25 | 4410 | 1,187,307.69 | |
| 13 | 2020 | 0.90 | 3.25 | 4507 | 1,241,158.46 | |
| 14 | 2021 | 0.91 | 3.25 | 4606 | 1,293,931.69 | |
| 15 | 2022 | 0.93 | 3.25 | 4707 | 1,351,271.08 | |
| 16 | 2023 | 0.95 | 3.25 | 4811 | 1,409,252.92 | |
| 17 | 2024 | 0.97 | 3.25 | 4917 | 1,470,561.23 | |
| 18 | 2025 | 0.99 | 3.25 | 5025 | 1,533,784.62 | |
| 19 | 2026 | 1.01 | 3.25 | 5136 | 1,600,851.69 | |
| 20 | 2027 | 1.04 | 3.25 | 5249 | 1,671,604.62 | |
| 21 | 2028 | 1.06 | 3.25 | 5365 | 1,744,425.62 | |
| 22 | 2029 | 1.08 | 3.25 | 5483 | 1,820,231.89 | |
| 23 | 2030 | 1.10 | 3.25 | 5604 | 1,899,469.58 | |
| 24 | 2031 | 1.12 | 3.25 | 5727 | 1,981,924.65 | |
| 25 | 2032 | 1.15 | 3.25 | 5853 | 2,068,065.18 | |
| 26 | 2033 | 1.17 | 3.25 | 5982 | 2,158,031.85 | |
| 27 | 2034 | - | | | | |
| 28 | 2035 | - | | | | |
| 29 | 2036 | - | | | | |
| 30 | 2037 | - | | | | |
| 31 | 2038 | - | | | | |
| 32 | 2039 | - | | | | |
| 33 | 2040 | - | | | | |
| 34 | 2041 | - | | | | |
| 35 | 2042 | - | | | | |
| 36 | 2043 | - | | | | |
| 37 | 2044 | - | | | | |
| 38 | 2045 | - | | | | |
| 39 | 2046 | - | | | | |
| 40 | 2047 | - | | | | |

## PROJECT COST / BENEFIT ANALYSIS TEMPLATE

**Makkovik Diesel Plant Automation**
**Plant Automation**
**Automation**

***Note: Costs are shown as positive values;Benefits as negative values***

| | |
|---|---|
| Current Year | **2007** |
| Present Worth Year | 2007 |
| Number of Years in Study | 26 |
| Discount Rate | 7.0% |
| Total In-service Project Cost | $ 547,900 |
| In-service Year | 2009 |
| Other Project Cost ***after*** In-service (if applicable) | $ - |
| Other Project Year (if applicable) | |
| Replacement Cost (if applicable) | $ - |
| Replacement Year (if applicable) | |
| Project cost in Ending (**E**) or Beginning (**B**) Year $$ | |
| O&M costs - 75% Materials, 25% Labour (**75**) or 50% Materials, 50% Labour (**50**) or User (**U**) | |

| A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | | Annual O&M Cost $ | Annual Fuel Price (if applicable) | Annual Fuel Cost $ | Other Cost $ | Total Costs $ | Benefit 1 *(specify)* $ | Benefit 2 *(specify)* $ | NET $ | P.W. January 2007 | Cumulative Present Worth |
| 0 | 2007 | - | | - | - | - | - | - | - | - | - |
| 1 | 2008 | - | | - | - | - | - | - | - | - | - |
| 2 | 2009 | - | 0.68 | 698,091 | - | 1,245,991 | - | - | 1,245,991 | 1,048,407 | 1,048,407 |
| 3 | 2010 | - | 0.68 | 709,762 | - | 709,762 | - | - | 709,762 | 541,474 | 1,589,881 |
| 4 | 2011 | - | 0.70 | 751,881 | - | 751,881 | - | - | 751,881 | 536,081 | 2,125,962 |
| 5 | 2012 | - | 0.73 | 792,746 | - | 792,746 | - | - | 792,746 | 528,240 | 2,654,202 |
| 6 | 2013 | - | 0.75 | 841,304 | - | 841,304 | - | - | 841,304 | 523,922 | 3,178,124 |
| 7 | 2014 | - | 0.77 | 886,149 | - | 886,149 | - | - | 886,149 | 515,747 | 3,693,871 |
| 8 | 2015 | - | 0.79 | 930,246 | - | 930,246 | - | - | 930,246 | 505,992 | 4,199,863 |
| 9 | 2016 | - | 0.81 | 974,677 | - | 974,677 | - | - | 974,677 | 495,476 | 4,695,339 |
| 10 | 2017 | - | 0.84 | 1,021,846 | - | 1,021,846 | - | - | 1,021,846 | 485,472 | 5,180,811 |
| 11 | 2018 | - | 0.85 | 1,068,119 | - | 1,068,119 | - | - | 1,068,119 | 474,258 | 5,655,068 |
| 12 | 2019 | - | 0.88 | 1,118,478 | - | 1,118,478 | - | - | 1,118,478 | 464,129 | 6,119,197 |
| 13 | 2020 | - | 0.90 | 1,169,207 | - | 1,169,207 | - | - | 1,169,207 | 453,439 | 6,572,636 |
| 14 | 2021 | - | 0.91 | 1,218,921 | - | 1,218,921 | - | - | 1,218,921 | 441,793 | 7,014,429 |
| 15 | 2022 | - | 0.93 | 1,272,937 | - | 1,272,937 | - | - | 1,272,937 | 431,188 | 7,445,617 |
| 16 | 2023 | - | 0.95 | 1,327,557 | - | 1,327,557 | - | - | 1,327,557 | 420,271 | 7,865,887 |
| 17 | 2024 | - | 0.97 | 1,385,311 | - | 1,385,311 | - | - | 1,385,311 | 409,864 | 8,275,751 |
| 18 | 2025 | - | 0.99 | 1,444,870 | - | 1,444,870 | - | - | 1,444,870 | 399,518 | 8,675,269 |
| 19 | 2026 | - | 1.01 | 1,508,049 | - | 1,508,049 | - | - | 1,508,049 | 389,708 | 9,064,978 |
| 20 | 2027 | - | 1.04 | 1,574,700 | - | 1,574,700 | - | - | 1,574,700 | 380,311 | 9,445,288 |
| 21 | 2028 | - | 1.06 | 1,643,300 | - | 1,643,300 | - | - | 1,643,300 | 370,914 | 9,816,203 |
| 22 | 2029 | - | 1.08 | 1,714,711 | - | 1,714,711 | - | - | 1,714,711 | 361,713 | 10,177,916 |
| 23 | 2030 | - | 1.10 | 1,789,355 | - | 1,789,355 | - | - | 1,789,355 | 352,765 | 10,530,681 |
| 24 | 2031 | - | 1.12 | 1,867,030 | - | 1,867,030 | - | - | 1,867,030 | 343,999 | 10,874,680 |
| 25 | 2032 | - | 1.15 | 1,948,177 | - | 1,948,177 | - | - | 1,948,177 | 335,467 | 11,210,147 |
| 26 | 2033 | - | 1.17 | 2,032,929 | - | 2,032,929 | - | - | 2,032,929 | 327,160 | 11,537,307 |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |

Assumptions & Notes:

| | | |
|---|---|---|
| Date Revised | | |
| Date Printed | 11-Sep-2007 | 4:12 PM |

## Scratch Pad area for Annual Fuel costs

This area is used to enter Fuel costs associated with the project. ***NOTE: Fuel Prices are to be entered in Column D in Main Table***
Economic Analysis section of System Planning prepares various fuel price forecasts for numerous delivery points.
Please reference the appropriate forecast and enter the values ***in Column D in Main Table***.
Columns 3 below picks up the fuel prices from the main table. Columns 4 & 5 can be used to do some calculations if preferred.
Necessary calculations can be performed to determine each current year dollar value of the annual fuel costs.
The respective annual costs are to be entered in column 6.
***NOTE: Annual Fuel costs (if applicable) may start in the in-service year .***

RETURN

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Year | | Annual Fuel price (if applicable) | Fuel Efficiency 3.45kwh/l Energy Forecast (MWh) | | Annual Fuel costs (Current $$) | Comments / Explanations |
| 0 | 2007 | - | | | | |
| 1 | 2008 | - | | | | |
| 2 | 2009 | 0.68 | 3.45 | 3547 | 698,090.72 | |
| 3 | 2010 | 0.68 | 3.45 | 3601 | 709,762.32 | |
| 4 | 2011 | 0.70 | 3.45 | 3711 | 751,880.87 | |
| 5 | 2012 | 0.73 | 3.45 | 3762 | 792,746.09 | |
| 6 | 2013 | 0.75 | 3.45 | 3870 | 841,304.35 | |
| 7 | 2014 | 0.77 | 3.45 | 3955 | 886,149.28 | |
| 8 | 2015 | 0.79 | 3.45 | 4042 | 930,245.80 | |
| 9 | 2016 | 0.81 | 3.45 | 4131 | 974,676.52 | |
| 10 | 2017 | 0.84 | 3.45 | 4222 | 1,021,846.38 | |
| 11 | 2018 | 0.85 | 3.45 | 4315 | 1,068,118.84 | |
| 12 | 2019 | 0.88 | 3.45 | 4410 | 1,118,478.26 | |
| 13 | 2020 | 0.90 | 3.45 | 4507 | 1,169,207.25 | |
| 14 | 2021 | 0.91 | 3.45 | 4606 | 1,218,921.16 | |
| 15 | 2022 | 0.93 | 3.45 | 4707 | 1,272,936.52 | |
| 16 | 2023 | 0.95 | 3.45 | 4811 | 1,327,557.10 | |
| 17 | 2024 | 0.97 | 3.45 | 4917 | 1,385,311.30 | |
| 18 | 2025 | 0.99 | 3.45 | 5025 | 1,444,869.57 | |
| 19 | 2026 | 1.01 | 3.45 | 5136 | 1,508,048.70 | |
| 20 | 2027 | 1.04 | 3.45 | 5249 | 1,574,700.00 | |
| 21 | 2028 | 1.06 | 3.45 | 5365 | 1,643,299.50 | |
| 22 | 2029 | 1.08 | 3.45 | 5483 | 1,714,711.20 | |
| 23 | 2030 | 1.10 | 3.45 | 5604 | 1,789,355.40 | |
| 24 | 2031 | 1.12 | 3.45 | 5727 | 1,867,030.47 | |
| 25 | 2032 | 1.15 | 3.45 | 5853 | 1,948,177.35 | |
| 26 | 2033 | 1.17 | 3.45 | 5982 | 2,032,928.55 | |
| 27 | 2034 | - | | | | |
| 28 | 2035 | - | | | | |
| 29 | 2036 | - | | | | |
| 30 | 2037 | - | | | | |
| 31 | 2038 | - | | | | |
| 32 | 2039 | - | | | | |
| 33 | 2040 | - | | | | |
| 34 | 2041 | - | | | | |
| 35 | 2042 | - | | | | |
| 36 | 2043 | - | | | | |
| 37 | 2044 | - | | | | |
| 38 | 2045 | - | | | | |
| 39 | 2046 | - | | | | |
| 40 | 2047 | - | | | | |

**PROJECT COST / BENEFIT ANALYSIS TEMPLATE**

**Rigolet Diesel Plant Automation**

**Status Quo**

**Status Quo**

***Note: Costs are shown as positive values;Benefits as negative values***

| | |
|---|---|
| Current Year | **2007** |
| Present Worth Year | 2007 |
| Number of Years in Study | 26 |
| Discount Rate | 7.0% |
| Total In-service Project Cost | $ - |
| In-service Year | 2009 |
| Other Project Cost ***after*** In-service (if applicable) | $ - |
| Other Project Year (if applicable) | |
| Replacement Cost (if applicable) | $ - |
| Replacement Year (if applicable) | |
| Project cost in Ending (**E**) or Beginning (**B**) Year $$ | |
| O&M costs - 75% Materials, 25% Labour (**75**) or 50% Materials, 50% Labour (**50**) or User (**U**) | |

| A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | | Annual O&M Cost $ | Annual Fuel Price $cdn/l | Annual Fuel Cost $ | Other Cost $ | Total Costs $ | Benefit 1 *(specify)* $ | Benefit 2 *(specify)* $ | NET $ | P.W. January 2007 | Cumulative Present Worth |
| 0 | 2007 | - | | - | - | - | - | - | - | - | - |
| 1 | 2008 | - | | - | - | - | - | - | - | - | - |
| 2 | 2009 | - | 0.68 | 485,680 | - | 485,680 | - | - | 485,680 | 396,460 | 396,460 |
| 3 | 2010 | - | 0.68 | 497,022 | - | 497,022 | - | - | 497,022 | 379,176 | 775,635 |
| 4 | 2011 | - | 0.70 | 521,893 | - | 521,893 | - | - | 521,893 | 372,102 | 1,147,738 |
| 5 | 2012 | - | 0.72 | 554,473 | - | 554,473 | - | - | 554,473 | 369,468 | 1,517,206 |
| 6 | 2013 | - | 0.75 | 583,809 | - | 583,809 | - | - | 583,809 | 363,567 | 1,880,773 |
| 7 | 2014 | - | 0.77 | 613,780 | - | 613,780 | - | - | 613,780 | 357,226 | 2,237,999 |
| 8 | 2015 | - | 0.79 | 644,726 | - | 644,726 | - | - | 644,726 | 350,688 | 2,588,687 |
| 9 | 2016 | - | 0.81 | 674,169 | - | 674,169 | - | - | 674,169 | 342,713 | 2,931,400 |
| 10 | 2017 | - | 0.83 | 706,478 | - | 706,478 | - | - | 706,478 | 335,643 | 3,267,043 |
| 11 | 2018 | - | 0.85 | 738,062 | - | 738,062 | - | - | 738,062 | 327,708 | 3,594,751 |
| 12 | 2019 | - | 0.87 | 772,376 | - | 772,376 | - | - | 772,376 | 320,509 | 3,915,260 |
| 13 | 2020 | - | 0.89 | 805,929 | - | 805,929 | - | - | 805,929 | 312,553 | 4,227,813 |
| 14 | 2021 | - | 0.91 | 840,755 | - | 840,755 | - | - | 840,755 | 304,728 | 4,532,541 |
| 15 | 2022 | - | 0.93 | 876,318 | - | 876,318 | - | - | 876,318 | 296,839 | 4,829,380 |
| 16 | 2023 | - | 0.95 | 914,455 | - | 914,455 | - | - | 914,455 | 289,493 | 5,118,873 |
| 17 | 2024 | - | 0.97 | 952,421 | - | 952,421 | - | - | 952,421 | 281,787 | 5,400,660 |
| 18 | 2025 | - | 0.99 | 993,776 | - | 993,776 | - | - | 993,776 | 274,787 | 5,675,448 |
| 19 | 2026 | - | 1.01 | 1,035,604 | - | 1,035,604 | - | - | 1,035,604 | 267,620 | 5,943,067 |
| 20 | 2027 | - | 1.03 | 1,080,708 | - | 1,080,708 | - | - | 1,080,708 | 261,005 | 6,204,072 |
| 21 | 2028 | - | 1.05 | 1,126,700 | - | 1,126,700 | - | - | 1,126,700 | 254,311 | 6,458,383 |
| 22 | 2029 | - | 1.07 | 1,174,809 | - | 1,174,809 | - | - | 1,174,809 | 247,822 | 6,706,205 |
| 23 | 2030 | - | 1.10 | 1,225,115 | - | 1,225,115 | - | - | 1,225,115 | 241,527 | 6,947,733 |
| 24 | 2031 | - | 1.12 | 1,277,361 | - | 1,277,361 | - | - | 1,277,361 | 235,353 | 7,183,085 |
| 25 | 2032 | - | 1.14 | 1,331,964 | - | 1,331,964 | - | - | 1,331,964 | 229,358 | 7,412,444 |
| 26 | 2033 | - | 1.17 | 1,389,015 | - | 1,389,015 | - | - | 1,389,015 | 223,535 | 7,635,978 |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
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Assumptions & Notes:

| | | |
|---|---|---|
| Date Revised | | |
| Date Printed | 11-Sep-2007 | 4:13 PM |

## Scratch Pad area for Annual Fuel costs

This area is used to enter Fuel costs associated with the project. ***NOTE: Fuel Prices are to be entered in Column D in Main Table***
Economic Analysis section of System Planning prepares various fuel price forecasts for numerous delivery points.
Please reference the appropriate forecast and enter the values ***in Column D in Main Table***.
Columns 3 below picks up the fuel prices from the main table. Columns 4 & 5 can be used to do some calculations if preferred.
Necessary calculations can be performed to determine each current year dollar value of the annual fuel costs.
The respective annual costs are to be entered in column 6.
***NOTE: Annual Fuel costs (if applicable) may start in the in-service year .***

RETURN

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Year | | Annual Fuel price $cdn/l | Fuel Efficiency 3.25kwh/l Energy Forecast (MWh) | | Annual Fuel costs (Current $$) | Comments / Explanations |
| 0 | 2007 | - | | | | |
| 1 | 2008 | - | | | | |
| 2 | 2009 | 0.68 | 3.25 | 2335 | 485,680.00 | |
| 3 | 2010 | 0.68 | 3.25 | 2386 | 497,022.15 | |
| 4 | 2011 | 0.70 | 3.25 | 2437 | 521,892.92 | |
| 5 | 2012 | 0.72 | 3.25 | 2489 | 554,472.62 | |
| 6 | 2013 | 0.75 | 3.25 | 2540 | 583,809.23 | |
| 7 | 2014 | 0.77 | 3.25 | 2594 | 613,780.31 | |
| 8 | 2015 | 0.79 | 3.25 | 2649 | 644,725.85 | |
| 9 | 2016 | 0.81 | 3.25 | 2705 | 674,169.23 | |
| 10 | 2017 | 0.83 | 3.25 | 2763 | 706,477.85 | |
| 11 | 2018 | 0.85 | 3.25 | 2822 | 738,061.54 | |
| 12 | 2019 | 0.87 | 3.25 | 2882 | 772,376.00 | |
| 13 | 2020 | 0.89 | 3.25 | 2943 | 805,929.23 | |
| 14 | 2021 | 0.91 | 3.25 | 3006 | 840,755.08 | |
| 15 | 2022 | 0.93 | 3.25 | 3069 | 876,317.54 | |
| 16 | 2023 | 0.95 | 3.25 | 3135 | 914,455.38 | |
| 17 | 2024 | 0.97 | 3.25 | 3201 | 952,420.62 | |
| 18 | 2025 | 0.99 | 3.25 | 3269 | 993,776.00 | |
| 19 | 2026 | 1.01 | 3.25 | 3339 | 1,035,603.69 | |
| 20 | 2027 | 1.03 | 3.25 | 3410 | 1,080,707.69 | |
| 21 | 2028 | 1.05 | 3.25 | 3482 | 1,126,700.20 | |
| 22 | 2029 | 1.07 | 3.25 | 3556 | 1,174,808.55 | |
| 23 | 2030 | 1.10 | 3.25 | 3632 | 1,225,115.20 | |
| 24 | 2031 | 1.12 | 3.25 | 3709 | 1,277,361.04 | |
| 25 | 2032 | 1.14 | 3.25 | 3788 | 1,331,964.18 | |
| 26 | 2033 | 1.17 | 3.25 | 3869 | 1,389,015.35 | |
| 27 | 2034 | - | | | | |
| 28 | 2035 | - | | | | |
| 29 | 2036 | - | | | | |
| 30 | 2037 | - | | | | |
| 31 | 2038 | - | | | | |
| 32 | 2039 | - | | | | |
| 33 | 2040 | - | | | | |
| 34 | 2041 | - | | | | |
| 35 | 2042 | - | | | | |
| 36 | 2043 | - | | | | |
| 37 | 2044 | - | | | | |
| 38 | 2045 | - | | | | |
| 39 | 2046 | - | | | | |
| 40 | 2047 | - | | | | |

**PROJECT COST / BENEFIT ANALYSIS TEMPLATE**

**Rigolet Diesel Plant Automation**

**Plant Automation**

**Automation**

***Note: Costs are shown as positive values;Benefits as negative values***

| | |
|---|---|
| Current Year | **2007** |
| Present Worth Year | 2007 |
| Number of Years in Study | 26 |
| Discount Rate | 7.0% |
| Total In-service Project Cost | $ 347,600 |
| In-service Year | 2009 |
| Other Project Cost ***after*** In-service (if applicable) | $ - |
| Other Project Year (if applicable) | |
| Replacement Cost (if applicable) | $ - |
| Replacement Year (if applicable) | |
| Project cost in Ending (**E**) or Beginning (**B**) Year $$ | |
| O&M costs - 75% Materials, 25% Labour (**75**) or 50% Materials, 50% Labour (**50**) or User (**U**) | |

| A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | | Annual O&M Cost $ | Annual Fuel Price (if applicable) | Annual Fuel Cost $ | Other Cost $ | Total Costs $ | Benefit 1 *(specify)* $ | Benefit 2 *(specify)* $ | NET $ | P.W. January 2007 | Cumulative Present Worth |
| 0 | 2007 | - | | - | - | - | - | - | - | - | - |
| 1 | 2008 | - | | - | - | - | - | - | - | - | - |
| 2 | 2009 | - | 0.68 | 457,525 | - | 805,125 | - | - | 805,125 | 677,084 | 677,084 |
| 3 | 2010 | - | 0.68 | 468,209 | - | 468,209 | - | - | 468,209 | 357,195 | 1,034,278 |
| 4 | 2011 | - | 0.70 | 491,638 | - | 491,638 | - | - | 491,638 | 350,531 | 1,384,809 |
| 5 | 2012 | - | 0.72 | 522,329 | - | 522,329 | - | - | 522,329 | 348,050 | 1,732,859 |
| 6 | 2013 | - | 0.75 | 549,965 | - | 549,965 | - | - | 549,965 | 342,491 | 2,075,350 |
| 7 | 2014 | - | 0.77 | 578,199 | - | 578,199 | - | - | 578,199 | 336,517 | 2,411,867 |
| 8 | 2015 | - | 0.79 | 607,350 | - | 607,350 | - | - | 607,350 | 330,358 | 2,742,225 |
| 9 | 2016 | - | 0.81 | 635,087 | - | 635,087 | - | - | 635,087 | 322,846 | 3,065,071 |
| 10 | 2017 | - | 0.83 | 665,523 | - | 665,523 | - | - | 665,523 | 316,185 | 3,381,256 |
| 11 | 2018 | - | 0.85 | 695,275 | - | 695,275 | - | - | 695,275 | 308,711 | 3,689,967 |
| 12 | 2019 | - | 0.87 | 727,601 | - | 727,601 | - | - | 727,601 | 301,928 | 3,991,895 |
| 13 | 2020 | - | 0.89 | 759,209 | - | 759,209 | - | - | 759,209 | 294,434 | 4,286,330 |
| 14 | 2021 | - | 0.91 | 792,016 | - | 792,016 | - | - | 792,016 | 287,063 | 4,573,392 |
| 15 | 2022 | - | 0.93 | 825,517 | - | 825,517 | - | - | 825,517 | 279,631 | 4,853,023 |
| 16 | 2023 | - | 0.95 | 861,443 | - | 861,443 | - | - | 861,443 | 272,711 | 5,125,734 |
| 17 | 2024 | - | 0.97 | 897,208 | - | 897,208 | - | - | 897,208 | 265,451 | 5,391,186 |
| 18 | 2025 | - | 0.99 | 936,166 | - | 936,166 | - | - | 936,166 | 258,858 | 5,650,043 |
| 19 | 2026 | - | 1.01 | 975,569 | - | 975,569 | - | - | 975,569 | 252,105 | 5,902,149 |
| 20 | 2027 | - | 1.03 | 1,018,058 | - | 1,018,058 | - | - | 1,018,058 | 245,874 | 6,148,023 |
| 21 | 2028 | - | 1.05 | 1,061,384 | - | 1,061,384 | - | - | 1,061,384 | 239,568 | 6,387,592 |
| 22 | 2029 | - | 1.07 | 1,106,704 | - | 1,106,704 | - | - | 1,106,704 | 233,456 | 6,621,047 |
| 23 | 2030 | - | 1.10 | 1,154,094 | - | 1,154,094 | - | - | 1,154,094 | 227,526 | 6,848,573 |
| 24 | 2031 | - | 1.12 | 1,203,311 | - | 1,203,311 | - | - | 1,203,311 | 221,709 | 7,070,282 |
| 25 | 2032 | - | 1.14 | 1,254,749 | - | 1,254,749 | - | - | 1,254,749 | 216,062 | 7,286,344 |
| 26 | 2033 | - | 1.17 | 1,308,493 | - | 1,308,493 | - | - | 1,308,493 | 210,576 | 7,496,920 |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |
| | | | | | | - | | | - | - | - |

Assumptions & Notes:

| | | |
|---|---|---|
| Date Revised | | |
| Date Printed | 11-Sep-2007 | 4:13 PM |

## Scratch Pad area for Annual Fuel costs

This area is used to enter Fuel costs associated with the project. ***NOTE: Fuel Prices are to be entered in Column D in Main Table***
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Necessary calculations can be performed to determine each current year dollar value of the annual fuel costs.
The respective annual costs are to be entered in column 6.
***NOTE: Annual Fuel costs (if applicable) may start in the in-service year .***

RETURN

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Year | | Annual Fuel price (if applicable) | Fuel Efficiency 3.45kwh/l Energy Forecast (MWh) | | Annual Fuel costs (Current $$) | Comments / Explanations |
| 0 | 2007 | - | | | | |
| 1 | 2008 | - | | | | |
| 2 | 2009 | 0.68 | 3.45 | 2335 | 457,524.64 | |
| 3 | 2010 | 0.68 | 3.45 | 2386 | 468,209.28 | |
| 4 | 2011 | 0.70 | 3.45 | 2437 | 491,638.26 | |
| 5 | 2012 | 0.72 | 3.45 | 2489 | 522,329.28 | |
| 6 | 2013 | 0.75 | 3.45 | 2540 | 549,965.22 | |
| 7 | 2014 | 0.77 | 3.45 | 2594 | 578,198.84 | |
| 8 | 2015 | 0.79 | 3.45 | 2649 | 607,350.43 | |
| 9 | 2016 | 0.81 | 3.45 | 2705 | 635,086.96 | |
| 10 | 2017 | 0.83 | 3.45 | 2763 | 665,522.61 | |
| 11 | 2018 | 0.85 | 3.45 | 2822 | 695,275.36 | |
| 12 | 2019 | 0.87 | 3.45 | 2882 | 727,600.58 | |
| 13 | 2020 | 0.89 | 3.45 | 2943 | 759,208.70 | |
| 14 | 2021 | 0.91 | 3.45 | 3006 | 792,015.65 | |
| 15 | 2022 | 0.93 | 3.45 | 3069 | 825,516.52 | |
| 16 | 2023 | 0.95 | 3.45 | 3135 | 861,443.48 | |
| 17 | 2024 | 0.97 | 3.45 | 3201 | 897,207.83 | |
| 18 | 2025 | 0.99 | 3.45 | 3269 | 936,165.80 | |
| 19 | 2026 | 1.01 | 3.45 | 3339 | 975,568.70 | |
| 20 | 2027 | 1.03 | 3.45 | 3410 | 1,018,057.97 | |
| 21 | 2028 | 1.05 | 3.45 | 3482 | 1,061,384.25 | |
| 22 | 2029 | 1.07 | 3.45 | 3556 | 1,106,703.71 | |
| 23 | 2030 | 1.10 | 3.45 | 3632 | 1,154,094.03 | |
| 24 | 2031 | 1.12 | 3.45 | 3709 | 1,203,311.12 | |
| 25 | 2032 | 1.14 | 3.45 | 3788 | 1,254,748.86 | |
| 26 | 2033 | 1.17 | 3.45 | 3869 | 1,308,492.72 | |
| 27 | 2034 | - | | | | |
| 28 | 2035 | - | | | | |
| 29 | 2036 | - | | | | |
| 30 | 2037 | - | | | | |
| 31 | 2038 | - | | | | |
| 32 | 2039 | - | | | | |
| 33 | 2040 | - | | | | |
| 34 | 2041 | - | | | | |
| 35 | 2042 | - | | | | |
| 36 | 2043 | - | | | | |
| 37 | 2044 | - | | | | |
| 38 | 2045 | - | | | | |
| 39 | 2046 | - | | | | |
| 40 | 2047 | - | | | | |