

March 30, 2012

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Sent By Courier**

Ms. Kirsten Walli  
Board Secretary  
Ontario Energy Board  
Suite 2700  
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On January 1, 2012, Macleod Dixon joined  
Norton Rose OR to create Norton Rose Canada.

Your reference  
EB-2011-0271

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Dear Ms. Walli:

**Halton Hills Hydro Inc. ("HHH")  
Distribution Rates 2012 (EB-2011-0271)**

On behalf of HHH, please find enclosed HHH's responses to undertakings from the oral hearing held on March 22, 2012.

Yours very truly,

*Original signed by*

Richard King

/mm

Enclosure

Cop(y/ies) to: All Intervenors in EB-2011-0271  
Art Skidmore (HHH)  
David Smelsky (HHH)

DOCSTOR: 2392743\1

**UNDERTAKING NO. J1.1: TO PROVIDE A SCHEDULE SHOWING GROSS ASSET VALUES AND ACCUMULATIVE DEPRECIATION UNDER CGAAP AND MIFRS FOR THE ORIGINAL AND REVISED CALCULATIONS IN A FORMAT SIMILAR TO TOP HALF OF TABLE JT-3.**

**RESPONSE:**

Please see attached.

Halton Hills Hydro Inc.  
PP& E Deferral Account  
Proposal

| Option             |   | 2012        | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    | 2021    | 2022    | 2023    | 2024    | 2025    | 2026    | 2027    | 2028    | 2029    | 2030   | 2031   |
|--------------------|---|-------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|
| 1                  | NPV of HHHI's 20 year amortization - Adjusted every four years to coincide with rate rebasing |             |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Net Present Value: |   | (\$863,792) |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Opening            |   | 836,717     | 794,881 | 753,045 | 711,209 | 669,374 | 627,538 | 585,702 | 543,866 | 502,030 | 460,194 | 418,359 | 376,523 | 334,687 | 292,851 | 251,015 | 209,179 | 167,343 | 125,508 | 83,672 | 41,836 |
| Amortization       |   | 41,836      | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836 | 41,836 |
| Closing            |   | 794,881     | 753,045 | 711,209 | 669,374 | 627,538 | 585,702 | 543,866 | 502,030 | 460,194 | 418,359 | 376,523 | 334,687 | 292,851 | 251,015 | 209,179 | 167,343 | 125,508 | 83,672  | 41,836 | 0      |
| Average            |   | 815,799     | 773,963 | 732,127 | 690,292 | 648,456 | 606,620 | 564,784 | 522,948 | 481,112 | 439,276 | 397,441 | 355,605 | 313,769 | 271,933 | 230,097 | 188,261 | 146,425 | 104,590 | 62,754 | 20,918 |
|                    | Accum Total   |             |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Return             | 596,579   | 50,580      | 50,580  | 50,580  | 50,580  | 40,204  | 40,204  | 40,204  | 40,204  | 29,829  | 29,829  | 29,829  | 29,829  | 19,454  | 19,454  | 19,454  | 19,454  | 9,078   | 9,078   | 9,078  | 9,078  |
| Amortization       | 836,717   | 41,836      | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836 | 41,836 |
| Total              | 1,433,296   | 92,415      | 92,415  | 92,415  | 92,415  | 82,040  | 82,040  | 82,040  | 82,040  | 71,665  | 71,665  | 71,665  | 71,665  | 61,290  | 61,290  | 61,290  | 61,290  | 50,914  | 50,914  | 50,914 | 50,914 |
| 2                  | NPV of HHHI's 20 year amortization - Declining Balance Approach                               |             |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Net Present Value: |   | (\$822,080) |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Opening            |   | 836,717     | 794,881 | 753,045 | 711,209 | 669,374 | 627,538 | 585,702 | 543,866 | 502,030 | 460,194 | 418,359 | 376,523 | 334,687 | 292,851 | 251,015 | 209,179 | 167,343 | 125,508 | 83,672 | 41,836 |
| Amortization       |   | 41,836      | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836 | 41,836 |
| Closing            |   | 794,881     | 753,045 | 711,209 | 669,374 | 627,538 | 585,702 | 543,866 | 502,030 | 460,194 | 418,359 | 376,523 | 334,687 | 292,851 | 251,015 | 209,179 | 167,343 | 125,508 | 83,672  | 41,836 | 0      |
| Average            |   | 815,799     | 773,963 | 732,127 | 690,292 | 648,456 | 606,620 | 564,784 | 522,948 | 481,112 | 439,276 | 397,441 | 355,605 | 313,769 | 271,933 | 230,097 | 188,261 | 146,425 | 104,590 | 62,754 | 20,918 |
|                    | Accum Total   |             |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Return             | 518,765   | 50,580      | 47,986  | 45,392  | 42,798  | 40,204  | 37,610  | 35,017  | 32,423  | 29,829  | 27,235  | 24,641  | 22,047  | 19,454  | 16,860  | 14,266  | 11,672  | 9,078   | 6,485   | 3,891  | 1,297  |
| Amortization       | 836,717   | 41,836      | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836 | 41,836 |
| Total              | 1,355,482   | 92,415      | 89,822  | 87,228  | 84,634  | 82,040  | 79,446  | 76,852  | 74,259  | 71,665  | 69,071  | 66,477  | 63,883  | 61,290  | 58,696  | 56,102  | 53,508  | 50,914  | 48,320  | 45,727 | 43,133 |
| 3                  | NPV of OEB Approach   |             |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Net Present Value: |   | (\$900,458) |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Opening            |   | 836,717     | 627,538 | 418,359 | 209,179 |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Amortization       |   | 209,179     | 209,179 | 209,179 | 209,179 |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Closing            |   | 627,538     | 418,359 | 209,179 | -       |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
|                    | Accum Total   |             |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Return             | 207,506   | 51,876      | 51,876  | 51,876  | 51,876  |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Amortization       | 836,717   | 209,179     | 209,179 | 209,179 | 209,179 |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Total              | 1,044,223   | 261,056     | 261,056 | 261,056 | 261,056 |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |

|                     |           |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
|---------------------|-----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|--------|
| PP&E amount         | 836,717   |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Amortization Period | 20        |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Retrun Rate         | 6.200%    |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
|                     |           | 2012    | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    | 2021    | 2022    | 2023    | 2024    | 2025    | 2026    | 2027    | 2028    | 2029    | 2030   | 2031   |
| Opening             |           | 836,717 | 794,881 | 753,045 | 711,209 | 669,374 | 627,538 | 585,702 | 543,866 | 502,030 | 460,194 | 418,359 | 376,523 | 334,687 | 292,851 | 251,015 | 209,179 | 167,343 | 125,508 | 83,672 | 41,836 |
| Amortization        |           | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836 | 41,836 |
| Closing             |           | 794,881 | 753,045 | 711,209 | 669,374 | 627,538 | 585,702 | 543,866 | 502,030 | 460,194 | 418,359 | 376,523 | 334,687 | 292,851 | 251,015 | 209,179 | 167,343 | 125,508 | 83,672  | 41,836 | 0      |
| Average             |           | 815,799 | 773,963 | 732,127 | 690,292 | 648,456 | 606,620 | 564,784 | 522,948 | 481,112 | 439,276 | 397,441 | 355,605 | 313,769 | 271,933 | 230,097 | 188,261 | 146,425 | 104,590 | 62,754 | 20,918 |
| Accum Total         |           |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |
| Return              | 596,579   | 50,580  | 50,580  | 50,580  | 50,580  | 40,204  | 40,204  | 40,204  | 40,204  | 29,829  | 29,829  | 29,829  | 29,829  | 19,454  | 19,454  | 19,454  | 19,454  | 9,078   | 9,078   | 9,078  | 9,078  |
| Amortization        | 836,717   | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836 | 41,836 |
| Total               | 1,433,296 | 92,415  | 92,415  | 92,415  | 92,415  | 82,040  | 82,040  | 82,040  | 82,040  | 71,665  | 71,665  | 71,665  | 71,665  | 61,290  | 61,290  | 61,290  | 61,290  | 50,914  | 50,914  | 50,914 | 50,914 |
| Normalized Amount   | 71,665    |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |        |

PV of HHHI's 20 year amortization, Modified Declining Balance  
(\$863,792)

PV of OEB Approach  
(\$900,458)  
-

|                     |           |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |   |   |
|---------------------|-----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|---|---|
| PP&E amount         | 836,717   |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |   |   |
| Amortization Period | 20        |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |   |   |
| Return Rate         | 6.200%    |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |   |   |
|                     |           | 2012    | 2013    | 2014    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    | 2021    | 2022    | 2023    | 2024    | 2025    | 2026    | 2027    | 2028    | 2029    | 2030    | 2031   | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 |   |   |
| Opening             | 836,717   | 794,881 | 753,045 | 711,209 | 669,374 | 627,538 | 585,702 | 543,866 | 502,030 | 460,194 | 418,359 | 376,523 | 334,687 | 292,851 | 251,015 | 209,179 | 167,343 | 125,508 | 83,672  | 41,836  | 0      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |   |   |
| Amortization        | 41,836    | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 0      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0 |   |
| Closing             | 794,881   | 753,045 | 711,209 | 669,374 | 627,538 | 585,702 | 543,866 | 502,030 | 460,194 | 418,359 | 376,523 | 334,687 | 292,851 | 251,015 | 209,179 | 167,343 | 125,508 | 83,672  | 41,836  | 0       | 0      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0 |   |
| Average             | 815,799   | 773,963 | 732,127 | 690,292 | 648,456 | 606,620 | 564,784 | 522,948 | 481,112 | 439,276 | 397,441 | 355,605 | 313,769 | 271,933 | 230,097 | 188,261 | 146,425 | 104,590 | 62,754  | 20,918  | 0      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0 |   |
| Accum Total         | 518,765   | 50,580  | 47,986  | 45,392  | 42,798  | 40,204  | 37,610  | 35,017  | 32,423  | 29,829  | 27,235  | 24,641  | 22,047  | 19,454  | 16,860  | 14,266  | 11,672  | 9,078   | 6,485   | 3,891   | 1,297  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |   |   |
| Return              | 41,836    | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 41,836  | 0      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0 |   |
| Amortization        | 836,717   | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 836,717 | 0      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0 | 0 |
| Total               | 1,355,482 | 92,415  | 89,822  | 87,228  | 84,634  | 82,040  | 79,446  | 76,852  | 74,259  | 71,665  | 69,071  | 66,477  | 63,883  | 61,290  | 58,696  | 56,102  | 53,508  | 50,914  | 48,320  | 45,727  | 43,133 | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0 | 0 |
| Normalized Amount   | 67,774    |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |         |        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |   |   |

NPV of HRRH's 20 year amortization Approach  
(\$822,080)

NPV of OEB Approach  
(\$900,458)

| PP&E Deferral Accounts on Transition to MIFRS  |                   |                   |                  |                  |                  |                  |
|--|-------------------|-------------------|------------------|------------------|------------------|------------------|
|  | 2010              | 2011              | 2012             | 2013             | 2014             | 2015             |
| <b>PP&amp;E Values Under CGAAP</b>   |                   |                   |                  |                  |                  |                  |
| Opening Net PP&E   | 28,170,052        | 27,281,803        |                  |                  |                  |                  |
| Additions  | 1,860,433         | 2,835,783         |                  |                  |                  |                  |
| Depreciations  | (2,748,682)       | (2,115,000)       |                  |                  |                  |                  |
| <b>Closing Net PP&amp;E</b>  | <b>27,281,803</b> | <b>28,002,586</b> | -                | -                | -                | -                |
| <b>PP&amp;E Values CGAPP for 2010; MIFRS for 2011</b>  |                   |                   |                  |                  |                  |                  |
| Opening Net PP&E   | 28,170,052        | 27,281,803        |                  |                  |                  |                  |
| Additions  | 1,860,433         | 2,655,235         |                  |                  |                  |                  |
| Depreciations  | (2,748,682)       | (1,097,735)       |                  |                  |                  |                  |
| <b>Closing Net PP&amp;E</b>  | <b>27,281,803</b> | <b>28,839,303</b> | -                | -                | -                | -                |
| Difference in Closing Net PP&E, CGAPP vs MIFRS   | -                 | (836,717)         |                  |                  |                  |                  |
| <b>**Adjustment to 2012 Rate Base on rebasing</b>  |                   |                   |                  |                  |                  |                  |
| <b>PP&amp;E Deferral Account Under MIFRS -rebasing in 2012</b>                               |                   |                   |                  |                  |                  |                  |
| <b>Opening Balance</b>   |                   | -                 | <b>(836,717)</b> | <b>(627,538)</b> | <b>(418,359)</b> | <b>(209,179)</b> |
| Amount added in the Year   |                   | (836,717)         | -                |                  |                  |                  |
|  |                   | (836,717)         | (836,717)        | (627,538)        | (418,359)        | (209,179)        |
| Amortize Amount in Deferral Account over 4   |                   |                   |                  |                  |                  |                  |
| <b>Years</b>   |                   | -                 | 209,179          | 209,179          | 209,179          | 209,179          |
| <b>Closing Balance</b>   | -                 | <b>(836,717)</b>  | <b>(627,538)</b> | <b>(418,359)</b> | <b>(209,179)</b> | -                |
| Effect on Revenue Requirement of Including Deferral Account Amortization on Rebasing in 2012 |                   |                   |                  |                  |                  |                  |
| Amortization of deferral Account   |                   |                   | (209,179)        |                  |                  |                  |
| Return on Rate Base - 6.20%  | 6.200%            |                   | (51,876)         |                  |                  |                  |
| <b>Amount of increase (decrease) in 2012 Revenue Requirement on rebasing</b>                 |                   |                   | <b>(261,056)</b> |                  |                  |                  |

NPV of OEB Approach      (\$900,458)

File Number: EB-20XX-XXXX  
Exhibit: X  
Tab: Y  
Schedule: Z  
Page: xx

Date:

Appendix 2-B  
Fixed Asset Continuity Schedule - CGAAP (including land)

Year<sup>1</sup> 2011

|           |      |   | Cost              |                 |              |           | Accumulated Depreciation |                 |              |           |                 |                |
|-----------|------|---|-------------------|-----------------|--------------|-----------|--------------------------|-----------------|--------------|-----------|-----------------|----------------|
| CCA Class | OEB  | Description                               | Depreciation Rate | Opening Balance | Additions    | Disposals | Closing Balance          | Opening Balance | Additions    | Disposals | Closing Balance | Net Book Value |
| N/A       | 1805 | Land                                      |                   | \$ 359,609      | \$ 180,000   | \$ -      | \$ 539,609               | \$ -            | \$ -         | \$ -      | \$ -            | \$ 539,609     |
| 47        | 1808 | Buildings                                 |                   | \$ 3,080,205    | \$ -         | \$ -      | \$ 3,080,205             | \$ 598,689      | \$ 72,475    | \$ -      | \$ 671,164      | \$ 2,409,041   |
| 13        | 1810 | Leasehold Improvements                    |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 47        | 1815 | Transformer Station Equipment >50 kV      |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 47        | 1820 | Distribution Station Equipment <50 kV     |                   | \$ 4,223,477    | \$ 109,697   | \$ -      | \$ 4,333,174             | \$ 1,053,166    | \$ 169,655   | \$ -      | \$ 1,222,821    | \$ 3,110,352   |
| 47        | 1825 | Storage Battery Equipment                 |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 47        | 1830 | Poles, Towers & Fixtures                  |                   | \$ 15,977,374   | \$ 512,794   | \$ -      | \$ 16,490,168            | \$ 12,306,771   | \$ 749,437   | \$ -      | \$ 13,056,208   | \$ 3,433,960   |
| 47        | 1835 | Overhead Conductors & Devices             |                   | \$ 5,607,599    | \$ 584,688   | \$ -      | \$ 6,192,287             | \$ 357,649      | \$ 255,004   | \$ -      | \$ 612,652      | \$ 5,579,635   |
| 47        | 1840 | Underground Conduit                       |                   | \$ 970,085      | \$ 420,789   | \$ -      | \$ 1,390,874             | \$ 78,395       | \$ 169,486   | \$ -      | \$ 247,882      | \$ 1,142,992   |
| 47        | 1845 | Underground Conductors & Devices          |                   | \$ 4,675,723    | \$ 304,465   | \$ -      | \$ 4,980,188             | \$ 226,091      | \$ 72,478    | \$ -      | \$ 298,569      | \$ 4,681,619   |
| 47        | 1850 | Line Transformers                         |                   | \$ 6,961,088    | \$ 213,753   | \$ -      | \$ 7,174,841             | \$ 327,424      | \$ 308,701   | \$ -      | \$ 636,125      | \$ 6,538,716   |
| 47        | 1855 | Services (Overhead & Underground)         |                   | \$ 2,556,444    | \$ -         | \$ -      | \$ 2,556,444             | \$ 418,500      | \$ 102,258   | \$ -      | \$ 520,758      | \$ 2,035,686   |
| 47        | 1860 | Meters                                    |                   | \$ 1,048,410    | \$ -         | \$ -      | \$ 1,048,410             | \$ 19,920       | \$ 53,797    | \$ -      | \$ 73,716       | \$ 974,693     |
| 47        | 1860 | Meters (Smart Meters)                     |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| N/A       | 1905 | Land                                      |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| CEC       | 1906 | Land Rights                               |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 47        | 1908 | Buildings & Fixtures                      |                   | \$ -            | \$ 124,075   | \$ -      | \$ 124,075               | \$ -            | \$ 1,460     | \$ -      | \$ 1,460        | \$ 122,615     |
| 13        | 1910 | Leasehold Improvements                    |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 8         | 1915 | Office Furniture & Equipment (10 years)   |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 8         | 1915 | Office Furniture & Equipment (5 years)    |                   | \$ 351,062      | \$ 48,044    | \$ -      | \$ 399,106               | \$ 256,806      | \$ 14,409    | \$ -      | \$ 271,215      | \$ 127,891     |
| 10        | 1920 | Computer Equipment - Hardware             |                   | \$ 1,033,364    | \$ 22,079    | \$ -      | \$ 1,055,443             | \$ 967,411      | \$ 60,438    | \$ -      | \$ 1,027,850    | \$ 27,593      |
| 45        | 1920 | Computer Equip.-Hardware(Post Mar. 22/04) |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 45        | 1920 | Computer Equip.-Hardware(Post Mar. 19/07) |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 12        | 1925 | Computer Software                         |                   | \$ 1,062,621    | \$ 94,436    | \$ -      | \$ 1,157,057             | \$ 1,032,946    | \$ 35,400    | \$ -      | \$ 1,068,345    | \$ 88,711      |
| 10        | 1930 | Transportation Equipment                  |                   | \$ 2,291,028    | \$ 228,000   | \$ -      | \$ 2,519,028             | \$ 1,321,349    | \$ 162,418   | \$ -      | \$ 1,483,766    | \$ 1,035,262   |
| 8         | 1935 | Stores Equipment                          |                   | \$ 53,152       | \$ 24,659    | \$ -      | \$ 77,811                | \$ 52,043       | \$ 2,679     | \$ -      | \$ 49,365       | \$ 28,447      |
| 8         | 1940 | Tools, Shop & Garage Equipment            |                   | \$ 558,091      | \$ -         | \$ -      | \$ 558,091               | \$ 354,902      | \$ 1,924     | \$ -      | \$ 352,978      | \$ 205,113     |
| 8         | 1945 | Measurement & Testing Equipment           |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 8         | 1950 | Power Operated Equipment                  |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 8         | 1955 | Communications Equipment                  |                   | \$ -            | \$ 34,816    | \$ -      | \$ 34,816                | \$ -            | \$ -         | \$ -      | \$ -            | \$ 34,816      |
| 8         | 1955 | Communication Equipment (Smart Meters)    |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 8         | 1960 | Miscellaneous Equipment                   |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
| 47        | 1975 | Load Management Controls Utility Premises |                   | \$ 563,902      | \$ -         | \$ -      | \$ 563,902               | \$ 298,141      | \$ 56,390    | \$ -      | \$ 354,531      | \$ 209,371     |
| 47        | 1980 | System Supervisor Equipment               |                   | \$ 833,241      | \$ 57,086    | \$ -      | \$ 890,327               | \$ 363,824      | \$ 61,073    | \$ -      | \$ 424,897      | \$ 465,430     |
| 47        | 1985 | Miscellaneous Fixed Assets                |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ 11,239    | \$ -      | \$ 11,239       | \$ 11,239      |
| 47        | 1995 | Contributions & Grants                    |                   | \$ 5,912,892    | \$ 123,597   | \$ -      | \$ 6,036,489             | \$ 1,022,032    | \$ 236,516   | \$ -      | \$ 1,258,548    | \$ 4,777,942   |
|           | etc. |   |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
|           |      |   |                   | \$ -            | \$ -         | \$ -      | \$ -                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -           |
|           |      | Total                                     |                   | \$ 46,293,583   | \$ 2,835,783 | \$ -      | \$ 49,129,366            | \$ 19,011,994   | \$ 2,115,000 | \$ -      | \$ 21,126,994   | \$ 28,002,372  |
|           |      |   |                   | -\$ 0           |              |           |                          |                 |              |           |                 |                |

-\$ 0

Less: Fully Allocated Depreciation  
Transportation -\$ 162,418  
Stores Equipment  
Net Depreciation -\$ 1,952,582

<sup>1</sup> Provide a Fixed Asset Continuity Schedule for 5 historic Years, Bridge Year and Test Year

Notes:

- 1 Tables in the format outlined above covering all fixed asset accounts should be submitted for the Test Year, Bridge Year and all relevant historical years. At a minimum , the applicant must provide data for the earlier of: 1) all historical years back to its last rebasing; or 2) at least three years of historical actuals, in addition to Bridge Year and Test Year forecasts.
- 2 The "CCA Class" for fixed assets should agree with the CCA Class used for tax purposes in Tax Returns. Fixed Assets sub-components may be used where the underlying asset components are classified under multiple CCA Classes for tax purposes. If an applicant uses any different classes from those shown in the table, an explanation should be provided. (also see note 3 below).
- 3 The table may need to be customized for a utility's asset categories or for any new asset accounts announced or authorized by the Board.

File Number: EB-20XX-XXXX  
Exhibit: X  
Tab: Y  
Schedule: Z  
Page: xx  
Date:

**Appendix 2-B  
Fixed Asset Continuity Schedule**

Year <sup>1</sup>                      2011

|           |      |   | Cost            |              |           |                 | Accumulated Depreciation |              |           |                 |                |  |
|-----------|------|---|-----------------|--------------|-----------|-----------------|--------------------------|--------------|-----------|-----------------|----------------|--|
| CCA Class | OEB  | Description                               | Opening Balance | Additions    | Disposals | Closing Balance | Opening Balance          | Additions    | Disposals | Closing Balance | Net Book Value |  |
| N/A       | 1805 | Land                                      | \$ 359,609      | \$ 180,000   | \$ -      | \$ 539,609      | \$ -                     | \$ -         | \$ -      | \$ -            | \$ 539,609     |  |
| 47        | 1808 | Buildings                                 | \$ 3,080,205    | \$ -         | \$ -      | \$ 3,080,205    | \$ 598,689               | \$ 79,825    | \$ -      | \$ 678,514      | \$ 2,401,691   |  |
| 13        | 1810 | Leasehold Improvements                    | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 47        | 1815 | Transformer Station Equipment >50 kV      | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 47        | 1820 | Distribution Station Equipment <50 kV     | \$ 4,223,477    | \$ 42,438    | \$ -      | \$ 4,265,915    | \$ 1,053,166             | \$ 148,699   | \$ -      | \$ 1,201,865    | \$ 3,064,050   |  |
| 47        | 1825 | Storage Battery Equipment                 | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 47        | 1830 | Poles, Towers & Fixtures                  | \$ 15,977,374   | \$ 467,325   | \$ -      | \$ 16,444,699   | \$ 12,306,557            | \$ 257,429   | \$ -      | \$ 12,563,985   | \$ 3,880,713   |  |
| 47        | 1835 | Overhead Conductors & Devices             | \$ 5,607,599    | \$ 540,451   | \$ -      | \$ 6,148,050    | \$ 357,649               | \$ 88,504    | \$ -      | \$ 446,153      | \$ 5,701,897   |  |
| 47        | 1840 | Underground Conduit                       | \$ 970,085      | \$ 412,292   | \$ -      | \$ 1,382,377    | \$ 78,395                | \$ 20,042    | \$ -      | \$ 98,438       | \$ 1,283,939   |  |
| 47        | 1845 | Underground Conductors & Devices          | \$ 4,675,723    | \$ 297,574   | \$ -      | \$ 4,973,296    | \$ 226,091               | \$ 81,617    | \$ -      | \$ 307,708      | \$ 4,665,588   |  |
| 47        | 1850 | Line Transformers                         | \$ 6,961,088    | \$ 205,299   | \$ -      | \$ 7,166,388    | \$ 327,424               | \$ 121,276   | \$ -      | \$ 448,700      | \$ 6,717,687   |  |
| 47        | 1855 | Services (Overhead & Underground)         | \$ 2,556,444    | \$ -         | \$ -      | \$ 2,556,444    | \$ 418,500               | \$ 60,783    | \$ -      | \$ 479,283      | \$ 2,077,161   |  |
| 47        | 1860 | Meters                                    | \$ 1,048,410    | \$ -         | \$ -      | \$ 1,048,410    | \$ 19,920                | \$ 28,270    | \$ -      | \$ 48,190       | \$ 1,000,220   |  |
| 47        | 1860 | Meters (Smart Meters)                     | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| N/A       | 1905 | Land                                      | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| CEC       | 1906 | Land Rights                               | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 47        | 1908 | Buildings & Fixtures                      | \$ -            | \$ 124,075   | \$ -      | \$ 124,075      | \$ -                     | \$ -         | \$ -      | \$ -            | \$ 124,075     |  |
| 13        | 1910 | Leasehold Improvements                    | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 8         | 1915 | Office Furniture & Equipment (10 years)   | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 8         | 1915 | Office Furniture & Equipment (5 years)    | \$ 351,062      | \$ 48,044    | \$ -      | \$ 399,106      | \$ 256,806               | \$ 3,205     | \$ -      | \$ 260,011      | \$ 139,095     |  |
| 10        | 1920 | Computer Equipment - Hardware             | \$ 1,033,364    | \$ 22,079    | \$ -      | \$ 1,055,443    | \$ 967,411               | \$ 19,460    | \$ -      | \$ 986,872      | \$ 68,571      |  |
| 45        | 1920 | Computer Equip.-Hardware(Post Mar. 22/04) | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 45.1      | 1920 | Computer Equip.-Hardware(Post Mar. 19/07) | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 12        | 1925 | Computer Software                         | \$ 1,062,621    | \$ 84,175    | \$ -      | \$ 1,146,795    | \$ 1,032,946             | \$ 81,649    | \$ -      | \$ 1,114,595    | \$ 32,200      |  |
| 10        | 1930 | Transportation Equipment                  | \$ 2,291,028    | \$ 228,000   | \$ -      | \$ 2,519,028    | \$ 1,321,349             | \$ 160,092   | \$ -      | \$ 1,481,441    | \$ 1,037,587   |  |
| 8         | 1935 | Stores Equipment                          | \$ 53,152       | \$ 24,659    | \$ -      | \$ 77,811       | \$ 52,043                | \$ 2,679     | \$ -      | \$ 49,365       | \$ 28,447      |  |
| 8         | 1940 | Tools, Shop & Garage Equipment            | \$ 558,091      | \$ -         | \$ -      | \$ 558,091      | \$ 354,902               | \$ 17,085    | \$ -      | \$ 371,986      | \$ 186,105     |  |
| 8         | 1945 | Measurement & Testing Equipment           | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 8         | 1950 | Power Operated Equipment                  | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 8         | 1955 | Communications Equipment                  | \$ -            | \$ 33,023    | \$ -      | \$ 33,023       | \$ -                     | \$ -         | \$ -      | \$ -            | \$ 33,023      |  |
| 8         | 1955 | Communication Equipment (Smart Meters)    | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 8         | 1960 | Miscellaneous Equipment                   | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 47        | 1975 | Load Management Controls Utility Premises | \$ 563,902      | \$ -         | \$ -      | \$ 563,902      | \$ 298,141               | \$ 11,969    | \$ -      | \$ 310,110      | \$ 253,792     |  |
| 47        | 1980 | System Supervisor Equipment               | \$ 833,241      | \$ 56,400    | \$ -      | \$ 889,642      | \$ 363,824               | \$ 38,797    | \$ -      | \$ 402,621      | \$ 487,021     |  |
| 47        | 1985 | Miscellaneous Fixed Assets                | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
| 47        | 1995 | Contributions & Grants                    | \$ 5,912,892    | \$ 110,598   | \$ -      | \$ 6,023,491    | \$ 1,022,032             | \$ 118,289   | \$ -      | \$ 1,140,321    | \$ 4,883,169   |  |
|           | etc. |   | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
|           |      |   | \$ -            | \$ -         | \$ -      | \$ -            | \$ -                     | \$ -         | \$ -      | \$ -            | \$ -           |  |
|           |      | Total                                     | \$ 46,293,583   | \$ 2,655,235 | \$ -      | \$ 48,948,818   | \$ 19,011,780            | \$ 1,097,735 | \$ -      | \$ 20,109,515   | \$ 28,839,304  |  |
|           |      |   | \$ -            | \$ 0         |           |                 |                          |              |           |                 |                |  |

-\$ 0

|    |                  |
|----|------------------|
| 10 | Transportation   |
| 8  | Stores Equipment |

Less: Fully Allocated Depreciation  
Transportation                      -\$ 160,092  
Stores Equipment  
Net Depreciation                      -\$ 937,643

Provide a Fixed Asset Continuity Schedule for 5 historic Years, Bridge Year and Test

**Notes:**

- Tables in the format outlined above covering all fixed asset accounts should be submitted for the Test Year, Bridge Year and all relevant historical years. At a minimum , the applicant must provide data for the earlier of: 1) all historical years back to its last rebasing; or 2) at least three years of historical actuals, in addition to Bridge Year and Test Year forecasts.
- The "CCA Class" for fixed assets should agree with the CCA Class used for tax purposes in Tax Returns. Fixed Assets sub-components may be used where the underlying asset components are classified under multiple CCA Classes for tax purposes. If an applicant uses any different classes from those shown in the table, an explanation should be provided. (also see note 3 below).
- The table may need to be customized for a utility's asset categories or for any new asset accounts announced or authorized by the Board.



**UNDERTAKING NO. J1.2: TO PROVIDE TERM OF LOAN ASSOCIATED WITH THE EXPECTED INTEREST RATE NOTED IN INTERROGATORY 62(A).**

**RESPONSE:**

Please see attached.

## David Smelsky

---

**From:** Do, Jessica <jessica.a.do@td.com>  
**Sent:** Thursday, January 12, 2012 4:05 PM  
**To:** David Smelsky  
**Subject:** Fixed rates

Hi David,

Here are the indicative rates as of today for a notional amount of \$5 million:

**For 15 year amortization:**

- 5 year term: 3.2%
- 10 year term: 3.96%

**For 20 year amortization:**

- 5 year term: 3.22%
- 10 year term: 4.08%

I included the 20 year amortization just in case you needed it.

Thanks,

Jessica Do | Account Manager | **TD Commercial Banking**

89 Broadway, 2nd Floor | Orangeville, ON L9W 1K2

T: 519-941-1850 ext.280 | F: 519-941-9061 | E: [jessica.a.do@td.com](mailto:jessica.a.do@td.com)

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**UNDERTAKING NO. J1.3: TO PROVIDE STUDIES IN HALTON HILL'S POSSESSION WITH RESPECT TO TECHNOLOGY BEING USED IN OTHER NORTH AMERICAN AND INTERNATIONAL JURISDICTIONS, HIGHLIGHTING THOSE STUDIES THAT MIRROR WHAT IS BEING PROPOSED IN ONTARIO.**

**RESPONSE:**

Please see attached. In addition to the studies, the decision to proceed with the Green Energy Initiative was made based on HHH's pilot project experience (with four panels), as well as HHH's discussions with individuals at other utilities with these units installed—including individuals at Oakville Hydro, Festival Hydro, and the Public Service Electric and Gas Company (the public utility in New Jersey with 135,000 units installed, with approval of their regulator, the New Jersey Board of Public Utilities).

# The Economic Opportunity of Distributed Smart Solar Systems

Hisham .A. Othman, Ruba A. Amarin

**Abstract--** Leading countries around the world have charted bold strategies over the past 3 years to emerge from the global economic depression. These strategies invariably included substantial investments in Smart Grids and Renewable Technologies. Utilities, manufacturers, consultants, and developers embraced the opportunity, and demonstrated many smart technologies, new and relabeled. An innovative emerging technology that has the potential to empower the electric distribution system and its customers is the Smart Solar technology, which uniquely combines a smart grid infrastructure with reliable solar energy integration. This paper introduces the massively distributed Smart Solar technology and discusses its technical merits from a T&D utility perspective. Furthermore, the paper proposes a methodology to quantify the economic opportunity of a Smart Solar investment, along the electricity value chain, and the sensitivity of this economic opportunity to various utility economic and technical drivers. The proposed techno-economic analysis methodology should provide a valuable guidance to the utility executives to help them chart robust smart grid and renewable technology strategies to meet their stakeholder requirements.

**Index Terms**—smart grid, solar energy, distributed smart solar systems, conservation voltage reduction (CVR).

## I. INTRODUCTION

Solar energy is a renewable resource that is increasingly harvested around the World by PV solar panels. PV solar systems come in three distinct configurations:

*Solar Farms:* Typically installed in remote areas and interconnected to the transmission grid. Farm size is measured in MWs. Typical farms have several large inverters (0.5-1MW each) and have step up transformers.

*Distributed Solar Systems:* Typically installed on poles, carports, rooftops, and small ground lots. Each installation can be from hundreds to thousands of Watts, but the total system can scale up to large MWs. Each panel is typically equipped with its own inverter thus enabling maximum energy harvesting on a panel by panel basis, or several panels are strung together and connected to one inverter [1].

*Distributed Smart Solar Systems:* Similar to Distributed Solar Systems, but come integrated with smart grid capabilities to enable the distribution companies and large

industrial/educational parks to realize substantial benefits of smart grids in addition to the reliable solar energy generation even at high penetration levels and with the ability to operate a reliable micro-grid. Typical capabilities include sensors, communications, local intelligence, and remote distributed monitoring and control [2].

Section II elaborates on the Smart Solar technology, while Section III discusses the two-stage inverter structure. Section IV describes the Generator Emulation Control and how it promotes voltage and frequency. Section V outlines a cost-benefit evaluation methodology of the various solar technologies, and Section VI examines the beneficiaries of the Smart Solar investment along the value chain of the electricity industry. Section VII provides a case study using typical techno-economic data to compare the levelized cost of energy of each of the various technologies, and finally Section VIII provides several recommendations and conclusions.

## II. DISTRIBUTED SMART SOLAR TECHNOLOGY

Distributed Smart Solar (DSS) technology combines an advanced panel-level inverter with the smart grid sensors and communication technologies (Figure 1). A typical configuration is to provide each solar panel with a Smart Energy Module (SEM) connected to the low voltage utility network. All the SEMs form a secure meshed communication network that upload their information to a data center via communication aggregators. Command and control centers and distribution management systems (DMS) access the data center to manage the solar portfolio as a virtual power plant and also to implement several smart grid functions.

The panel level inverter within the SEM is designed to allow maximum power harvesting on a panel-by-panel basis and has the capability to generate or absorb reactive power dynamically [3]. These basic capabilities allow high levels of penetration of the distributed solar systems without the intermittency problems, and are demonstrated to yield 10-15% higher solar harvest than solar farms [4, 5]. The SEM also has measurement sensors to provide real-time information about the low voltage network to the DMS through a secure and open meshed communication network and aggregators that send the information via WAN/LAN/GSM/GPRS.

This technology enables each solar panel to become a node in a smart grid and thus facilitates the implementation of many utility applications such as demand response, conservation voltage reduction (CVR) [6], Volt/VAR loss minimization, predictive maintenance, outage notification, theft detection, and street lighting controls. The financial benefits of this technology go beyond those of solar energy generation to

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those of the smart grid, and thus allow the utility to optimize the generation, the load, and the distribution assets in between.

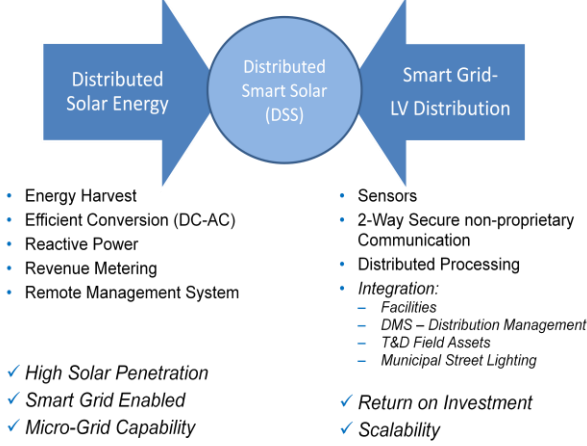


Figure 1. Distributed Smart Solar (DSS) technology.

### III. TWO-STAGE INVERTER STRUCTURE

This section describes the dynamic design and implementation for a two-stage inverter system. This system under study is a true-sine output PWM inverter for distributed renewable generation. Its design targets operation in grid-tie mode, as well as stand-alone mode where the grid is disconnected due to instability and safety issues.

The two-stage inverter structure shown in Figure 2 presents a number of advantages:

1. Natural ability for handling light and reactive loading, through bidirectional power flow in the sinusoidal pulse width modulator (SPWM) stage.
2. Isolation in the dc-dc converter through a light-weight high-frequency transformer.
3. Reduced component stress: the repetitive double-rated power peaks are completely handled by the simple and efficient SPWM stage. The isolated pre-regulator dc-dc converter handles a constant averaged power stress, reducing the stress on its low-voltage high-current input terminal.
4. The power mismatch is handled by a storage capacitor at the dc-link. Since this capacitor operates at a moderately high voltage, and does not directly interface any of the input or output, it can be allowed to swing wider in voltage, thus reducing the amount of capacitance required.

Simplified control structure: the SPWM stage is controlled to regulate the output current or voltage waveforms, while the pre-regulator stage is responsible for optimized utilization of the source. Maintenance of the dc-link voltage is a combined responsibility.

### Operating Modes

The control strategy for the inverter is affected by the operating modes. The inverter has two modes: stand-alone and grid-tie.

When the inverter is not connected to the grid, it is responsible for supplying a regulated voltage to its load. The amount of power processed in the inverter is thus a function of that load. The SPWM stage is then responsible for instantaneous regulation of its output voltage, while the pre-regulator subsystem is then responsible for regulating the dc-link to the appropriate voltage level. When connected to the grid, the inverter attempts to push as much power as is available from the source into the grid. The pre-regulator subsystem is then only responsible for extracting maximum power available. The SPWM stage is then responsible for current injection into the grid, at a level that maintains the dc-link voltage regulated.

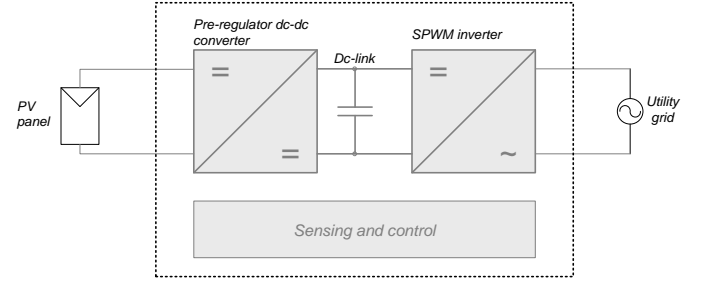


Figure 2. Simplified two-stage inverter block diagram.

### IV. GENERATOR EMULATION CONTROLS

Some of the main problems of integrating PV plants are lack of dynamic reactive power. Providing appropriate control on PV inverters, which includes voltage support and reactive power supply, will facilitate the large-scale integration of distributed renewable energy sources into the grid. Generator Emulation Controls (GEC) is a unique innovation developed and demonstrated under the SEGIS program [2]. It is an inverter control concept designed to approximate electromechanical behavior of synchronous machines that are beneficial for power system stability. GEC is designed to capture the super-synchronous behavior defined by the induced electromotive force (EMF) and synchronous impedance. This equips the inverter with the basic tendencies for voltage regulation support, load following, parallel operation, and seem-less mode transitions. Sub-synchronous behavior is then captured through managing the amplitude and phase of the “emulated EMF.” This gives the inverter its inertial dynamics, and provides a basis for energy management within the system. GEC-operated inverter exhibits a number of behavioral characteristics that promotes stability on the grid. Most notably, GEC features include Volt-VAr voltage regulation support, Hz-Watt frequency damping controls, fault ride-through capabilities, and adjustable voltage and frequency settings [7].

GEC-operated inverter exhibits a number of behavioral characteristics that promotes stability on the grid. Most notably, the following features are fundamental to GEC:

#### Volt-VAR:

The Volt-VAR management capability incorporates fixed reactive power (VAR) injection and automated Volt-VAR management. GEC-operated inverter supports the injection of user-specified fixed reactive power to the full capacity of device operation, both leading and lagging. Automated Volt-VAR operation provides voltage regulation support by sinking reactive power if the line voltage is higher than the selected maximum voltage and by sourcing reactive power if the line voltage drops below the selected minimum voltage (Figure 3).

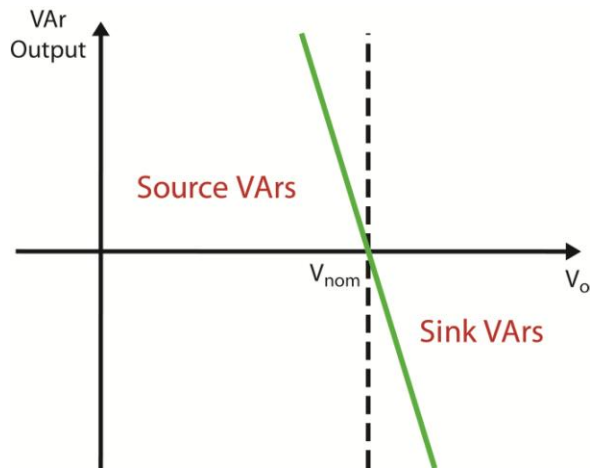


Figure 3. Volt-VAR droop characteristics.

#### Hz-Watt

GEC-operated inverters are capable of dynamically modulating real power output in response to frequency transients (Figure 4). This provides a natural protection mechanism against over-generation, particularly in small isolated systems and islanded microgrids. It also provides natural dynamic damping of local load and PV transients in larger systems.

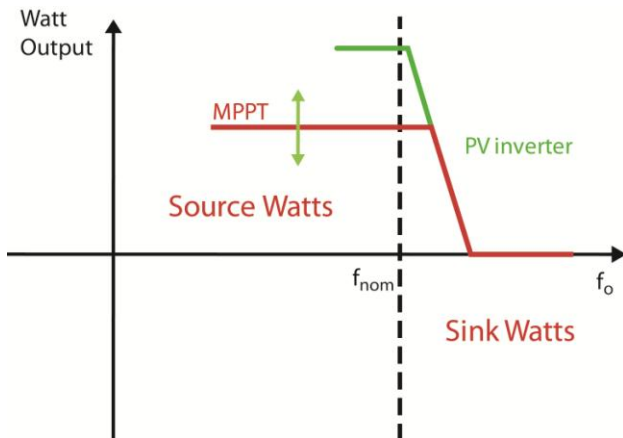


Figure 4. Power/frequency droop characteristics.

## V. COST BENEFIT EVALUATION OF SOLAR SYSTEMS

The initial capital cost of the installed solar system increases as it gets more distributed and as it gets smarter. Thus, solar farms will be less expensive upfront to build, while distributed smart solar systems will likely have a higher upfront cost to build. However, the value generated to all the stakeholders also increases as the system distribution and closeness to demand centers increases and as the system smartness increases. In addition, solar farms are large projects that require extensive planning and permitting and involve several stakeholders leading to possible delays, cancellations, and project failures; while distributed solar projects are incremental in nature and are deployed one panel at a time thus ensuring success of the project. Therefore, a systematic analysis of the costs and benefits of each technology is warranted. It is often the case that the most expensive technology yields vastly superior benefits and lower lifetime costs which make it the most valued and cost effective and thus the right choice. It is important to ultimately compare the technologies on their levelized cost of energy as delivered to the consumers.

The following factors should be included in the **value** evaluation of each technology (Table 1):

- Solar harvest potential.
- Carbon credits.
- Job creation.
- Smart grid benefits stemming from demand response and AMI integration.
- Smart grid benefits stemming from distribution asset management such as:
  - o predictive maintenance,
  - o outage management,
  - o loss optimization,
  - o conservation voltage reduction (CVR),
  - o power quality monitoring,
  - o power quality mitigation,
  - o reliability improvement,
  - o energy theft detection.
- Smart grid benefits stemming from municipality asset management such as street lighting control.

The following factors should be included in the **cost** evaluation of each technology (Table 2):

- Initial capital cost of the installed solar system per DC Watt through commissioning.
- Land acquisition cost including permitting.
- Transmission connection facility costs and related system upgrades.
- Annual O&M costs.
- Annual T&D associated losses to deliver the solar energy to the consumers.
- Initial capital costs of T&D upgrades to deliver the solar energy.
- Expected failure consequence costs including lost revenues

Table 1. Value Evaluation Factors

| Value Factors                               | Solar Farm  | Distributed Solar   | Smart Distributed Solar   |
|---|---|---|---|
| Solar Harvest Potential                     | √ Normal due to string inverter architecture resulting in total efficiency reduction                        | √√ Superior to farms by up to 15% due to panel level inverter                 | √√ Superior to farms by up to 15% due to panel level inverter.  |
| Carbon Credit                               | √ Normal  | √√ Higher than farm due to T&D loss reduction                                 | √√√ Higher than Distributed Solar due to energy savings from CVR and Demand Response.   |
| Job Creation                                | √ Creates local installation jobs but also requires specialized labor due to complexity of large inverters. | √√ More entry-level job creation than in a farm due to and simpler technology | √√√ Creates same entry level jobs as Distributed solar but also more high-level jobs dealing in smart grid technologies.  |
| Smart Grid Benefits – Demand Integration    |   |   | √√√ Significant value created by managing demand response (peak shifting and energy conservation).  |
| Smart Grid Benefits – Asset Management      |   |   | √√√ Provides distribution systems with the often cost prohibitive sensing and control in the LV circuits creating enormous benefits arising from activation of several smart grid capabilities. |
| Smart Grid Benefits – Municipal Integration |   |   | √√√ Provides municipalities significant cost reductions from controlling the street lights, implementation of community WiFi solutions, and surveillance.                                       |

Table 2. Cost Evaluation Factors

| Cost Factors                          | Solar Farm  | Distributed Solar   | Smart Distributed Solar  |
|---------------------------------------|---|---|--|
| Initial System Capital                | √√√ Optimized in space and equipment ratings.   | √√ Moderately higher initial system capital expense.  | √ Same as Distributed Solar but with the added expense of the communication system and smart grid integration.   |
| Land Acquisition including Permitting | √ Need space in vicinity of Transmission lines.   | √√ Not needed.  | √√ Not Needed.   |
| Transmission Connections and Upgrades | √ Need to design and implement transmission connections and upgrades driving startup costs.   | √√ Not needed.  | √√ Not needed.   |
| Annual O&M Costs                      | √ Requires specialized service technicians to diagnose and correct system problems; requires stocking of spare parts for large inverters, transformers, and switchgear. | √√ Large number of distributed devices each with a small rating reduces the need for specialized labor and requires small spares inventory. | √√√ Smart diagnosis and management by exception drive O&M costs even lower.                                      |
| Annual T&D Losses                     | √ Farm connections are at transmission level and thus incur full T&D losses   | √√ Located at demand centers over rooftops and thus avoids T&D losses.  | √√ Located at demand centers over rooftops and thus avoids T&D losses.   |
| Failure Consequence Costs             | √ Losing one panel in a string or an inverter will disable the whole string and result in significant outage costs until locating and repairing the fault.              | √√ All panels are installed in parallel at LV circuits and thus losing of one panel has very little consequence.                            | √√ All panels are installed in parallel at LV circuits and thus losing of one panel has very little consequence. |



## VI. BENEFICIARIES OF SMART SOLAR INVESTMENTS

Establishing the right solar energy policies and regulations in a country is crucial to the proper expansion of the various forms of solar energy technologies. In this respect, it is important to understand who along the electricity value chain benefits from the solar energy investments in order to allocate the costs to these beneficiaries in a proper fashion. The beneficiaries of a solar energy investment depend on the market structure and subsidy system in a country. Figure 5 and Figure 6 show typical beneficiaries in a subsidized system and in an un-subsidized system. The subsidies are assumed to be provided through low fuel costs to the electricity sector.

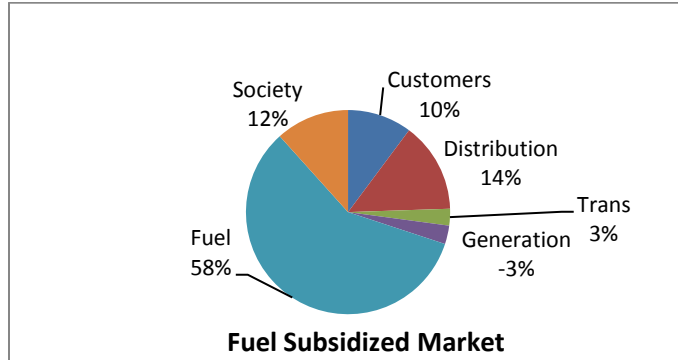


Figure 5. Fuel subsidized market.

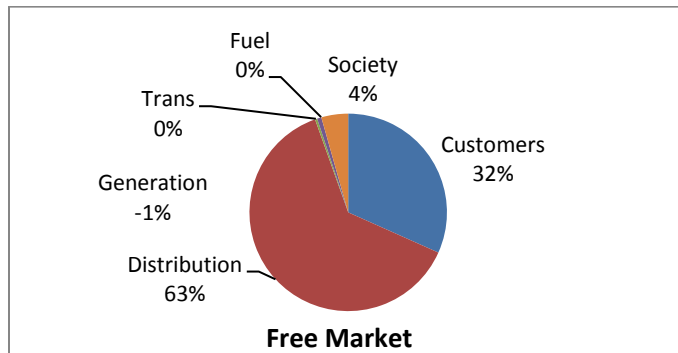


Figure 6. Free market.

It is obvious that a smart solar investment impacts all entities in the electricity value chain from fuel companies to generation companies to transmission companies to distribution companies and finally the consumers. The impact varies according to the setup of the market and its subsidy system, if any. In a fuel-subsidized system, the fuel company is the largest beneficiary because it saves the fuel consumption and captures its opportunity cost. In all cases, consumers are also beneficiaries due to the demand response and CVR programs. Armed with the proper analysis about the beneficiaries from the investments, the regulators and policy makers will be in a good position to design a fair market mechanism that promotes the long-term investments of this technology.

## VII. CASE STUDY

A typical scenario of a utility or large industrial/educational facility that is considering solar system implementation is investigated here. Fossil generators are typically the prime energy source and the available options are to install a large solar farm, to install distributed solar systems on poles, rooftops, and carports, to install smart distributed solar system thus enabling two technologies with one investment, and finally to stay with the fossil generation.

Using typical technical and economic data, and assuming:

- The fossil fuel is Oil at \$80/Barrel,
- The average net efficiency of fossil plants during peak hours of 32%, and Availability of 90%,
- The capital cost of fossil fuel power plant is \$1.0/Watt,
- The capital cost of the solar farm is \$3.0/Watt,
- The capital cost of the distributed solar of \$4.0/Watt,
- The capital cost of the smart distributed solar of \$5.5/Watt,
- Solar irradiance of 5.5 kWh/m<sup>2</sup>/day,
- Solar system capacity factor of 13.5% for the solar farm,
- Solar system capacity factor of 15.5% for the distributed solar system,
- Smart solar system is distributed on LV circuits to yield a leverage factor of 5x its size.
- Smart grid benefits of 2% load reduction through demand response or CVR.
- Smart grid benefits of 5% reduction in distribution system O&M annual expenses.
- The weighted average cost of capital (WACC) of 10%, and inflation rate of 3%,

The comparative study among the various options is outlined pictorially below.

A common index to compare the various alternatives is the levelized cost of energy as delivered to the consumers. This is a fixed price over the 20 year assessment period. Figure 7 shows that Fossil units will incur a cost for the fuel, for the generation tolling, for the transmission wheeling, and for the distribution services totaling \$0.250/kWh. The solar farm does not have a fuel cost but has a higher generation tolling cost and still incurs T&D costs to yield a total delivered price of \$0.243/kWh. Distributed solar has a higher capital cost but has a higher energy harvest potential and avoids the T&D losses and capital yielding a delivered cost of \$0.200/kWh. So far all three alternatives have similar cost values. The smart solar technology drives costs down due to the substantial benefits of the smart grid in terms of demand response and asset management driving the cost down to \$0.146/kWh.



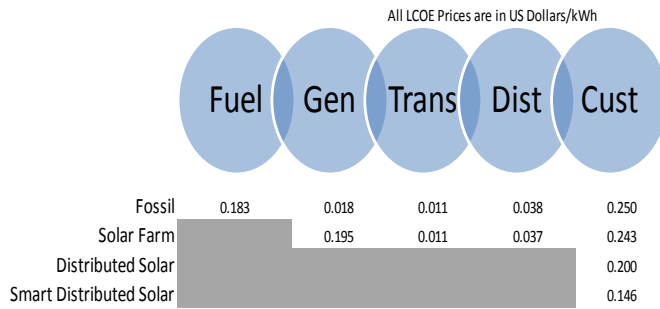


Figure 7. Electricity value chain.

## VIII. CONCLUSIONS

1. PV Solar technologies come in three architectures: farms, distributed, and smart distributed.
2. Solar Farms have the lowest capital cost but also the lowest economic benefits.
3. Smart distributed Solar provides the infrastructure of the smart grid as the solar panels are installed. They are future proof and constitute a smart investment.
4. Smart Distributed Solar provides significant economic benefits that can reduce the cost of delivered energy below all other alternatives despite having the highest initial capital cost.
5. Regulators and Policy makers should allocate a portion of the renewable energy portfolio targets to the smart solar technologies.

## IX. REFERENCES

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- [4] J.H.R. Enslin, H. Alatrash, 'Distribution Network Impacts of High Penetration of Distributed Photovoltaic Systems', 21<sup>st</sup> International Conference on Electricity Distribution, Frankfurt, 6-9 June 2011.
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- [7] H. Alatrash, A. Mensah, E. Mark, G. Haddad and J. Enslin, 'Generator Emulation Controls for Photovoltaic Inverters', submitted to IEEE PES Transactions on Smart Grid, 2011.

## X. BIOGRAPHIES



**Hisham A. Othman**, graduated from the University of Illinois at Urbana-Champaign with a Ph.D. in Electrical Engineering.

He is currently the VP of Professional Services and MEA regional manager at Petra Solar, Inc. His employment experience included serving as a Senior Engineer at General Electric Company in Schenectady NY, and VP Network Management at ABB in Raleigh NC and Area Manager at ABB in the Near East. His special fields of interest include physical asset

management, smart grids, renewable energy, and FACTS.

Hisham holds two patents in FACTS technologies, published more than 30 papers, was the recipient of the GE Young Engineer award in 1993, and received three awards of Excellence from ABB Power Technologies division in 2002.



**Ruba A. Amarin**, graduated from the University of Central Florida at Orlando with a Ph.D. in Electrical Engineering in 2010. She holds an M.S. degree in Industrial Engineering specializing in Engineering Management.

She is currently the Product Manager from Smart Grid and Power Systems at Petra Solar Inc. Ruba published more than 30 papers and has few patents pending in the smart grid area.

**UNDERTAKING NO. J1.4: TO PROVIDE UPDATED TABLE EP TC-1 TO REFLECT INCLUSION OF OM&A COSTS, UPDATE TO COST OF CAPITAL BASED ON THE BOARD'S MARCH 2ND LETTER, AND ASSOCIATED IMPACT ON PILS; AND WITH COST OF CAPITAL AND OM&A INCLUDE, THAT USED THE \$350,000 DEDUCTION FOR THE CCA TO SHOW THE NET REVENUE REQUIREMENT.**

**RESPONSE:**

Please see attached.

#### Undertaking J1.4

Halton Hills Hydro Inc.

Updated Table EP TC-1 reflecting OM&A , Accelerated CCA

|   |               |
|---|---------------|
| Capital Expenditure                         | 1,400,000     |
| Depreciation Expense                        | 35,000        |
| Net Book Value                              | 1,365,000     |
| OM&A  | 11,760        |
| Fixed Assets Opening Balance 2012           | -             |
| Fixed Assets Closing Balance 2012           | 1,365,000     |
| <b>Average Fixed Asset Balance for 2012</b> | 682,500       |
| Working Capital Allowance                   | 1,764         |
| <b>Rate Base</b>                            | 684,264       |
| Regulated Rate of Return                    | 6.20%         |
| <b>Regulated Return on Capital</b>          | 42,424        |
| Deemed Interest Expense                     | 17,466        |
| Deemed Return on Equity                     | 24,959        |
| OM&A  | 11,760        |
| Regulated Return on Capital                 | 42,424        |
| Depreciation Expense                        | 35,000        |
|   | 89,184        |
| Pils  | (38,923)      |
| <b>Revenue Requirement</b>                  | <b>50,261</b> |
| <b>Pils:</b>                                |               |
| CCA   | 350,000       |
| (1,400,000 x 50% x 50%)                     |               |
| Deemed Return on Equity                     | 24,959        |
| Add Depreciation                            | 35,000        |
| Less CCA                                    | - 350,000     |
|   | - 290,041     |
| Pils before Gross Up                        | - 44,956      |
| Grossed Up - Pils                           | -\$ 38,923    |

**UNDERTAKING NO. J1.5: TO PROVIDE THE NET PRESENT VALUE ASSESSMENT OF GREEN ENERGY INITIATIVE.**

**RESPONSE:**

Please see attached.

## Undertaking J1.5

Halton Hills Hydro Inc.  
Net Present Value of Green Energy Initiative

|   |               | Year<br>2    | Year<br>3     | Year<br>4     | Year<br>5     | Year<br>6     | Year<br>7     | Year<br>8     | Year<br>9     | Year<br>10    | Year<br>11    | Year<br>12    | Year<br>13    | Year<br>14    | Year<br>15    | Year<br>16    | Year<br>17    | Year<br>18    | Year<br>19    | Year<br>20    | Year<br>21   |
|---|---------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|
| Capital Expenditure                         | 1,400,000     | 1,365,000    | 1,295,000     | 1,225,000     | 1,155,000     | 1,085,000     | 1,015,000     | 945,000       | 875,000       | 805,000       | 735,000       | 665,000       | 595,000       | 525,000       | 455,000       | 385,000       | 315,000       | 245,000       | 175,000       | 105,000       | 35,000       |
| Depreciation Expense                        | 35,000        | 70,000       | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 35,000       |
| Net Book Value                              | 1,365,000     | 1,295,000    | 1,225,000     | 1,155,000     | 1,085,000     | 1,015,000     | 945,000       | 875,000       | 805,000       | 735,000       | 665,000       | 595,000       | 525,000       | 455,000       | 385,000       | 315,000       | 245,000       | 175,000       | 105,000       | 35,000        | -            |
| OM&A  | 2.50% 11,760  | 12,054       | 12,355        | 12,664        | 12,981        | 13,305        | 13,638        | 13,979        | 14,328        | 14,687        | 15,054        | 15,430        | 15,816        | 16,211        | 16,617        | 17,032        | 17,458        | 17,894        | 18,342        | 18,800        | 19,270       |
| Fixed Assets Opening Balance 2012           | -             |              |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |              |
| Fixed Assets Closing Balance 2012           | 1,365,000     | 1,295,000    | 1,225,000     | 1,155,000     | 1,085,000     | 1,015,000     | 945,000       | 875,000       | 805,000       | 735,000       | 665,000       | 595,000       | 525,000       | 455,000       | 385,000       | 315,000       | 245,000       | 175,000       | 105,000       | 35,000        | -            |
| <b>Average Fixed Asset Balance for 2012</b> | 682,500       | 647,500      | 612,500       | 577,500       | 542,500       | 507,500       | 472,500       | 437,500       | 402,500       | 367,500       | 332,500       | 297,500       | 262,500       | 227,500       | 192,500       | 157,500       | 122,500       | 87,500        | 52,500        | 17,500        | -            |
| Working Capital Allowance                   | 1,764         | 1,808        | 1,853         | 1,900         | 1,947         | 1,996         | 2,046         | 2,097         | 2,149         | 2,203         | 2,258         | 2,315         | 2,372         | 2,432         | 2,492         | 2,555         | 2,619         | 2,684         | 2,751         | 2,820         | 2,891        |
| <b>Rate Base</b>                            | 684,264       | 649,308      | 614,353       | 579,400       | 544,447       | 509,496       | 474,546       | 439,597       | 404,649       | 369,703       | 334,758       | 299,815       | 264,872       | 229,932       | 194,992       | 160,055       | 125,119       | 90,184        | 55,251        | 20,320        | 2,891        |
| Regulated Rate of Return                    | 6.20%         | 6.20%        | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%         | 6.20%        |
| <b>Regulated Return on Capital</b>          | 42,424        | 40,257       | 38,090        | 35,923        | 33,756        | 31,589        | 29,422        | 27,255        | 25,088        | 22,922        | 20,755        | 18,589        | 16,422        | 14,256        | 12,090        | 9,923         | 7,757         | 5,591         | 3,426         | 1,260         | 179          |
| Deemed Interest Expense                     | 16,970        | 16,103       | 15,236        | 14,369        | 13,502        | 12,635        | 11,769        | 10,902        | 10,035        | 9,169         | 8,302         | 7,435         | 6,569         | 5,702         | 4,836         | 3,969         | 3,103         | 2,237         | 1,370         | 504           | 72           |
| Deemed Return on Equity                     | 60.0% 25,455  | 24,154       | 22,854        | 21,554        | 20,253        | 18,953        | 17,653        | 16,353        | 15,053        | 13,753        | 12,453        | 11,153        | 9,853         | 8,553         | 7,254         | 5,954         | 4,654         | 3,355         | 2,055         | 756           | 108          |
| OM&A  | 11,760        | 12,054       | 12,355        | 12,664        | 12,981        | 13,305        | 13,638        | 13,979        | 14,328        | 14,687        | 15,054        | 15,430        | 15,816        | 16,211        | 16,617        | 17,032        | 17,458        | 17,894        | 18,342        | 18,800        | 19,270       |
| Deferral Account Offset - Cost of Power     | (35,495)      | (35,495)     | (36,382)      | (37,292)      | (38,224)      | (39,180)      | (40,159)      | (41,163)      | (42,192)      | (43,247)      | (44,328)      | (45,437)      | (46,573)      | (47,737)      | (48,930)      | (50,154)      | (51,407)      | (52,693)      | (54,010)      | (55,360)      | (56,744)     |
| Regulated Return on Capital                 | 42,424        | 40,257       | 38,090        | 35,923        | 33,756        | 31,589        | 29,422        | 27,255        | 25,088        | 22,922        | 20,755        | 18,589        | 16,422        | 14,256        | 12,090        | 9,923         | 7,757         | 5,591         | 3,426         | 1,260         | 179          |
| Depreciation Expense                        | 35,000        | 70,000       | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 35,000       |
| Pils  | 53,689        | 86,816       | 84,063        | 81,295        | 78,512        | 75,714        | 72,900        | 70,071        | 67,224        | 64,361        | 61,480        | 58,582        | 55,665        | 52,730        | 49,776        | 46,802        | 43,808        | 40,793        | 37,757        | 34,700        | (2,295)      |
|   | (38,857)      | (81,304)     | (34,509)      | 12,286        | 12,112        | 11,937        | 11,763        | 11,588        | 11,414        | 11,240        | 11,065        | 10,891        | 10,716        | 10,542        | 10,367        | 10,193        | 10,019        | 9,844         | 9,670         | 9,495         | 4,711        |
| <b>Revenue Requirement</b>                  | <b>14,833</b> | <b>5,512</b> | <b>49,554</b> | <b>93,581</b> | <b>90,624</b> | <b>87,652</b> | <b>84,663</b> | <b>81,659</b> | <b>78,638</b> | <b>75,601</b> | <b>72,546</b> | <b>69,473</b> | <b>66,382</b> | <b>63,272</b> | <b>60,143</b> | <b>56,995</b> | <b>53,826</b> | <b>50,637</b> | <b>47,427</b> | <b>44,195</b> | <b>2,417</b> |
| <b>Pils:</b>                                |               |              |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |              |
| CCA - accelerated 50.0%                     | 350,000       | 700,000      | 350,000       | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -            |
| (1,400,000 x 50% x 50%)                     |               |              |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |               |              |
| Deemed Return on Equity                     | 25,455        | 24,154       | 22,854        | 21,554        | 20,253        | 18,953        | 17,653        | 16,353        | 15,053        | 13,753        | 12,453        | 11,153        | 9,853         | 8,553         | 7,254         | 5,954         | 4,654         | 3,355         | 2,055         | 756           | 108          |
| Add Depreciation                            | 35,000        | 70,000       | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 70,000        | 35,000       |
| Less CCA - accelerated 50.0%                | - 350,000     | - 700,000    | - 350,000     | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -             | -            |
|   | - 289,545     | - 605,846    | - 257,146     | 91,554        | 90,253        | 88,953        | 87,653        | 86,353        | 85,053        | 83,753        | 82,453        | 81,153        | 79,853        | 78,553        | 77,254        | 75,954        | 74,654        | 73,355        | 72,055        | 70,756        | 35,108       |
| Pils before Gross Up                        | - 44,880      | - 93,906     | - 39,858      | 14,191        | 13,989        | 13,788        | 13,586        | 13,385        | 13,183        | 12,982        | 12,780        | 12,579        | 12,377        | 12,176        | 11,974        | 11,773        | 11,571        | 11,370        | 11,169        | 10,967        | 5,442        |
| Grossed Up - Pils                           | -\$ 38,857    | -\$ 81,304   | -\$ 34,509    | \$ 12,286     | \$ 12,112     | \$ 11,937     | \$ 11,763     | \$ 11,588     | \$ 11,414     | \$ 11,240     | \$ 11,065     | \$ 10,891     | \$ 10,716     | \$ 10,542     | \$ 10,367     | \$ 10,193     | \$ 10,019     | \$ 9,844      | \$ 9,670      | \$ 9,495      | \$ 4,711     |

Discount Rate 6.20%

Capital Cost of Project \$ 1,400,000

Revenue in Year 1 \$ 14,833

Present Value of Revenues from

Year 2 to 21 \$ 724,065

Total Revenue \$ 738,898

Net Present Value \$ (661,102)

**UNDERTAKING NO. J1.6: TO PROVIDE ACTUAL TREE-TRIMMING COSTS INCURRED FOR 2008 THROUGH 2010.**

**RESPONSE:**

Please see attached.

**Undertaking J1.6**

Halton Hills Hydro Inc.

**OM&A Tree Trimming Services**

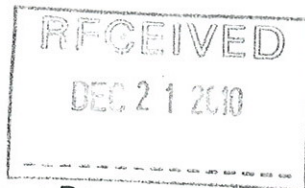
|              | 2008                 | 2009                | 2010                 |
|--------------|----------------------|---------------------|----------------------|
|              | \$ 109,332.50        | \$ 76,885.00        | \$ 120,317.00        |
|              |                      |                     |                      |
| <b>Total</b> | <b>\$ 109,332.50</b> | <b>\$ 76,885.00</b> | <b>\$ 120,317.00</b> |

**UNDERTAKING NO. J1.7: TO PROVIDE ACTUAL PROPERTY INSURANCE COSTS FOR 2011.**

**RESPONSE:**

Please see attached, which shows the property insurance invoice. This comprises part of the \$132,000 figure shown in Account 5635 for the test year (Table EP1-32, EProbe Compendium, p. 40 of 47). Also included in this amount is \$53,000 for comprehensive liability insurance.





## MEARIE Property Insurance Program 2011 Premium Renewal Invoice

Insured: Halton Hills Hydro Inc.

Coverage Effective January 1, 2011

MEARIE is pleased to provide you with your Property Insurance Program Premium Detail for the 2011 term. Please be advised terms are based on your expiring coverage options. Should you wish to change your deductible options please contact MEARIE.

| MEARIE Property Insurance Program – 2011 Policy                                     | Amount      |
|---|-------------|
| Total Premium   | \$78,551.00 |
| Policy # P2011HALT1   |             |
| Policy Period: January 1, 2011 to January 1, 2012                                   |             |
| Policy includes: Property, Boiler & Machinery and Crime Insurance where applicable. |             |

Total 2011 Premium: \$78,551.00

RST 8%: \$8,594.19

Total Premium Due: \$87,145.19

#5917

100-0000-177-00-00

Prepaid Expense

Payment must be received by January 1, 2011. An interest penalty of 3% plus the bank prime rate per annum will be charged on late premiums. Cancellation of your coverage may apply in the event of non-payment or premium.

Please make cheque payable to: Municipal Electric Association Reciprocal Insurance Exchange.

By virtue of this Policy and any other policies purchased from the Company being in force, the insured becomes a member of Company Underwriting Group III, subject to the provisions of the Subscriber Agreement.

copy to  
Chris C  
A

*D. J. 10/12/21*

J1.7