

| Measure   | Value           | Unit                       | Source  |
|---|-----------------|----------------------------|---|
| <b>Residential Energy Efficiency</b>                    |                 |                            |   |
| Homeowners - Electricity Bill                           | \$2,194         | \$/yr                      | DOE LEAD  |
| Homeowners - Natural Gas Bill                           | \$825           | \$/yr                      | DOE LEAD  |
| Number of Households Weatherized                        | 400             |                            |   |
| Energy savings (compared to BAU)                        | 12%             |                            | Based on L  |
| % of households in OTP                                  | 50%             |                            |   |
| % of households in NCEC                                 | 50%             |                            |   |
| OTP residential fixed charge                            | 10.75           | \$/mo                      | <a href="https://www">https://www</a>                                     |
| OTP residential energy charge - summer                  | 0.08194         | \$/kWh                     | <a href="https://www">https://www</a>                                     |
| OTP residential energy charge - winter                  | 0.06111         | \$/kWh                     | <a href="https://www">https://www</a>                                     |
| Energy consumption in summer                            | 60%             |                            |   |
| Estimated electricity usage                             | 28.05           | MWh/yr                     |   |
| Estimated electricity savings                           | 3.46            |                            |   |
| GHG impact from electricity savings                     | 793.15          | tons CO2e/yr               |   |
| Average ND price of residential natural gas (2022)      | 16.83           | \$/TCF                     | <a href="https://www">https://www</a>                                     |
| Estimated natural gas consumption                       | 49.01           | TCF                        |   |
| Estimated natural gas savings                           | 6.04            | TCF                        |   |
| GHG intensity of natural gas                            | 120.96          | lbs CO2 per TCF            | <a href="https://www">https://www</a>                                     |
| GHG impact from natural gas savings                     | 146.10          | tons CO2e/yr               |   |
| <b>Total GHG impact</b>                                 | <b>939.25</b>   | <b>tons CO2e/yr</b>        |   |
| Estimated cost per household                            | 3,726.55        | \$/hh                      |   |
| Total measure cost                                      | \$1,490,621     |                            | <a href="https://www.capnd.org/file_do">https://www.capnd.org/file_do</a> |
| Length of realized savings                              | 40              | years                      |   |
| <b>GHG Emission Reduction Cost</b>                      | <b>39.68</b>    | <b>\$/ton CO2e reduced</b> |   |
| <b>Residential Solar</b>                                |                 |                            |   |
| Single Family Home - Electricity usage after efficiency | 24.60           | MWh/yr                     |   |
| Rooftop solar production                                | 1,328           | kWh/kW*yr                  | based on P  |
| Percent of load covered by solar                        | 30%             |                            |   |
| Estimated solar size                                    | 5.56            | kW                         |   |
| Estimated production                                    | 7.38            | MWh/yr                     |   |
| Number of households with solar                         | 400             |                            |   |
| % of households in OTP                                  | 50%             |                            |   |
| % of households in NCEC                                 | 50%             |                            |   |
| <b>GHG impact</b>                                       | <b>1,693.13</b> | <b>tons CO2e/yr</b>        |   |
| Residential PV + Storage installed cost                 | 4.90            | \$/W                       | <a href="https://emp">https://emp</a>                                     |
| Total measure cost                                      | \$10,890,934    |                            |   |
| System life   | 25              | years                      |   |

**GHG Emission Reduction Cost****257.30 \$/ton CO2e reduced****Combined Energy Efficiency and Residential Solar Totals**

|  |                              |
|--|------------------------------|
| <b>Total GHG Impact</b>                        | <b>2,632.37 tons CO2e/yr</b> |
| <b>Total by 2030, assuming phased approach</b> | <b>6580.93 tons CO2e</b>     |
| <b>Total by 2050, assuming phased approach</b> | <b>59228.41 tons CO2e</b>    |

**Lighting**

|  |                      |                                       |
|--|----------------------|---------------------------------------|
| Current energy charge of street lighting | \$525 \$/yr per pole |                                       |
| OTP outdoor lighting fixed charge        | 3.2 \$/mo            | <a href="https://www">https://www</a> |
| OTP outdoor lighting energy charge       | 0.0544 \$/kWh        | <a href="https://www">https://www</a> |
| Estimated energy usage                   | 8.94 MWh/yr          |                                       |
| Number of street lights                  | 300                  |                                       |
| % of street lights in OTP                | 70%                  |                                       |
| % of street lights in NCEC               | 30%                  |                                       |

**GHG Impact****1,505.04 tons CO2e/yr**

|                     |                 |             |
|---------------------|-----------------|-------------|
| Per light post cost | \$6,395 \$/pole | *includes c |
| System life         | 24 years        |             |
| Total project cost  | \$1,918,500     |             |

**GHG Emission Reduction Cost****53.11 \$/ton CO2e reduced**

|                           |                            |           |
|---------------------------|----------------------------|-----------|
| <b>GHG Impact by 2030</b> | <b>5,468.32 tons CO2e</b>  | *assuming |
| <b>GHG Impact by 2050</b> | <b>35,569.17 tons CO2e</b> |           |

**Commercial Building Construction**

|                                       |                |   |
|---------------------------------------|----------------|---|
| Square feet                           | 31,640 sqft    |   |
| Energy consumption per area           | 22.5 kWh/sqft  | <a href="https://blog">https://blog</a> |
| Energy efficiency improvement         | 27.00%         | <a href="https://www">https://www</a>   |
| Energy consumption without efficiency | 711,900 kWh/yr |   |
| Energy consumption with efficiency    | 519,687 kWh/yr |   |
| Energy savings                        | 192,213 kWh/yr |   |
| In OTP (=1), or in NCEC (=0)          | 0              |   |

**GHG Impact of Efficiency****116.39 tons CO2e/yr**

|  |             |                                       |
|--|-------------|---------------------------------------|
| Green building cost premium (cost of efficiency upgrade) | \$4 \$/sqft | <a href="https://www">https://www</a> |
| Total measure cost                                       | \$126,560   |                                       |
| Length of realized savings                               | 40          |                                       |

**GHG Emission Reduction Cost****27.19 \$/ton CO2e reduced**

|                                  |                 |            |
|----------------------------------|-----------------|------------|
| Percent of load covered by solar | 20%             |            |
| Rooftop solar production         | 1,328 kWh/kW*yr | based on P |
| Estimated production             | 104 MWh/yr      |            |
| Estimated solar size             | 78.27 kW        |            |

**GHG Impact of Solar****62.94 tons CO2e/yr**

|   |           |                                       |
|---|-----------|---------------------------------------|
| Small non-residential PV * Storage installed cost | 5.20 \$/W | <a href="https://emp">https://emp</a> |
| Total measure cost                                | \$406,984 |                                       |
| System life                                       | 25 years  |                                       |

#### GHG Emission Reduction Cost of Solar

**258.67 \$/ton CO2e reduced**

|   |                              |             |
|---|------------------------------|-------------|
| Geothermal heat pump capacity               | 64 tons                      | REopt (bas  |
| Geothermal electricity consumption          | 37,748 kWh                   |             |
| Estimated Propane Cost                      | \$1.70 \$/gal                |             |
| Estimated Propane Cost                      | \$18.58 \$/MMBTU             |             |
| Change in Propane Use                       | -468 MMBTU/yr                | REopt       |
| Change in Electricity Use                   | -29 kWh/yr                   | Reopt (fact |
| Emissions from Propane                      | 0.057692308 tonnes CO2/MMBTU |             |
| Reduction in emissions from reduced propane | 29.76 tons CO2/yr            |             |
| Reduction in emissions from electricity     | 0.02 tons CO2/yr             |             |

#### GHG Impact of Geothermal

**29.78 tons CO2/yr**

|   |                |       |
|---|----------------|-------|
| Total capital cost of geothermal system | \$246,262 \$   | REopt |
| Total O&M costs                         | \$16,136 \$/yr |       |
| System life                             | 25 years       |       |
| Total measure cost                      | \$434,304      |       |

#### GHG Emission Reduction Cost of Geothermal

**872.62 \$/ton CO2e reduced**

#### GHG Impact Total

**209.10 tons CO2/yr**

#### GHG Emission Reduction Cost Total

**138.79 \$/ton CO2e reduced**

#### GHG Impact by 2030

**627.31 tons CO2e**

\*Assuming

#### GHG Impact by 2050

**4809.35 tons CO2e**

› tool; estimate for Turtle Mountain Reservation  
› tool; estimate for Turtle Mountain Reservation

DOE estimated savings of \$372 per household ([https://www.capnd.org/file\\_download/inline/9023c1cf-60ec-](https://www.capnd.org/file_download/inline/9023c1cf-60ec-4e6b-ab16-fa015baea079)

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|     |     |      |      |      |       |       |       |       |       |
|-----|-----|------|------|------|-------|-------|-------|-------|-------|
| Jan | Feb | Mar  | Apr  | May  | Jun   | Jul   | Aug   | Sep   |       |
|     | 8.7 | 8.65 | 8.37 | 9.24 | 11.75 | 20.23 | 30.38 | 33.34 | 30.62 |

[eia.gov/environment/emissions/co2\\_vol\\_mass.php](https://eia.gov/environment/emissions/co2_vol_mass.php)

[wnload/inline/9023c1cf-60ec-4e6b-ab16-fa015baea079](https://www.capnd.org/file_download/inline/9023c1cf-60ec-4e6b-ab16-fa015baea079)

› VWatts for Belcourt, ND (<https://pvwatts.nrel.gov/pvwatts.php>)

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[nrel.gov/sites/default/files/5\\_tracking\\_the\\_sun\\_2023\\_report.pdf](https://nrel.gov/sites/default/files/5_tracking_the_sun_2023_report.pdf)

\*\*assuming 25% CO2e in 2026, 50% in 2027, 75% in 2028, and 100% in 2029 onwards to account for pha

[http://otpc.com/media/0lah5wch/mn\\_1103.pdf](http://otpc.com/media/0lah5wch/mn_1103.pdf) (pg. 2)  
[http://otpc.com/media/0lah5wch/mn\\_1103.pdf](http://otpc.com/media/0lah5wch/mn_1103.pdf) (pg. 2)

ost of replacement batteries to extend the life of the lights to 24 years

|  |     |          |   |
|--|-----|----------|---|
| 30 lights installed Year 1, 130 Year 2, 140 Year 3 | 0.1 | 0.533333 | 1 |
|--|-----|----------|---|

<http://budderfly.com/building-energy-consumption#:~:text=The%20Department%20of%20Energy%20pegs,KWl>  
[http://epa.gov/sites/default/files/2016-03/documents/table\\_rules\\_of\\_thumb.pdf](http://epa.gov/sites/default/files/2016-03/documents/table_rules_of_thumb.pdf)

[http://epa.gov/sites/default/files/2016-03/documents/table\\_rules\\_of\\_thumb.pdf](http://epa.gov/sites/default/files/2016-03/documents/table_rules_of_thumb.pdf)

Watts for Belcourt, ND (<https://pvwatts.nrel.gov/pvwatts.php>)

ed on 31,640 sq ft Medium Office building)

oring in ground source heat pump and change in A/C)

| DR   | 1        | 2        | 3        | 4        | 5        | 6        | 7        |
|------|----------|----------|----------|----------|----------|----------|----------|
| 0.07 | \$16,136 | \$16,136 | \$16,136 | \$16,136 | \$16,136 | \$16,136 | \$16,136 |

construction completion and interconnection in 2027

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|       |       |      |
|-------|-------|------|
| Oct   | Nov   | Dec  |
| 19.15 | 11.07 | 10.5 |





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