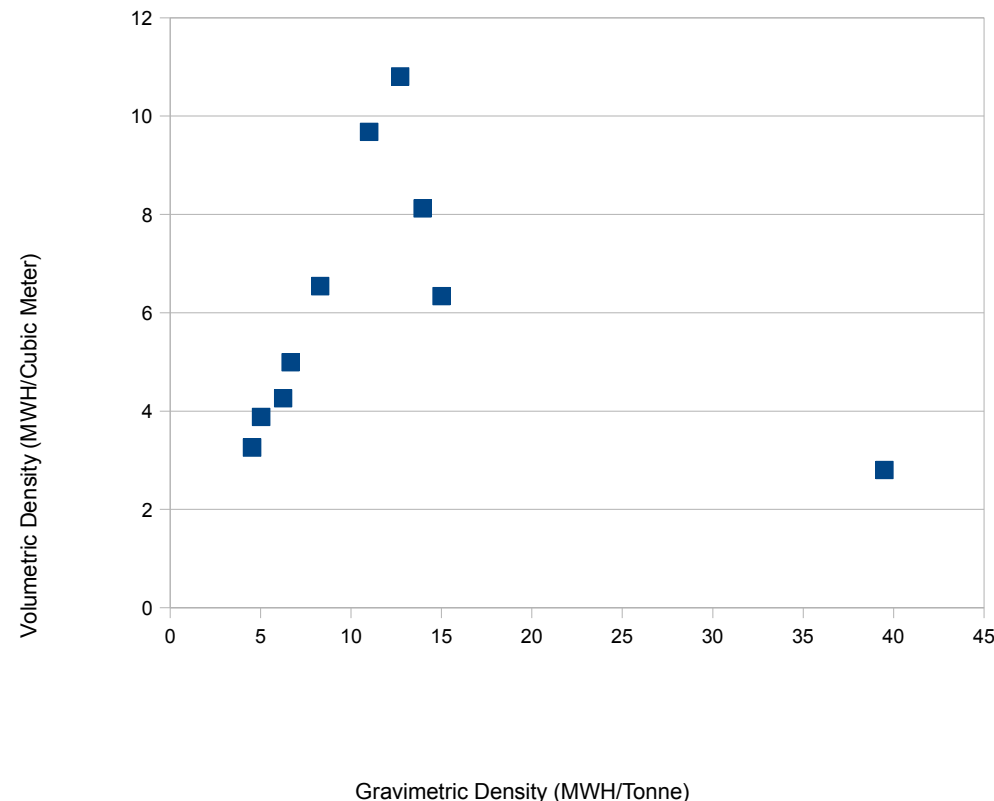


# Energy Carriers

| Energy Carrier  | MWH/ton – |        | Litres/MWH | Gallons/MWH | Kg/MWH | Person-Mass | MWH/tandem Payload |         | Tank + load gross tonne | Vaporization, MWH/tonne | Vaporization, % energy mass |       |
|-----------------|-----------|--------|------------|-------------|--------|-------------|--------------------|---------|-------------------------|-------------------------|-----------------------------|-------|
|                 | MWH/Mg    | MWH/m3 |            |             |        |             | truck              | trailer |                         |                         |                             |       |
| Ethanol         | 8.29      | 6.54   | 152.87     | 40.38       | 120.62 | 1.53        | 227.81             |         | 27.48                   | 32.01                   | 0.23                        | 2.82% |
| Ammonia (NH3)   | 6.25      | 4.26   | 234.6      | 61.98       | 160    | 2.03        | 134.25             |         | 21.48                   | 31.23                   | 0.38                        | 6.09% |
| Hydrogen (LH2)  | 39.49     | 2.8    | 356.75     | 94.24       | 25.32  | 0.32        | 132.63             |         | 3.36                    | 23.1                    | 0.13                        | 0.32% |
| Methane         | 15        | 6.34   | 157.75     | 41.67       | 66.67  | 0.84        | 299.96             |         | 20                      | 30.89                   | 0.14                        | 0.94% |
| Propane         | 13.95     | 8.12   | 123.13     | 32.53       | 71.66  | 0.91        | 255.78             |         | 18.33                   | 18.33                   | 0.12                        | 0.85% |
| Diesel [9]      | 12.71     | 10.81  | 92.54      | 24.45       | 78.66  | 1.00        | 376.33             |         | 29.6                    | 34.14                   | 0.07                        | 0.56% |
| Biodiesel[6]    | 0         |        |            |             |        |             |                    |         |                         |                         |                             |       |
| Soybean Oil[7]  | 11        | 9.68   | 103.31     | 27.29       | 90.91  | 1.15        | 337.11             |         | 30.65                   | 35.18                   |                             |       |
| Corn            | 4.53      | 3.26   | 306.75     | 81.03       | 220.86 | 2.80        | 137.86             |         | 30.45                   | 34.08                   |                             |       |
| Soybeans [7]    | 5.03      | 3.88   | 257.64     | 68.06       | 198.9  | 2.52        | 164.14             |         | 32.65                   | 36.28                   |                             |       |
| Coal(Antracite) | 7.5       |        |            |             |        |             |                    |         |                         |                         |                             |       |
| Coal            | 6.66      | 4.99   |            |             |        |             |                    | 211.15  |                         |                         |                             |       |
| Coal(Lignite)   | 4.17      |        |            |             |        |             |                    |         |                         |                         |                             |       |
| Wood            | 4.17      |        |            |             |        |             |                    |         |                         |                         |                             |       |
| MgH2 slurry     | 3.9       | 4.8    |            |             |        |             |                    |         |                         |                         |                             |       |
| CO2             | 0.18      | 0.22   |            |             |        |             |                    |         |                         |                         |                             |       |
| LN2             | 0.12      | 0.08   |            |             |        |             |                    |         |                         |                         |                             |       |
| LNG (heat only) | 0.14      | 0.06   |            |             |        |             |                    |         |                         |                         |                             |       |

|                      |                       |               |             |            |             |     |        |             |  |  |  |  |
|----------------------|-----------------------|---------------|-------------|------------|-------------|-----|--------|-------------|--|--|--|--|
| Average person: (kg) |                       | 79            | Truck tare: |            | 14000       |     |        |             |  |  |  |  |
|                      |                       |               |             |            |             |     | 264.17 | 2204        |  |  |  |  |
| Pressure tanks       | Tare, lbs             | Gallons       | Max         | Load Limit | Length (ft) | M^3 |        | tare, tonne |  |  |  |  |
| Truck Tandem MCC3'   | 21480                 | 10400         |             |            |             |     | 31.49  | 9.75        |  |  |  |  |
| Truck B-train MCC33' | 40000                 | 17490         |             |            |             |     | 66.21  | 18.15       |  |  |  |  |
| Rail NH3/LPG (105J3  | 101800                | 34000         | 263000      | 161200     | 70          |     | 128.7  | 46.19       |  |  |  |  |
|                      |                       |               |             |            |             |     | 0      |             |  |  |  |  |
| Atmo Liquid tanks    |                       |               |             |            |             |     | 0      |             |  |  |  |  |
| Truck Tandem (DOT4   | 10000                 | 9200          |             |            |             |     | 34.83  | 4.54        |  |  |  |  |
| Truck B-train        |                       | 17000         |             |            |             |     | 64.35  |             |  |  |  |  |
| Rail T108            | 63000                 | 30000         | 263000      | 200000     | 60          |     | 113.56 | 28.58       |  |  |  |  |
|                      |                       |               |             |            |             |     | 0      |             |  |  |  |  |
| LH2                  | (www.fibacanning.com) |               |             |            |             |     | 0      |             |  |  |  |  |
|                      | 43500                 | 12500         |             |            |             |     | 47.32  | 19.74       |  |  |  |  |
| LNG truck            | 24000                 | 12500         |             | 41000      | 44          |     | 47.32  | 10.89       |  |  |  |  |
|                      |                       |               |             |            |             |     |        |             |  |  |  |  |
|                      |                       |               |             |            |             |     | 28.38  |             |  |  |  |  |
|                      |                       |               |             |            |             |     |        |             |  |  |  |  |
| Grain                | Tare, lbs             | Bushels (vol) |             |            |             | M^3 |        |             |  |  |  |  |
| Truck Tandem         | 8000                  | 1200          |             |            |             |     | 42.29  | 3.63        |  |  |  |  |



## Electrical Energy Storage technologies

Daily storage

## Seasonal storage

| Storage Technology           | Mass Energy Density, MWH/tonne |       | Volume Energy Density, MWH/m^3 |        | Cost, \$1000/MW (equipment) |       | Cost, \$1000/MWH (storage) |       | Self Discharge (% per month) |       | Round Trip Efficiency |       | Lifetime (cycles) |       | Lifetime (years) |       | Cost, 100MW nameplate, 1GWH storage (10 hours), millions of dollars |       | Cost, 100MW nameplate, 100GWH storage (1000 hours), millions of dollars |          |
|------------------------------|--------------------------------|-------|--------------------------------|--------|-----------------------------|-------|----------------------------|-------|------------------------------|-------|-----------------------|-------|-------------------|-------|------------------|-------|---------------------------------------------------------------------|-------|-------------------------------------------------------------------------|----------|
|                              | lower                          | upper | lower                          | upper  | lower                       | upper | lower                      | upper | lower                        | upper | lower                 | upper | lower             | upper | lower            | upper | lower                                                               | upper | lower                                                                   | upper    |
| NH3 synthesis/combustion[1]  | 5.18                           | 6.25  | 3.53                           | 4.26   | 600                         | 1600  | 0.07                       | 0.25  | 0%                           | 1%    | 20%                   | 50%   |                   |       | 10               | 30    | \$60                                                                | \$160 | \$67                                                                    | \$185    |
| LH2 syn/comb. [2]            | 33.39                          | 39.49 | 2.37                           | 2.8    | 600                         | 1000  | 0.5                        | 2     | 5%                           | 75%   | 30%                   | 50%   |                   |       | 10               | 30    | \$61                                                                | \$102 | \$110                                                                   | \$300    |
| H2 (compressed gas storage)  | 33.39                          | 39.49 |                                |        | 500                         | 800   | 10                         | 50    | 0%                           | 5%    | 35%                   | 75%   |                   |       |                  |       | \$60                                                                | \$130 | \$1,050                                                                 | \$5,080  |
| CAES (compressed air) [3]    |                                |       | 0.002                          |        | 400                         | 500   | 1                          | 5     | 0%                           | 1%    | 80%                   | 85%   |                   |       |                  | 30    | \$41                                                                | \$55  | \$140                                                                   | \$550    |
| Pumped Hydro (100m) [4]      |                                |       |                                | 0.0003 | 400                         | 500   | 10                         | 45    | 0%                           |       | 75%                   |       |                   |       |                  | 30    | \$50                                                                | \$95  | \$1,040                                                                 | \$4,550  |
| Thermal [5]                  |                                |       | 0.020                          | 0.080  |                             |       | 40                         | 65    | 20%                          | 40%   | 90%                   | 95%   |                   |       |                  |       | \$40                                                                | \$65  | \$4,000                                                                 | \$6,500  |
| Xtreme Power (dry cell) [13] |                                |       |                                |        |                             |       | 400                        | 500   |                              |       |                       |       |                   |       |                  |       | \$400                                                               | \$500 | \$40,000                                                                | \$50,000 |
| Vanadium Flow Battery [12]   | 0.0250                         | 0.04  | 0.004                          | 0.011  | 2750                        | 3750  | 100                        | 200   | 1%                           | 10%   | 70%                   | 80%   | 10000             | 13000 | 10               | 20    | \$375                                                               | \$575 | \$10,275                                                                | \$20,375 |
| Flywheel [6]                 | 2.0E-4                         | 0.20  |                                |        |                             |       | 300                        |       | N/A                          | N/A   | 80%                   | 90%   |                   |       | 10               | 20    | \$300                                                               |       | \$30,000                                                                |          |
| NiMH Battery [7]             | 0.030                          | 0.08  | 0.0003                         |        |                             |       | 364                        |       | 30%                          |       | 66%                   |       | 500               | 1000  | 3                | 5     | \$364                                                               |       | \$36,400                                                                |          |
| NiCad Battery[8]             | 0.040                          | 0.06  | 0.0001                         |        |                             |       | 400                        |       | 20%                          |       | 70%                   | 90%   |                   | 1500  | 3                | 5     | \$400                                                               |       | \$40,000                                                                |          |
| Lithium Ion Battery [9]      | 0.160                          | 0.20  | 0.0002                         |        |                             |       | 300                        |       | 5%                           |       | 99%                   |       |                   | 1200  | 3                | 5     | \$300                                                               |       | \$30,000                                                                |          |
| Lithium Polymer Battery [10] | 0.130                          | 0.20  |                                |        |                             |       | 500                        |       | 10%                          |       | 99%                   |       |                   | 1000  | 3                | 5     | \$500                                                               |       | \$50,000                                                                |          |
| Lead Acid Battery [11]       | 0.030                          | 0.04  | 0.0001                         |        |                             |       | 100                        | 200   | 10%                          |       | 70%                   | 92%   | 500               | 800   | 3                | 5     | \$100                                                               | \$200 | \$10,000                                                                | \$20,000 |

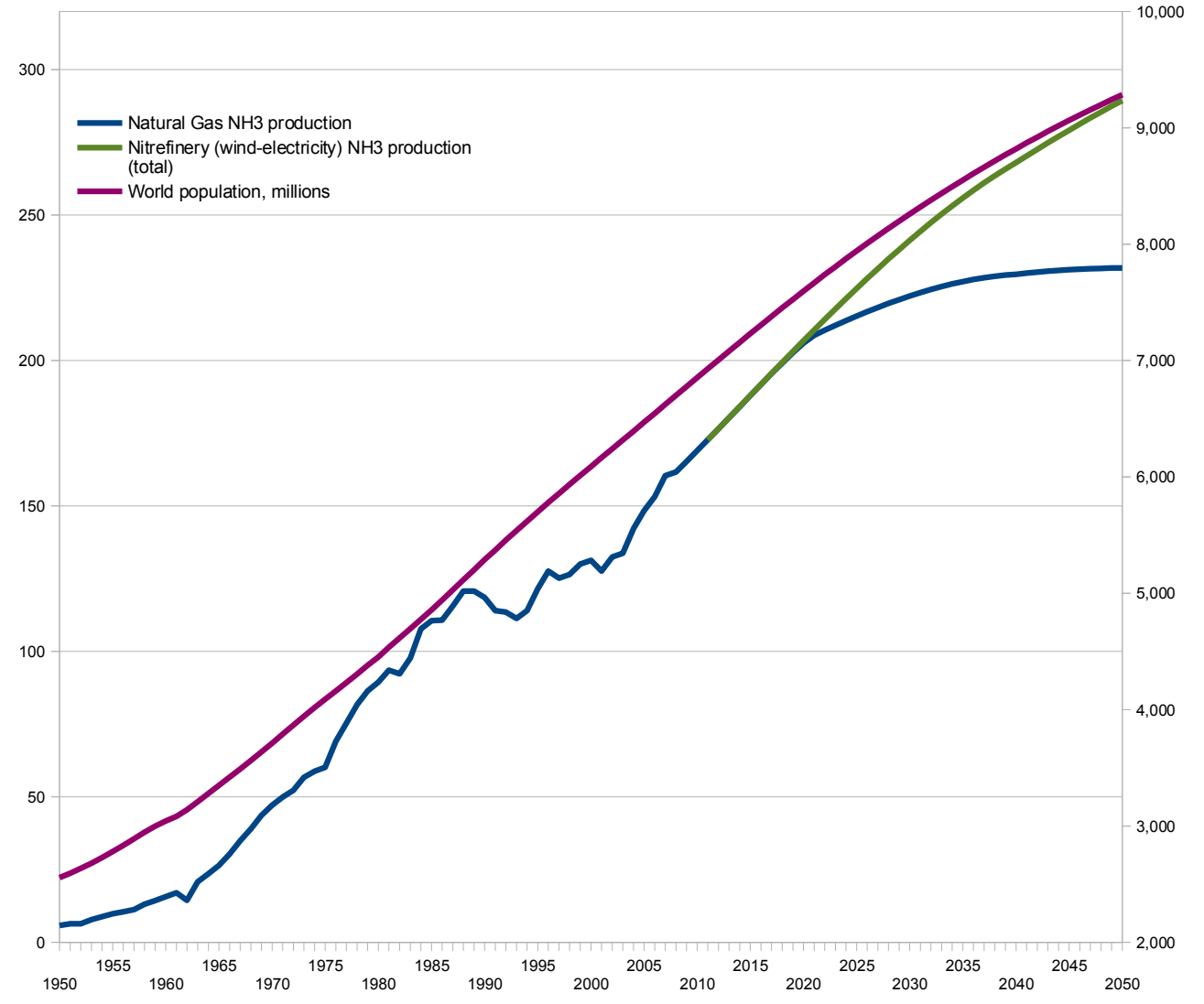
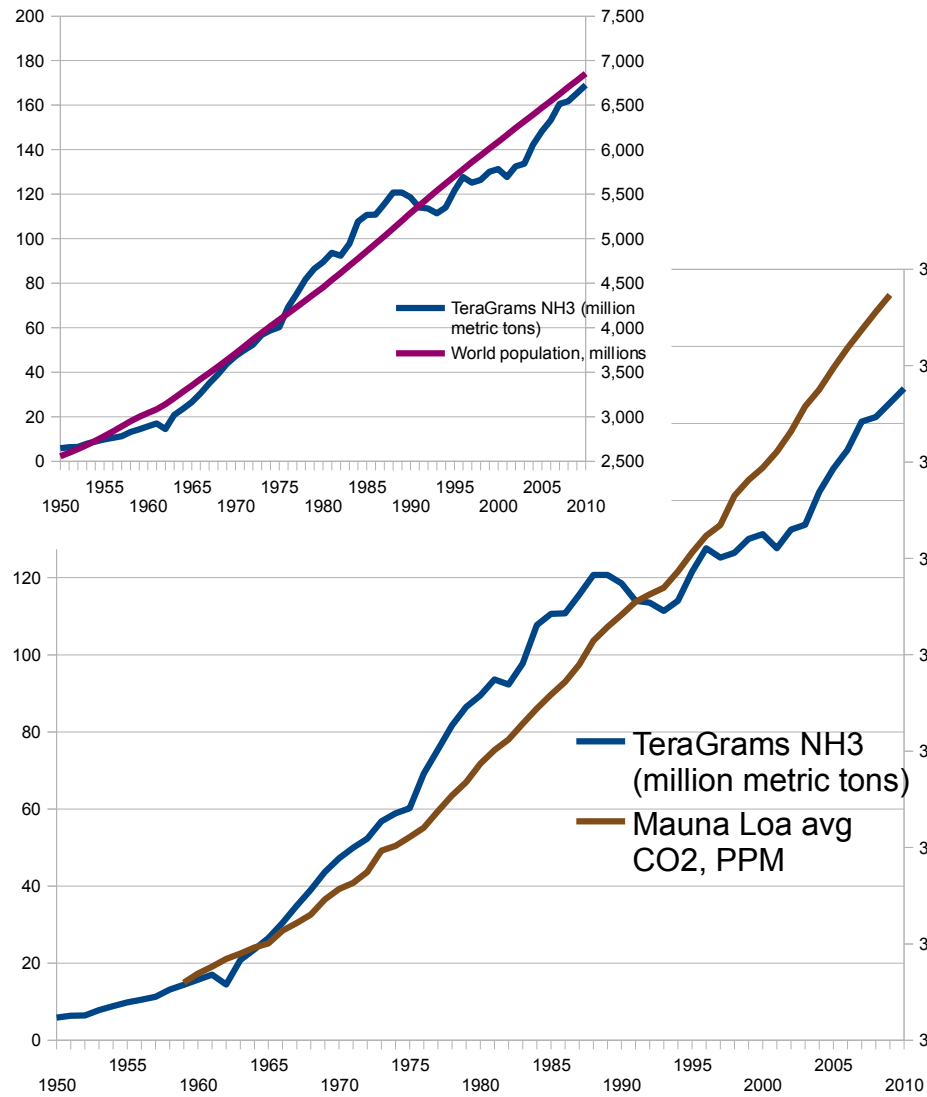
## Notes

Costs are broken into cost per MW nameplate (input) capacity, and per MWH incremental storage cost

- |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [1]     | Ammonia Synthesis using Freedom Fertilizer 100-150MW nameplate wind to NH3 plant (water electrolysis, cryo air separation, haber-bosch reactor and storage). Round trip efficiencies are assuming a low of 20% for conversation of an diesel engine to NH3, and a potential for 50% for direct ammonia fuel cells. Volume and Mass energy are calculated from HHV (high heating value) and LHV (low heating value) of Ammonia and Hydrogen, from <a href="http://hydrogen.pnl.gov/cocoon/morf/projects/hydrogen/datasheets/lower_and_higher_heating_values.xls">hydrogen.pnl.gov/cocoon/morf/projects/hydrogen/datasheets/lower_and_higher_heating_values.xls</a>                                                                                                                                              |
| [2]     | Liquid hydrogen has boil-off issues, and energy to liquify is significant. Compressed hydrogen also has significant energy and cost requirements. Round trip H2 efficiencies are probably overly generous.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| [3],[4] | Equipment cost is a ballpark educated guess                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| [5]     | Thermal storage, such as electrical heating water for later use, or a solar thermal plant. Assumes storage as thermal. Cannot put electricity in, and get electricity back out at the 90-95% round trip ranges. (Thermal-in electrical out, or electrical in thermal out is 90-95% round trip)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| [6]     | Flywheels are efficient, but tends toward very short duration loads                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| [7-11]  | Various battery technologies have maximum 3-5 year lifetime with daily cycling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| [12]    | 6M EU, \$7.5M USD for 2MW system, <a href="http://www.seai.ie/Publications/Renewables_Publications/VRB-ESS-Energy-Storage-Rpt-Final.pdf">http://www.seai.ie/Publications/Renewables_Publications/VRB-ESS-Energy-Storage-Rpt-Final.pdf</a><br>No obvious breakdown of equipment vs storage for VRB batteries are available, est. from <a href="http://thefraserdomain.typepad.com/energy/2006/01/vandium_reflux_.html">http://thefraserdomain.typepad.com/energy/2006/01/vandium_reflux_.html</a><br>Density guessed from <a href="http://www.pdenerytpt://www.pdenery.com/en/technology/energy_storage_systems/technical_specifications/technical_specifications.html">http://www.pdenerytpt://www.pdenery.com/en/technology/energy_storage_systems/technical_specifications/technical_specifications.html</a> |
| [13]    | Target of \$500/KWH .. <a href="http://gigaom.com/cleantech/xtreme-power-raising-funds-for-extreme-plans/">http://gigaom.com/cleantech/xtreme-power-raising-funds-for-extreme-plans/</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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# World population, Ammonia production, and Carbon Dioxide



| US solar capacity additions (figure 1)         |                                |                          |                     |                | Pay It Forward Solar assumptions (5kw average per roof) |                          |                   |                       |                    |                      |                               |                                  |                     |                |                                   | 25 year net value |                                 | \$2,297,331,267      |               |
|------------------------------------------------|--------------------------------|--------------------------|---------------------|----------------|---------------------------------------------------------|--------------------------|-------------------|-----------------------|--------------------|----------------------|-------------------------------|----------------------------------|---------------------|----------------|-----------------------------------|-------------------|---------------------------------|----------------------|---------------|
| Net Benefits from Pay It Forward               | U.S. Annual Capacity Additions | U.S. Cumulative Capacity | install rate growth | Year           | Installation Year                                       | Total solar cost \$/watt | Solar module \$/w | KW installed capacity | Number of projects | Cumulative Kilowatts | Cumulative number of projects | Local (MN) mfg. And installation | Yearly kilowatt-hrs | Electric price | Energy dollars that stay in state | Cumulative cost   | Cumulative energy dollars saved | Net benefit to state |               |
|                                                |                                |                          |                     |                |                                                         |                          |                   |                       |                    |                      |                               |                                  | 13.40%              | 7.50%          |                                   |                   |                                 |                      |               |
| Solar, 25 yr                                   | \$2,297,331,267                | 1.9                      | 11.3                | 1998           | Rate Assump                                             | -7.50%                   | -8.00%            | 100.00%               | 5                  |                      |                               |                                  |                     |                |                                   |                   |                                 |                      |               |
| Wind, 15 yr                                    | \$1,228,271,949                | 2.8                      | 14.2                | 47.37%         | 1999                                                    | 2012                     | \$9.00            | \$5.00                | 5                  | 1                    | 5                             | 1                                | \$45,000            | 5,869          | \$0.11                            | \$646             | \$45,000                        | \$646                | -\$44,354     |
| MWH per year in 2022                           |                                | 3.9                      | 18.1                | 39.29%         | 2000                                                    | 2013                     | \$8.33            | \$4.60                | 10                 | 2                    | 15.0                          | 3                                | \$83,250            | 17,608         | \$0.12                            | \$2,082           | \$128,250                       | \$2,728              | -\$125,522    |
|                                                |                                | 11.4                     | 29.5                | 192.31%        | 2001                                                    | 2014                     | \$7.70            | \$4.23                | 20                 | 4                    | 35.0                          | 7                                | \$154,013           | 41,084         | \$0.13                            | \$5,223           | \$282,263                       | \$7,950              | -\$274,312    |
|                                                |                                |                          |                     |                |                                                         |                          |                   |                       |                    |                      |                               |                                  |                     |                |                                   |                   |                                 |                      |               |
| Solar                                          | 12,014                         | 22.8                     | 52.2                | 100.00%        | 2002                                                    | 2015                     | \$7.12            | \$3.89                | 40                 | 8                    | 75.0                          | 15                               | \$284,923           | 88,038         | \$0.14                            | \$12,031          | \$567,186                       | \$19,981             | -\$547,205    |
| Wind                                           | 7,036,470                      | 45.5                     | 97.7                | 99.56%         | 2003                                                    | 2016                     | \$6.59            | \$3.58                | 80                 | 16                   | 155.0                         | 31                               | \$527,108           | 181,945        | \$0.15                            | \$26,728          | \$1,094,293                     | \$46,709             | -\$1,047,584  |
| Minneapolis total load                         | 5,100,000                      | 57.8                     | 155.5               | 27.03%         | 2004                                                    | 2017                     | \$6.09            | \$3.30                | 160                | 32                   | 315.0                         | 63                               | \$975,149           | 369,760        | \$0.16                            | \$58,392          | \$2,069,443                     | \$105,101            | -\$1,964,342  |
| Surplus                                        | 1,948,484                      | 79.3                     | 234.8               | 37.20%         | 2005                                                    | 2018                     | \$5.64            | \$3.03                | 320                | 64                   | 635.0                         | 127                              | \$1,804,026         | 745,388        | \$0.17                            | \$126,539         | \$3,873,469                     | \$231,641            | -\$3,641,829  |
| Contact:<br>Troy Benjegerdes<br>troy@grid.coop |                                | 104.8                    | 339.7               | 32.16%         | 2006                                                    | 2019                     | \$5.21            | \$2.79                | 640                | 128                  | 1275.0                        | 255                              | \$3,337,449         | 1,496,646      | \$0.18                            | \$273,131         | \$7,210,918                     | \$504,772            | -\$6,706,146  |
|                                                |                                | 169.4                    | 509.0               | 61.64%         | 2007                                                    | 2020                     | \$4.82            | \$2.57                | 1280               | 256                  | 2555.0                        | 511                              | \$6,174,280         | 2,999,161      | \$0.20                            | \$588,383         | \$13,385,198                    | \$1,093,155          | -\$12,292,044 |
|                                                |                                | 309.6                    | 818.6               | 82.76%         | 2008                                                    | 2021                     | \$4.46            | \$2.36                | 2560               | 512                  | 5115.0                        | 1023                             | \$11,422,419        | 6,004,192      | \$0.21                            | \$1,266,262       | \$24,807,617                    | \$2,359,416          | -\$22,448,201 |
|                                                |                                | 435.5                    | 1,254.1             | 40.67%         | 2009                                                    | 2022                     | \$4.13            | \$2.17                | 5120               | 1024                 | 10235.0                       | 2047                             | \$21,131,474        | 12,014,252     | \$0.23                            | \$2,723,793       | \$45,939,091                    | \$5,083,209          | -\$40,855,882 |
|                                                |                                | 883.2                    | 2,137.3             | 102.80%        | 2010                                                    | 2023                     | \$3.82            | \$2.00                | 7680               | 1536                 | 17915.0                       | 3583                             | \$29,319,921        | 21,029,344     | \$0.24                            | \$5,125,208       | \$75,259,012                    | \$10,208,417         | -\$65,050,594 |
|                                                |                                | 4216.75%                 | 1710.38%            | 71.90% average |                                                         | 2024                     | \$3.53            | \$1.84                | 11520              | 2304                 | 29435.0                       | 5887                             | \$40,681,390        | 34,551,980     | \$0.26                            | \$9,052,472       | \$115,940,401                   | \$19,260,890         | -\$96,679,512 |
|                                                |                                |                          |                     |                |                                                         |                          |                   |                       |                    |                      |                               |                                  |                     |                |                                   |                   |                                 |                      |               |
|                                                |                                |                          |                     |                |                                                         |                          |                   |                       |                    |                      |                               |                                  |                     |                |                                   |                   |                                 |                      |               |
|                                                |                                |                          |                     |                |                                                         |                          |                   |                       |                    |                      |                               |                                  |                     |                |                                   |                   |                                 |                      |               |
|                                                |                                |                          |                     |                |                                                         |                          |                   |                       |                    |                      |                               |                                  |                     |                |                                   |                   |                                 |                      |               |

| Solar cost install (figure 8) |                          |                   |                      | Data source: <a href="http://eetd.lbl.gov/ea/emp/re-pubs.html">http://eetd.lbl.gov/ea/emp/re-pubs.html</a>                                               |         |         |                   |                            |                                |                           |                    |                      |                               |                               |                     |                    |                                   |                 | 15 year net value               |                      | \$1,228,271,949 |
|-------------------------------|--------------------------|-------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|-------------------|----------------------------|--------------------------------|---------------------------|--------------------|----------------------|-------------------------------|-------------------------------|---------------------|--------------------|-----------------------------------|-----------------|---------------------------------|----------------------|-----------------|
| Installation Year             | Total solar cost \$/watt | Solar module \$/w | Non-module cost \$/w | Pay It Forward Wind assumptions (see <a href="http://eetd.lbl.gov/ea/emp/reports/lbni-5119e.pdf">http://eetd.lbl.gov/ea/emp/reports/lbni-5119e.pdf</a> ) |         |         |                   |                            |                                |                           |                    |                      |                               |                               |                     |                    |                                   |                 | 15 year net value               |                      | \$1,228,271,949 |
| 1998                          | 11.0                     | 4.8               | 6.1                  | Reduction rate per year                                                                                                                                  |         |         | Installation Year | Total turbine cost \$/watt | Single turbine cost (MW input) | MW new installed capacity | Number of turbines | Cumulative Megawatts | Cumulative number of turbines | Midwest mfg. And installation | Megawatt-hours/year | Electric price/MWH | Energy dollars that stay in state | Cumulative cost | Cumulative energy dollars saved | Net benefit to state |                 |
| 1999                          | 10.8                     | 4.8               | 6.0                  | -1.82%                                                                                                                                                   | 0.00%   | -1.64%  | Rate Assump       | -4.00%                     | 3                              | 100.00%                   |                    |                      |                               |                               | 35.00%              | 6.00%              |                                   |                 |                                 |                      |                 |
| 2000                          | 9.7                      | 4.7               | 4.9                  | -10.19%                                                                                                                                                  | -2.08%  | -18.33% | 2015              | \$1.50                     | \$4,500,000                    | 9                         | 3                  | 9                    | 3                             | \$13,500,000                  | 27,594              | \$30.00            | \$827,820                         | \$13,500,000    | \$827,820                       | -\$12,672,180        |                 |
| 2001                          | 10.0                     | 4.3               | 5.7                  | 3.09%                                                                                                                                                    | -8.51%  | 16.33%  | 2016              | \$1.44                     | \$4,320,000                    | 18                        | 6                  | 27                   | 9                             | \$25,920,000                  | 82,782              | \$31.80            | \$2,632,468                       | \$39,420,000    | \$3,460,288                     | -\$35,959,712        |                 |
| 2002                          | 9.9                      | 3.9               | 6.0                  | -1.00%                                                                                                                                                   | -9.30%  | 5.26%   | 2017              | \$1.38                     | \$4,147,200                    | 36                        | 12                 | 63                   | 21                            | \$49,766,400                  | 193,158             | \$33.71            | \$6,510,970                       | \$89,186,400    | \$9,971,257                     | -\$79,215,143        |                 |
| 2003                          | 8.7                      | 3.6               | 5.1                  | -12.12%                                                                                                                                                  | -7.69%  | -15.00% | 2018              | \$1.33                     | \$3,981,312                    | 72                        | 24                 | 135                  | 45                            | \$95,551,488                  | 413,910             | \$35.73            | \$14,789,203                      | \$184,737,888   | \$24,760,460                    | -\$159,977,428       |                 |
| 2004                          | 8.4                      | 3.8               | 4.6                  | -3.45%                                                                                                                                                   | 5.56%   | -9.80%  | 2019              | \$1.27                     | \$3,822,060                    | 144                       | 48                 | 279                  | 93                            | \$183,458,857                 | 855,414             | \$37.87            | \$32,398,214                      | \$368,196,745   | \$57,158,674                    | -\$311,038,071       |                 |
| 2005                          | 7.9                      | 4.0               | 3.8                  | -5.95%                                                                                                                                                   | 5.26%   | -17.39% | 2020              | \$1.22                     | \$3,669,177                    | 288                       | 96                 | 567                  | 189                           | \$352,241,005                 | 1,738,422           | \$40.15            | \$69,792,024                      | \$720,437,750   | \$126,950,698                   | -\$593,487,052       |                 |
| 2006                          | 7.9                      | 4.2               | 3.7                  | 0.00%                                                                                                                                                    | 5.00%   | -2.63%  | 2021              | \$1.17                     | \$3,522,410                    | 576                       | 192                | 1143                 | 381                           | \$676,302,730                 | 3,504,438           | \$42.56            | \$149,133,368                     | \$1,396,740,481 | \$276,084,066                   | -\$1,120,656,414     |                 |
| 2007                          | 7.9                      | 4.1               | 3.7                  | 0.00%                                                                                                                                                    | -2.38%  | 0.00%   | 2022              | \$1.13                     | \$3,381,514                    | 1152                      | 384                | 2295                 | 765                           | \$1,298,501,242               | 7,036,470           | \$45.11            | \$317,407,476                     | \$2,695,241,723 | \$593,491,543                   | -\$2,101,750,180     |                 |
| 2008                          | 7.6                      | 3.7               | 3.9                  | -3.80%                                                                                                                                                   | -9.76%  | 5.41%   | 2023              |                            |                                | 0                         | 0                  | 2295                 | 765                           | \$0                           | 7,036,470           | \$47.82            | \$336,451,925                     | \$2,695,241,723 | \$929,943,467                   | -\$1,765,298,255     |                 |
| 2009                          | 7.5                      | 2.8               | 4.7                  | -1.32%                                                                                                                                                   | -24.32% | 20.51%  | 2024              |                            |                                | 0                         | 0                  | 2295                 | 765                           | \$0                           | 7,036,470           | \$50.68            | \$356,639,040                     | \$2,695,241,723 | \$1,286,582,508                 | -\$1,408,659,215     |                 |
| 2010                          | 6.2                      | 2.4               | 3.8                  | -17.33%                                                                                                                                                  | -14.29% | -19.15% | 2025              |                            |                                | 0                         | 0                  | 2295                 | 765                           | \$0                           | 7,036,470           | \$53.73            | \$378,037,383                     | \$2,695,241,723 | \$1,664,619,891                 | -\$1,030,621,832     |                 |
| average                       | -3.97%                   | -4.55%            | -3.43%               | -4.49%                                                                                                                                                   | -5.21%  | -3.04%  | 2026              |                            |                                | 0                         | 0                  | 2295                 | 765                           | \$0                           | 7,036,470           | \$56.95            | \$400,719,626                     | \$2,695,241,723 | \$2,065,339,516                 | -\$629,902,207       |                 |
|                               |                          |                   |                      |                                                                                                                                                          |         |         | 2027              |                            |                                | 0                         | 0                  | 2295                 | 765                           | \$0                           | 7,036,470           | \$60.37            | \$424,762,803                     | \$2,695,241,723 | \$2,490,102,319                 | -\$205,139,403       |                 |
|                               |                          |                   |                      |                                                                                                                                                          |         |         | 2028              |                            |                                | 0                         | 0                  | 2295                 | 765                           | \$0                           | 7,036,470           | \$63.99            | \$450,248,571                     | \$2,695,241,723 | \$2,940,350,891                 | \$245,109,168        |                 |
|                               |                          |                   |                      |                                                                                                                                                          |         |         | 2029              |                            |                                | 0                         | 0                  | 2295                 | 765                           | \$0                           | 7,036,470           | \$67.83            | \$477,263,486                     | \$2,695,241,723 | \$3,417,614,377                 | \$722,372,654        |                 |
|                               |                          |                   |                      |                                                                                                                                                          |         |         | 2030              |                            |                                | 0                         | 0                  | 2295                 | 765                           | \$0                           | 7,036,470           | \$71.90            | \$505,899,295                     | \$2,695,241,723 | \$3,923,513,672                 | \$1,228,271,949      |                 |

[1] [http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CClQFjAA&url=http%3A%2F%2Fscs.eelsevier.com%2FBranker\\_Pathak\\_and\\_Pearce\\_%2520RSEr.pdf&ei=UE05T8TXJKWLiAKq1rGuCg&usg=AFQjCNECqS3x133UnasjjMTDc-Pb5j-SWw](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CClQFjAA&url=http%3A%2F%2Fscs.eelsevier.com%2FBranker_Pathak_and_Pearce_%2520RSEr.pdf&ei=UE05T8TXJKWLiAKq1rGuCg&usg=AFQjCNECqS3x133UnasjjMTDc-Pb5j-SWw)

[2] <http://qspace.library.queensu.ca/jspui/handle/1974/6879>