

# Energy Technology Comparison Report



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## Introduction

This report is about two comparisons of energy technologies. We have calculated the expected rate of return on the invest opportunity based on the best information available in 07/08. The expected rate of return is like the interest rate you could expect on the money you put in. We will see that the older polluting technologies in Australia are a bad investment in the current market place as well as being a threat to the environment.

One comparison is of Azure Microgrid Solar Energy Technology in

- Australia
- Germany
- Italy
- USA (California) and
- Japan

The difference between these locations is the value of energy in each place and the sunlight available. For example Southern Germany has 2/3 of the sunlight of Sydney. All these things have been taken in to account in our evaluation

Also a comparison in Australia of

- Dirty Coal PowerStation's
- Clean Coal PowerStation's (if it can be done)
- Dirty Gas PowerStation's
- Clean Gas PowerStation's (if it can be done)
- Nuclear PowerStation's
- Azure Microgrid Solar Technology

These types of energy technology have been chosen for comparison because they can all supply energy on demand. Other renewable energy sources like wind and tidal are not currently used with storage systems so they will only provide an intermittent energy supply. Solar panels of the photovoltaic (PV) type are not used with storage system on a large scale either and PV is twice the cost of the Azure's system even with no energy storage, so was not considered in the comparison. There are sources of geothermal energy in Australia which could be cheap at the point of generation in Central Australia but we have no data on the infrastructure cost to get the energy to the cities so we will omit this for now.

# Azure Microgrid Solar Technology

| AZURE MICROGRID ASSETS PORTFOLIO                                  | % INVESTED IN EACH COUNTRY | INTERNAL RATE OF RETURN |
|---|----------------------------|-------------------------|
| Germany, Azure MICROGRID  | 30.0%                      | 11%                     |
| Italy, Azure MICROGRID  | 40.0%                      | 12%                     |
| California, Azure MICROGRID                                       | 15.0%                      | 10%                     |
| Japan, Azure MICROGRID  | 10.0%                      | 10%                     |
| Australia, Azure MICROGRID  | 5.0%                       | 7%                      |
| <b>Combined International Portfolio of Azure MICROGRID assets</b> |                            | 11%                     |

The table above shows the return you can expect from the Azure Microgrid Solar Technology in each country. It assumes no inflation in the value of electricity. Inflation would make the system a better investment. It shows the proportion Azure Energy would put in each country to make a diverse portfolio.

You will notice in the detailed source data that we have calculated a high low and average scenario and then used the probability of each to arrive at one value of return. We have done this in all our examples

The average carbon credits included were at the European rates at the end of 2007. We have included no government subsidies other than the carbon trading system.

A capital raising cost or flotation cost of 10% was added to the cost of all the systems.

## In Australia

The table below has all the data uses to estimate the return of the Microgrid in Australia. The electricity price is the retail rate. We are using the retail rate because the equipment will be installed on buildings as apposed to in the country where it will require the use of a distribution grid, Azure's technology needs no distribution grid. The average hydrogen value was based on a petrol price of \$1.40/L and we have just exceeded that price.

| AZURE MICROGRID IN AUSTRALIA               |              | COMMENTS / SOURCES |   |
|--|--------------|--------------------|---|
| Electricity price - low                    | \$0.1593     | \$/kWh             | Energy Australia standard rate in mid 2007 with three 8% price increase allowed by NSW government   |
| Electricity energy price                   | \$0.2253     | \$/kWh             | Energy Australia green energy rate for old generation source in mid 2007 with three 8% price increases allowed by NSW government                      |
| Electricity price - high                   | \$0.2468     | \$/kWh             | Energy Australia green energy rate for new generation source in mid 2007 with three 8% price increases allowed by NSW government x 1 + rate of return |
| Non-electrical energy at home - low price  | \$0.1593     | \$/kWh             | Energy rate assume same as electricity  |
| Non-electrical energy at home              | \$0.2253     | \$/kWh             | Energy rate assume same as electricity  |
| Non-electrical energy at home - high price | \$0.2468     | \$/kWh             | Energy rate assume same as electricity  |
| Excess hydrogen price - low                | \$0.1500     | \$/kWh             | Based on petrol price of \$1.20/L   |
| Excess hydrogen price                      | \$0.1725     | \$/kWh             | Based on petrol price of \$1.40/L   |
| Excess hydrogen price - high               | \$0.3450     | \$/kWh             | Based on petrol price of \$2.80 for fuel cell car which uses half the fuel  |
| Value of carbon credit                     | \$8.50       | tonne              | Chicago exchange in 2007  |
| Value of carbon credit                     | \$36.67      | tonne              | European/Kyoto rate in 2007   |
| Value of carbon credit                     | \$39.00      | tonne              | Stern report of the cost of pollution divided by 2  |
| Total energy sold per year by microgrid    | 651,000      | kWh/year           | Based on calculations from microgrid model  |
| Electricity percentage                     | 48.1%        |                    | Based on calculations from microgrid model  |
| Non-electrical percentage                  | 11.5%        |                    | Based on calculations from microgrid model  |
| Hydrogen percentage                        | 40.4%        |                    | Based on calculations from microgrid model  |
| Tonnes of carbon avoided                   | 215          | t/year             | Based on calculations from microgrid model  |
| Labour                                     | -\$4,000     | /year              |   |
| Materials                                  | -\$300       | /year              |   |
| Flotation cost                             | 10%          |                    |   |
| Initial cost - worst                       | -\$1,400,000 | /microgrid         | Estimate from microgrid construction cost estimates   |
| Initial cost - average                     | -\$1,300,000 | /microgrid         | Estimate from microgrid construction cost estimates   |
| Initial cost - best                        | -\$1,200,000 | /microgrid         | Estimate from microgrid construction cost estimates   |

## In Germany

German researchers reported the cost of petrol and electricity to us in late 2007. We use this data and allowed for the low sun level of Germany. Costs used are before VAT, their version of GST, which is much high then in Australia.

| AZURE MICROGRID IN GERMANY                 |              |            | COMMENTS / SOURCES  |
|--|--------------|------------|---|
| Electricity price low                      | \$0.2839     | \$/kWh     | Report from <a href="http://www.manager-magazin.de/unternehmen/artikel/0,2828,465850,00.html">http://www.manager-magazin.de/unternehmen/artikel/0,2828,465850,00.html</a> before VAT                      |
| Electricity energy price                   | \$0.3279     | \$/kWh     | Report from <a href="http://www.manager-magazin.de/unternehmen/artikel/0,2828,465850,00.html">http://www.manager-magazin.de/unternehmen/artikel/0,2828,465850,00.html</a> + 4.4 for green rate before VAT |
| Electricity price high                     | \$0.3499     | \$/kWh     | Report from <a href="http://www.manager-magazin.de/unternehmen/artikel/0,2828,465850,00.html">http://www.manager-magazin.de/unternehmen/artikel/0,2828,465850,00.html</a> + 6.6 green rate before VAT     |
| Non-electrical energy at home - low price  | \$0.2839     | \$/kWh     | Energy rate assume same as electricity  |
| Non-electrical energy at home              | \$0.3279     | \$/kWh     | Energy rate assume same as electricity  |
| Non-electrical energy at home - high price | \$0.3499     | \$/kWh     | Energy rate assume same as electricity  |
| Excess hydrogen price - low                | \$0.2130     | \$/kWh     | Commissioned report before VAT  |
| Excess hydrogen price                      | \$0.3195     | \$/kWh     | Commissioned report average before VAT  |
| Excess hydrogen price - high               | \$0.4260     | \$/kWh     | Commissioned report X2 for efficient cars before VAT  |
| Value of carbon credit                     | \$8.50       | tonne      | Chicago exchange in 2007  |
| Value of carbon credit                     | \$36.67      | tonne      | European/Kyoto rate in 2007   |
| Value of carbon credit                     | \$39.00      | tonne      | Stern report of the cost of pollution divided by 2  |
| Total energy sold per year by microgrid    | 651,000      | kWh/year   | Based on calculations from microgrid model  |
| Electricity percentage                     | 18.5%        |            | Based on calculations from microgrid model  |
| Non-electrical percentage                  | 11.5%        |            | Based on calculations from microgrid model  |
| Hydrogen percentage                        | 70.0%        |            | Based on calculations from microgrid model  |
| Tonnes of carbon avoided                   | 215          | t/year     | Based on calculations from microgrid model  |
| Labour                                     | -\$4,000     | /year      |   |
| Materials                                  | -\$300       | /year      |   |
| Flotation cost                             | 10%          |            |   |
| Initial cost - worst                       | -\$1,500,000 | /microgrid | Estimate from microgrid construction cost estimates   |
| Initial cost - average                     | -\$1,400,000 | /microgrid | Estimate from microgrid construction cost estimates   |
| Initial cost - best                        | -\$1,300,000 | /microgrid | Estimate from microgrid construction cost estimates   |

## In Italy

The energy price data is from a EUROSTAT report. Italy has had the highest electricity price in Europe. Costs used are before VAT, their version of GST, which is much high then in Australia.

| AZURE MICROGRID<br>IN ITALY                |              | COMMENTS / SOURCES |   |
|--|--------------|--------------------|---|
| Electricity price - low                    | \$0.2579     | \$/kWh             | EUROSTAT 93/2006 - 14 July 20                       |
| Electricity energy price                   | \$0.3019     | \$/kWh             | EUROSTAT 93/2006 - 14 July 20 + 4.4c green rate     |
| Electricity price - high                   | \$0.3239     | \$/kWh             | EUROSTAT 93/2006 - 14 July 20 +6.6c green rate      |
| Non-electrical energy at home - low price  | \$0.2579     | \$/kWh             | Energy rate assume same as electricity              |
| Non-electrical energy at home              | \$0.3019     | \$/kWh             | Energy rate assume same as electricity              |
| Non-electrical energy at home - high price | \$0.3239     | \$/kWh             | Energy rate assume same as electricity              |
| Excess hydrogen price - low                | \$0.2516     | \$/kWh             | Eurostat  |
| Excess hydrogen price                      | \$0.3775     | \$/kWh             | Eurostat average                                    |
| Excess hydrogen price - high               | \$0.5033     | \$/kWh             | Eurostat x 2 for high efficiency fuel cell car      |
| Value of carbon credit                     | \$8.50       | tonne              | Chicago exchange in 2007                            |
| Value of carbon credit                     | \$36.67      | tonne              | European/Kyoto rate in 2007                         |
| Value of carbon credit                     | \$39.00      | tonne              | Stern report of the cost of pollution divided by 2  |
| Total energy sold per year by microgrid    | 651,000      | kWh/year           | Based on calculations from microgrid model          |
| Electricity percentage                     | 18.5%        |                    | Based on calculations from microgrid model          |
| Non-electrical percentage                  | 11.5%        |                    | Based on calculations from microgrid model          |
| Hydrogen percentage                        | 70.0%        |                    | Based on calculations from microgrid model          |
| Tonnes of carbon avoided                   | 215          | t/year             | Based on calculations from microgrid model          |
| Labour                                     | -\$4,000     | /year              |   |
| Materials                                  | -\$300       | /year              |   |
| Flotation cost                             | 10%          |                    |   |
| Initial cost - worst                       | -\$1,400,000 | /microgrid         | Estimate from microgrid construction cost estimates |
| Initial cost - average                     | -\$1,300,000 | /microgrid         | Estimate from microgrid construction cost estimates |
| Initial cost - best                        | -\$1,200,000 | /microgrid         | Estimate from microgrid construction cost estimates |

## In USA (California)

Out data for California is from Southern California Edison who is a Utility there. The Gasoline price is from October 2007 so may have increased since then.

| AZURE MICROGRID IN CALIFORNIA              |              |            | COMMENTS / SOURCES                                  |
|--|--------------|------------|---|
| Electricity price - low                    | \$0.2666     | \$/kWh     | Southern California Edison - 5%                     |
| Electricity energy price                   | \$0.2806     | \$/kWh     | Southern California Edison                          |
| Electricity price - high                   | \$0.3466     | \$/kWh     | Southern California Edison + \$0.66 for green rate  |
| Non-electrical energy at home - low price  | \$0.2666     | \$/kWh     | Energy rate assume same as electricity              |
| Non-electrical energy at home              | \$0.2806     | \$/kWh     | Energy rate assume same as electricity              |
| Non-electrical energy at home - high price | \$0.3466     | \$/kWh     | Energy rate assume same as electricity              |
| Excess hydrogen price - low                | \$0.0920     | \$/kWh     | Regular Gasoline in California on 14-10-07          |
| Excess hydrogen price                      | \$0.0996     | \$/kWh     | Premium Gasoline in California on 14-10-07          |
| Excess hydrogen price - high               | \$0.1046     | \$/kWh     | Premium Gasoline in California on 14-10-07 + 5%     |
| Value of carbon credit                     | \$8.50       | tonne      | Chicago exchange in 2007                            |
| Value of carbon credit                     | \$36.67      | tonne      | European/Kyoto rate in 2007                         |
| Value of carbon credit                     | \$39.00      | tonne      | Stern report of the cost of pollution divided by 2  |
| Total energy sold per year by microgrid    | 651,000      | kWh/year   | Based on calculations from microgrid model          |
| Electricity percentage                     | 88.5%        |            | Based on calculations from microgrid model          |
| Non-electrical percentage                  | 11.5%        |            | Based on calculations from microgrid model          |
| Hydrogen percentage                        | 0.0%         |            | Based on calculations from microgrid model          |
| Tonnes of carbon avoided                   | 215          | t/year     | Based on calculations from microgrid model          |
| Labour                                     | -\$4,000     | /year      |   |
| Materials                                  | -\$300       | /year      |   |
| Flotation cost                             | 10%          |            |   |
| Initial cost - worst                       | -\$1,400,000 | /microgrid | Estimate from microgrid construction cost estimates |
| Initial cost - average                     | -\$1,300,000 | /microgrid | Estimate from microgrid construction cost estimates |
| Initial cost - best                        | -\$1,200,000 | /microgrid | Estimate from microgrid construction cost estimates |

## In Japan

The electricity price data for Japan is old so the prices may have increased since 2000 when the report used was prepared for government. Their petrol prices seem similar to Australia.

| AZURE MICROGRID IN JAPAN                   |              |            | COMMENTS / SOURCES  |
|--|--------------|------------|---|
| Electricity price - low                    | \$0.3016     | \$/kWh     | Data Source: Ministerial Inquiry Issues Paper, February 2000                  |
| Electricity energy price                   | \$0.3456     | \$/kWh     | Data Source: Ministerial Inquiry Issues Paper, February 2000 +4.4c green rate |
| Electricity price - high                   | \$0.3676     | \$/kWh     | Data Source: Ministerial Inquiry Issues Paper, February 2000 +6.6c green rate |
| Non-electrical energy at home - low price  | \$0.3016     | \$/kWh     | Energy rate assume same as electricity  |
| Non-electrical energy at home              | \$0.3456     | \$/kWh     | Energy rate assume same as electricity  |
| Non-electrical energy at home - high price | \$0.3676     | \$/kWh     | Energy rate assume same as electricity  |
| Excess hydrogen price - low                | \$0.0156     | \$/kWh     | Based on petrol price of \$1.36 for fuel cell car which uses half the fuel    |
| Excess hydrogen price                      | \$0.0234     | \$/kWh     | Average   |
| Excess hydrogen price - high               | \$0.0313     | \$/kWh     | Based on petrol price of \$1.36 for fuel cell car which uses half the fuel    |
| Value of carbon credit                     | \$8.50       | tonne      | Chicago exchange in 2007  |
| Value of carbon credit                     | \$36.67      | tonne      | European/Kyoto rate in 2007   |
| Value of carbon credit                     | \$39.00      | tonne      | Stern report of the cost of pollution divided by 2                            |
| Total energy sold per year by microgrid    | 651,000      | kWh/year   | Based on calculations from microgrid model                                    |
| Electricity percentage                     | 70.0%        |            | Based on calculations from microgrid model                                    |
| Non-electrical percentage                  | 12%          |            | Based on calculations from microgrid model                                    |
| Hydrogen percentage                        | 18%          |            | Based on calculations from microgrid model                                    |
| Tonnes of carbon avoided                   | 215          | t/year     | Based on calculations from microgrid model                                    |
| Labour                                     | -\$4,000     | /year      |   |
| Materials                                  | -\$300       | /year      |   |
| Flotation cost                             | 10%          |            |   |
| Initial cost - worst                       | -\$1,400,000 | /microgrid | Estimate from microgrid construction cost estimates                           |
| Initial cost - average                     | -\$1,300,000 | /microgrid | Estimate from microgrid construction cost estimates                           |
| Initial cost - best                        | -\$1,200,000 | /microgrid | Estimate from microgrid construction cost estimates                           |

# Other energy sources in Australia

The electricity price used on the nuclear and coal power stations are the same assuming the produce base load power. The value used is the highest we could find on the market at the time of calculation. One utility reported an average price of 3.6cents/kWh and we have assumed an increase to an average of 5.3cents/kWh to account for some expected price rises.

| Comparison of Energy Technologies                          | Internal rate of return |
|--|-------------------------|
| Combined International portfolio of Azure MICROGRID assets | 11%                     |
| Nuclear Power  | 4%                      |
| Dirty Coal (no carbon trading)                             | 6%                      |
| Geosequestered Coal  | 5%                      |
| Dirty Gas (no carbon trading)                              | 8%                      |
| Geosequestered Gas   | 6%                      |

## Nuclear Power

The cost of a Nuclear power station comes from some historical prices and from an Australian Government report obtained from the Australian Nuclear Science and Technology Organization (ANSTO). The report compared the estimates of the cost of a Nuclear Power Stations from many other similar reports and those values were used here. The projected cost of a new reactor appears to be very similar all over the world.

| NUCLEAR POWER                              |              |            | COMMENTS / SOURCES  |
|--|--------------|------------|---|
| Electricity price - low                    | \$0.0490     | \$/kWh     | Energy Australia standard rate in mid 2007 with three 8% price increase allowed by NSW government   |
| Electricity energy price                   | \$0.0530     | \$/kWh     | Energy Australia green energy rate for old generation source in mid 2007 with three 8% price increases allowed by NSW government  |
| Electricity price - high                   | \$0.0570     | \$/kWh     | Energy Australia green energy rate for new generation source in mid 2007 with three 8% price increases allowed by NSW government x 1 + rate of return                         |
| Non-electrical energy at home - low price  | \$0.0000     | \$/kWh     |   |
| Non-electrical energy at home              | \$0.0000     | \$/kWh     |   |
| Non-electrical energy at home - high price | \$0.0000     | \$/kWh     |   |
| Excess hydrogen price - low                | \$0.0000     | \$/kWh     |   |
| Excess hydrogen price                      | \$0.0000     | \$/kWh     |   |
| Excess hydrogen price - high               | \$0.0000     | \$/kWh     |   |
| Value of carbon credit                     | \$8.50       | tonne      | Chicago exchange in 2007  |
| Value of carbon credit                     | \$36.67      | tonne      | European/Kyoto rate in 2007   |
| Value of carbon credit                     | \$39.00      | tonne      | Stern report of the cost of pollution divided by 2  |
| Total energy sold per year by microgrid    | na           | kWh/year   | A nuclear power station only produces electricity   |
| Electricity percentage                     | 100.0%       |            |   |
| Non-electrical percentage                  | 0.0%         |            |   |
| Hydrogen percentage                        | 0.0%         |            |   |
| Tonnes of carbon avoided                   | 215          | t/year     | Based on calculations from microgrid model  |
| Operating and Maintenance cost             | -\$6,843     | /year      | Operating and maintenance cost from (Gittus) 1.5% of investment   |
| Variable operating cost                    | -\$0.01      | /kWh       | Variable operation and maintenance cost 5.55/MWh (Gittus)   |
| Plant cost - worst                         | \$5,244      | /kW        | Clinton <a href="http://www.eia.doe.gov/cneaf/nuclear/page/at_a_glance/reactors/clinton.html">http://www.eia.doe.gov/cneaf/nuclear/page/at_a_glance/reactors/clinton.html</a> |
| Plant cost                                 | \$4,045      | /kW        | Average cost of Clinton and Gittus  |
| Plant cost - best                          | \$2,846      | /kW        | Gittus report from ANSTO Capital cost JHG 2006 2843 table 1 p53   |
| Power equal to microgrid                   | 87           | kW         |   |
| Flotation cost                             | 10%          |            |   |
| Initial cost - worst                       | -\$1,400,000 | /microgrid |   |
| Initial cost - average                     | -\$1,300,000 | /microgrid |   |
| Initial cost - best                        | -\$1,200,000 | /microgrid |   |

## Dirty Coal

The power station cost was from a new plant being proposed in Victoria and is similar to one being built in Western Australia. We have assumed no carbon credit costs.

| DIRTY COAL                                 |            | COMMENTS / SOURCES |  |
|--|------------|--------------------|--|
| Electricity price - low                    | \$0.0490   | \$/kWh             | September average price in 2007  |
| Electricity energy price                   | \$0.0530   | \$/kWh             | Average of September peak average price and average price in 2007  |
| Electricity price - high                   | \$0.0570   | \$/kWh             | September average peak price in 2007   |
| Non-electrical energy at home - low price  | \$0.0000   | \$/kWh             |  |
| Non-electrical energy at home              | \$0.0000   | \$/kWh             |  |
| Non-electrical energy at home - high price | \$0.0000   | \$/kWh             |  |
| Excess hydrogen price - low                | \$0.0000   | \$/kWh             |  |
| Excess hydrogen price                      | \$0.0000   | \$/kWh             |  |
| Excess hydrogen price - high               | \$0.0000   | \$/kWh             |  |
| Value of carbon credit                     | \$0.00     | tonne              | European/Kyoto rate in 2007  |
| Value of carbon credit                     | \$0.00     | tonne              | Chicago exchange in 2007   |
| Value of carbon credit                     | \$0.00     | tonne              |  |
| Total energy sold per year by microgrid    | na         | kWh/year           |  |
| Electricity percentage                     | 100.0%     | \$/kWh             | A coal power station only produces electricity   |
| Non-electrical percentage                  | 0.0%       |                    |  |
| Hydrogen percentage                        | 0.0%       |                    |  |
| Tonnes of carbon avoided                   | 215        | t/year             | Based on calculations from microgrid model   |
| Operating and Maintenance cost             | -\$3,426   | /year              | Assumed the same as Nuclear Power - <a href="http://www.theaustralian.news.com.au/story/0,20867,21349233-643,00.html">http://www.theaustralian.news.com.au/story/0,20867,21349233-643,00.html</a>  |
| Coal price                                 | -\$70.00   | /tonne             | Coal price   |
| Geosequestration cost - worst              | \$0.00     | /tonne             | Australian Federal government report US\$14 to US\$71 /tonne <a href="http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf">http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf</a> |
| Geosequestration cost                      | \$0.00     | /tonne             | Average  |
| Geosequestration cost - best               | \$0.00     | /tonne             | Australian Federal government report US\$14 to US\$71 /tonne <a href="http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf">http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf</a> |
| Enthalpy of combustion of coal             | 33,500     | kJ/kg              |  |
| Energy conversion efficiency               | 38%        | tonne              |  |
| Energy price                               | -\$0.0198  | /kWh               |  |
| Cost per kilowatt - worst                  | \$2,625    | /kW                | <a href="http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/">http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/</a> x 1.4  |
| Cost per kilowatt                          | \$2,250    | /kW                | <a href="http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/">http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/</a> x 1.2  |
| Cost per kilowatt - best                   | \$1,875    | /kW                | <a href="http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/">http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/</a>  |
| Power equal to microgrid                   | 87         | kW                 |  |
| Flotation cost                             | 10%        |                    |  |
| Initial cost - worst                       | -\$228,375 |                    |  |
| Initial cost - average                     | -\$195,750 |                    |  |
| Initial cost - best                        | -\$163,125 |                    |  |

## Clean Coal

Everything is the same here as in the Dirty Coal with the inclusion of a cost for carbon storage underground (geosequestration). Note the carbon storage technology is just a theory not a real thing. The cost of the carbon storage was from a federal government report late in 2007 and ranged from \$17 to \$88 tonne, which is very broad range.

| GEOSEQUENCED COAL                          |            | COMMENTS / SOURCES |  |
|--|------------|--------------------|--|
| Electricity price - low                    | \$0.0490   | \$/kWh             | September average price in 2007  |
| Electricity energy price                   | \$0.0530   | \$/kWh             | Average of September peak average price and average price in 2007  |
| Electricity price - high                   | \$0.0570   | \$/kWh             | September average peak price in 2007   |
| Non-electrical energy at home - low price  | \$0.0000   | \$/kWh             |  |
| Non-electrical energy at home              | \$0.0000   | \$/kWh             |  |
| Non-electrical energy at home - high price | \$0.0000   | \$/kWh             |  |
| Excess hydrogen price - low                | \$0.0000   | \$/kWh             |  |
| Excess hydrogen price                      | \$0.0000   | \$/kWh             |  |
| Excess hydrogen price - high               | \$0.0000   | \$/kWh             |  |
| Value of carbon credit                     | \$8.50     | tonne              | Chicago exchange in 2007   |
| Value of carbon credit                     | \$36.67    | tonne              | European/Kyoto rate in 2007  |
| Value of carbon credit                     | \$39.00    | tonne              | Half Stern report of the cost of pollution   |
| Total energy sold per year by microgrid    | na         | kWh/year           |  |
| Electricity percentage                     | 100.0%     | \$/kWh             | A coal power station only produces electricity   |
| Non-electrical percentage                  | 0.0%       |                    |  |
| Hydrogen percentage                        | 0.0%       |                    |  |
| Tonnes of carbon avoided                   | 215        | t/year             | Based on calculations from microgrid model   |
| Operating and Maintenance cost             | -\$3,426   | /year              | Assumed the same as Nuclear Power - <a href="http://www.theaustralian.news.com.au/story/0,20867,21349233-643,00.html">http://www.theaustralian.news.com.au/story/0,20867,21349233-643,00.html</a>  |
| Coal price                                 | -\$70.00   | /tonne             | Coal price   |
| Geosequestration cost - worst              | -\$88.75   | /tonne             | Australian Federal government report US\$14 to US\$71 /tonne <a href="http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf">http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf</a> |
| Geosequestration cost                      | -\$53.13   | /tonne             | Average  |
| Geosequestration cost - best               | -\$17.50   | /tonne             | Australian Federal government report US\$14 to US\$71 /tonne <a href="http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf">http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf</a> |
| Enthalpy of combustion of coal             | 33,500     | kJ/kg              |  |
| Energy conversion efficiency               | 38%        | tonne              |  |
| Energy price                               | -\$0.0198  | /kWh               |  |
| Cost per kilowatt - worst                  | \$2,625    | /kW                | <a href="http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/">http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/</a> x 1.4  |
| Cost per kilowatt                          | \$2,250    | /kW                | <a href="http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/">http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/</a> x 1.2  |
| Cost per kilowatt - best                   | \$1,875    | /kW                | <a href="http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/">http://larvatusprodeo.net/2007/03/13/sort-of-clean-coal-in-victoria/</a>  |
| Power equal to microgrid                   | 87         | kW                 |  |
| Flotation cost                             | 10%        |                    |  |
| Initial cost - worst                       | -\$228,375 |                    |  |
| Initial cost - average                     | -\$195,750 |                    |  |
| Initial cost - best                        | -\$163,125 |                    |  |

## Dirty Gas

Our gas power station price was based on an Origin Energy gas power station and gas field combined. Gas power stations provide energy at times of peak demand when the electricity price is highest and can easily shut down when the energy price is low, along with demand. For this reason they can get an higher average price.

| DIRTY GAS                                  |            | COMMENTS / SOURCES |   |
|--|------------|--------------------|---|
| Electricity price - low                    | \$0.0490   | \$/kWh             | September average price in 2007   |
| Electricity energy price                   | \$0.0530   | \$/kWh             | Average of September peak average price and average price in 2007   |
| Electricity price - high                   | \$0.0000   | \$/kWh             | September average peak price in 2007  |
| Non-electrical energy at home - low price  | \$0.0000   | \$/kWh             |   |
| Non-electrical energy at home              | \$0.0000   | \$/kWh             |   |
| Non-electrical energy at home - high price | \$0.0000   | \$/kWh             |   |
| Excess hydrogen price - low                | \$0.0000   | \$/kWh             |   |
| Excess hydrogen price                      | \$0.0000   | \$/kWh             |   |
| Excess hydrogen price - high               | \$0.0000   | \$/kWh             |   |
| Value of carbon credit                     | \$0.00     | tonne              | Half Stern report of the cost of pollution  |
| Value of carbon credit                     | \$0.00     | tonne              | European/Kyoto rate in 2007   |
| Value of carbon credit                     | \$0.00     | tonne              | Chicago exchange in 2007  |
| Total energy sold per year by microgrid    | na         | kWh/year           |   |
| Electricity percentage                     | 100.0%     | \$/kWh             | A coal power station only produces electricity  |
| Non-electrical percentage                  | 0.0%       |                    |   |
| Hydrogen percentage                        | 0.0%       |                    |   |
| Tonnes of carbon avoided                   | 215        | t/year             | Based on calculations from microgrid model  |
| Operating and Maintenance cost             | -\$7,428   | /year              | Assumed the same as Nuclear Power - <a href="http://www.theaustralian.news.com.au/story/0,20867,21349233-643,00.html">http://www.theaustralian.news.com.au/story/0,20867,21349233-643,00.html</a>   |
| Gas price                                  | na         | /tonne             | Coal price  |
| Geosequestration cost - worst              | \$0.00     | /tonne             | Australian Federal government report US\$14 to US\$71 / tonne <a href="http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf">http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf</a> |
| Geosequestration cost                      | \$0.00     | /tonne             | Average   |
| Geosequestration cost - best               | \$0.00     | /tonne             | Australian Federal government report US\$14 to US\$71 / tonne <a href="http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf">http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf</a> |
| Enthalpy of combustion of coal             | 33,500     | kJ/kg              |   |
| Energy conversion efficiency               | 38%        | tonne              |   |
| Energy price                               | na         | /kWh               |   |
| Cost of plant with gas field - worst       | \$2,843    | /kW                | SMH.com.au 12-6-07 Origin Energy opts for coal seam gas x 1.4   |
| Cost of plant with gas field               | \$2,437    | /kW                | SMH.com.au 12-6-07 Origin Energy opts for coal seam gas x 1.2   |
| Cost of plant with gas field - best        | \$2,031    | /kW                | SMH.com.au 12-6-07 Origin Energy opts for coal seam gas   |
| Power equal to microgrid                   | 87         | kW                 |   |
| Flotation cost                             | 10%        |                    |   |
| Initial cost - worst                       | -\$247,376 |                    |   |
| Initial cost - average                     | -\$212,036 |                    |   |
| Initial cost - best                        | -\$176,697 |                    |   |

## Clean Gas

Here we have added the same carbon storage cost to the dirty gas power station as to the clean coal power station on a per tonne bases.

| GEOSEQUESTED GAS                           |            |          | COMMENTS / SOURCES   |
|--|------------|----------|--|
| Electricity price - low                    | \$0.0490   | \$/kWh   | September average price in 2007  |
| Electricity energy price                   | \$0.0530   | \$/kWh   | Average of September peak average price and average price in 2007  |
| Electricity price - high                   | \$0.0570   | \$/kWh   | September average peak price in 2007   |
| Non-electrical energy at home - low price  | \$0.0000   | \$/kWh   |  |
| Non-electrical energy at home              | \$0.0000   | \$/kWh   |  |
| Non-electrical energy at home - high price | \$0.0000   | \$/kWh   |  |
| Excess hydrogen price - low                | \$0.0000   | \$/kWh   |  |
| Excess hydrogen price                      | \$0.0000   | \$/kWh   |  |
| Excess hydrogen price - high               | \$0.0000   | \$/kWh   |  |
| Value of carbon credit                     | \$8.50     | tonne    | Half Stern report of the cost of pollution   |
| Value of carbon credit                     | \$36.67    | tonne    | European/Kyoto rate in 2007  |
| Value of carbon credit                     | \$39.00    | tonne    | Chicago exchange in 2007   |
| Total energy sold per year by microgrid    | na         | kWh/year |  |
| Electricity percentage                     | 100.0%     | \$/kWh   | A coal power station only produces electricity   |
| Non-electrical percentage                  | 0.0%       |          |  |
| Hydrogen percentage                        | 0.0%       |          |  |
| Tonnes of carbon avoided                   | 215        | t/year   | Based on calculations from microgrid model   |
| Operating and Maintenance cost             | -\$7,428   | /year    | Assumed the same as Nuclear Power x2 to run gas field - <a href="http://www.theaustralian.news.com.au/story/0,20867,21349233-643,00.html">http://www.theaustralian.news.com.au/story/0,20867,21349233-643,00.html</a>                      |
| Gas price                                  | na         | /tonne   | Coal price   |
| Geosequestration cost - worst              | -\$88.75   | /tonne   | Australian Federal government report US\$14 to US\$71 /tonne <a href="http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf">http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf</a> |
| Geosequestration cost                      | -\$53.13   | /tonne   | Average  |
| Geosequestration cost - best               | -\$17.50   | /tonne   | Australian Federal government report US\$14 to US\$71 /tonne <a href="http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf">http://www.aph.gov.au/house/committee/scin/geosequestration/report/chapter6.pdf</a> |
| Enthalpy of combustion of coal             | 33,500     | kJ/kg    |  |
| Energy conversion efficiency               | 38%        | tonne    |  |
| Energy price                               | na         | /kWh     |  |
| Cost of plant with gas field - worst       | \$2,843    | /kW      | SMH.com.au 12-6-07 Origin Energy opts for coal seam gas x 1.4  |
| Cost of plant with gas field               | \$2,437    | /kW      | SMH.com.au 12-6-07 Origin Energy opts for coal seam gas x 1.2  |
| Cost of plant with gas field - best        | \$2,031    | /kW      | SMH.com.au 12-6-07 Origin Energy opts for coal seam gas  |
| Power equal to microgrid                   | 87         | kW       |  |
| Flotation cost                             | 10%        |          |  |
| Initial cost - worst                       | -\$247,376 |          |  |
| Initial cost - average                     | -\$212,036 |          |  |
| Initial cost - best                        | -\$176,697 |          |  |

## Conclusion

The rate of return that is expected by investors is related to the risk of the venture. The lowest return of you can get in Australia is ~6% and is for a government bond which is considered in the finance industry as zero risk. The rate of return expected for non-zero risk ventures was 7% above the zero risk rate, before the credit crunch of 07/08. That would make the expected return 13% for non zero risk. The power systems discussed in this paper should be expect to return over 6% plus 2.5% to pay back the principle to be viable. Therefore 8.5% in the minimum return and more may be required.

Nuclear should not be able to obtain any debt and neither would clean coal. Dirty coal and clean gas could cover the interest on a zero risk loan but they are not zero risk and they would not be able to pay back the principle of the loan. Dirty gas is just viable but only with no carbon trading scheme and with a 40year contract to a purchaser of power.

The Azure Microgrid Solar Technology returned 11% as an international portfolio. The small module nature means small investments can be put in different markets around the world spreading the market risks. The other technologies are massive projects that can require \$billion's for the smallest unit which is stuck in one marketplace.

We believe Azure's solar technology is the best investment in the energy market in Australia today. We have proven here it is superior to coal, gas and nuclear energy financially. The environmental benefits of the solar energy system are now widely accepted also