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Stock Rating
Overweight

Industry View
In-Line

Origin Energy Ltd.

Spotlight on Solar Technology

What's Changed

Rating	**Equal-weight to Overweight**
Price Target	**A$6.75 to A$8.60**
EPS 06E / 07E	**+7% / +2%**

Origin's fledgling production of solar photovoltaic cells could deliver significant upside, if negotiations with parties to help upscale the production and access international markets prove successful. We believe there is no material value for this technology reflected in the current stock price.

Origin has underperformed other E&Ps since late 2004 due mostly to concerns about project delays and the future growth trajectory. We believe these concerns will diminish during 2006 exposing the stock price to production and EPS growth during 2006/07.

We have upgraded to Overweight with a one-year forward price target A$8.60, which represents an approximate 10% premium to the 2007E market multiple. Achievement of this requires the company to recover its earnings momentum, with risk to the upside depending upon its success in taking Solar forward.

Key Ratios and Statistics

Reuters: ORG.AX Bloomberg: ORG.AU

Australia Oil & Gas

Price target	A$8.60
Shr price, close (Feb 7, 2006)	A$7.08
52-Week Range	A$7.85-6.40
Sh out, basic, curr (mn)	792
Mkt cap, curr (mn)	A$5,642
EV, curr (mn)	A$9,486
Net debt/cap (06e) (%)	37.7
ROE (06e) (%)	13.1
Sh out, basic, per-end (06e) (mn)	792
S'hldr eqty (06e) (mn)	A$2,971
RNOA (06e) (%)	8.8

Fiscal Year (Jun)	2005	2006e	2007e	2008e
ModelWare EPS (A$)*	0.42	0.45	0.49	0.52
Prior ModelWare EPS (A$)	0.40	0.42	0.48	0.50
EPS, basic, rpt'd (A$)	0.37	0.45	0.49	0.52
Prior EPS, basic, rpt'd (A$)	-	0.42	0.48	0.50
Rev, net (A$ mn)	4,861	5,191	5,374	5,563
ModelWare net inc (A$ mn)	306	359	391	418
P/E	17.9	15.7	14.5	13.6
P/BV	2.2	1.9	1.8	1.6
EV/EBITDA	11.0	8.7	8.0	7.6
Div yld (%)	2.0	2.5	2.8	3.1

* = Please see explanation of Morgan Stanley ModelWare later in this note.
e = Morgan Stanley Research estimates

Please see analyst certification and other important disclosures starting on page 23.

Exhibit 1

Origin: Summary Financials

Profit & Loss

A$m, Years Ending June 30	2004A	2005A	2006E	2007E	2008E
Oil price: US$/bbl WTI	**41.34**	**45.07**	**58.07**	**48.75**	**45.00**
Exchange rate A$/US$/bbl	**0.74**	**0.74**	**0.75**	**0.74**	**0.72**
Oil & gas production (PJe)	**84.1**	**83.4**	**82.1**	**112.5**	**122.9**
Retail sales volumes (PJe)	**195.5**	**190.9**	**194.4**	**197.8**	**201.2**
Customer numbers (million)	**2.17**	**2.08**	**2.11**	**2.14**	**2.18**
Sales revenue	3522	4861	5191	5374	5563
other revenue	60	70	57	37	38
Total revenue	**3582**	**4931**	**5249**	**5412**	**5601**
operating costs	2948	4003	4126	4235	4404
BV of assets sold	0	0	18	0	0
EBITDA	**532**	**928**	**1105**	**1177**	**1197**
Depreciation	153	266	308	352	357
Goodwill	22	24	0	0	0
Amortisation of licenses & hedgeb	28	23	6	2	0
EBIT	**329**	**615**	**791**	**823**	**840**
Interest	45	135	173	163	151
Pretax profit	284	480	618	659	689
Tax	77	147	159	169	174
Net profit	207	333	333	333	333
Minority interest	2	67	99	100	97
Net operating profit	**205**	**266**	**359**	**391**	**418**
Significant items	0	0	0	0	0
Reported profit	205	266	359	391	418
Reconciliation to operating EBIT					
Reported EBIT	329.2	615.2	790.8	822.8	840.3
less interest & other income	60.2	70.2	57.4	37.4	37.8
-forex gains	0.0	0.0	0.0	0.0	0.0
-profit on asset sales	0.0	0.0	0.0	0.0	0.0
+goodwill	22.3	23.8	0.0	0.0	0.0
=operating EBIT	**291.3**	**568.8**	**733.4**	**785.4**	**802.5**
+interest & dividend income	60.2	70.2	57.4	37.4	37.8
-'interest expense	45.4	135.1	172.6	163.5	151.3
-tax	76.9	147.4	159.4	168.5	174.2
-minority interst	2.0	66.7	99.5	100.1	96.6
=adjsuted profit	227.2	289.8	359.4	390.7	418.2

CASHFLOW

A$m, Years Ending December 31	2004A	2005A	2006E	2007E	2008E
Operating revenues	3898.9	5240.6	5223.6	5407.8	5596.9
Operating costs	3423.0	4345.1	4143.2	4234.8	4403.6
Interest paid	53.2	158.8	174.2	165.1	153.3
Tax parid	-2.2	181.2	159.4	168.5	174.2
Net operating cashflow	424.8	555.5	746.7	839.4	865.8
Investing cashflows					
Proceeds from asset sales	9.4	3.0	22.0	0.0	0.0
Development capex & exploration	323.0	467.2	618.8	380.3	436.6
Acquisitiion & other	166.6	967.6	0.0	0.0	0.0
Net investing cashflow	508.3	1413.8	596.8	380.3	436.6
Ordinary dividends	34.2	108.5	140.2	156.8	173.7
Debt movements	140.6	390.4	0.0	-200.0	-200.0
Equity	4.8	611.3	11.4	12.6	12.6
Net financing cashflow	111.3	893.3	-128.7	-344.2	-361.1
Increase in cash helds	27.8	35.0	21.2	114.9	68.1
Exchange rate adjustments	0.1	-0.3	0.0	0.0	0.0
Net change in cash	**27.9**	**34.7**	**21.2**	**114.9**	**68.1**

BALANCE SHEET

A$m, Years Ending June 30	2004A	2005A	2006E	2007E	2008E
Current liabilities					
Payables	477.8	688.5	901.5	958.2	1017.8
Interest bearing debt	113.8	239.6	239.6	239.6	239.6
Provisions & other	71.9	87.2	87.2	87.2	87.2
Tax	2.7	9.1	9.1	9.1	9.1
other	0.0	0.0	0.0	0.0	0.0
Total current liabilities	666.1	1024.4	1237.4	1294.1	1353.7
Payables	3.8	6.7	6.7	6.7	6.7
Interest bearing debt	791.1	2590.7	2590.7	2390.7	2190.7
Provisions	47.1	66.0	92.0	118.0	144.0
Tax	259.8	337.0	337.0	337.0	337.0
Total liabilities	**1767.9**	**4024.8**	**4263.9**	**4146.5**	**4032.1**
Cash & investments	44.3	87.8	100.3	215.2	283.3
Receivables	617.0	828.5	925.1	957.7	999.0
Inventories	56.5	95.6	213.9	218.5	221.3
other	61.5	59.6	59.6	59.6	59.6
Total current assets	779.3	1071.4	1298.8	1450.9	1563.1
Inventments -equity accounted	115.1	114.7	114.7	114.7	114.7
Receivables	5.5	5.5	5.5	5.5	5.5
Investments	169.5	148.3	148.3	148.3	148.3
Exploration & development	251.6	311.2	583.9	824.1	1134.0
Property, plant & equipments	1469.6	5242.6	5257.1	5035.0	4794.7
Goodwill & licenses	812.0	998.0	998.0	998.0	998.0
Tax assets	96.7	88.2	88.2	88.2	88.2
other	8.14	19.313	19.313	19.313	19.313
Total Assets	**3707.3**	**8014.7**	**8523.4**	**8691.5**	**8873.3**
Shareholder funds	1939.5	3989.9	4259.5	4545.0	4841.2
Minority interest	7.08	1249.56	1288.56	1327.56	1366.56

Ratios & margins

Weighted average diluted shares		**673.7**	**721.3**	**795.98**	**798.971**	**802.991**
Current issued shares			796.941	796.9	796.9	796.9
Share price		**5.484**	**$ 7.08**	**$ 7.08**	**$ 7.08**	**$ 7.08**
Market cap		**3695**	**5107**	**5642**	**5642**	**5642**
+net debt		861	2743	2730	2415	2147
-less investments		-170	-148	-148	-148	-148
+minority		7.1	1249.6	1288.6	1327.6	1366.6
Enterprise value		**4393**	**8950**	**9513**	**9249**	**9032**
Operating EBITDA		444	835	1042	1138	1159
Reported EPS	cents	30.9	37.2	45.5	49.2	52.4
Modelware EPS	**cents**	**34.0**	**42.4**	**45.1**	**48.9**	**52.1**
PER	**X**	**16.1**	**16.7**	**15.7**	**14.5**	**13.6**
D.P.S.	**cents**	**13.0**	**15.0**	**17.7**	**19.8**	**21.8**
Payout ratio		**42%**	**40%**	**39%**	**40%**	**42%**
Yield	**%**	**2.4**	**2.1**	**2.5**	**2.8**	**3.1**
Balance sheet & returns						
Net Debt / Net Debt +Equit	%	31%	41%	39%	35%	31%
Interest cover	X	7.2	4.6	4.6	5.0	5.6
Return on assets	%	9.0%	7.8%	9.4%	9.7%	9.8%
Return on Equity	%	11.0%	9.0%	8.7%	8.9%	8.9%
Divisional EBIT						
Exploration & Productio	A$m	105.1	134.4	122.9	165.2	171.5
Retail	A$m	155.1	176.1	231.7	227.8	239.8
Generation	A$m	42.2	26.8	30.3	30.2	46.8
Networks	A$m	26.9	28.1	27.8	28.8	29.8
Contact	A$m	0.0	249.9	378.1	370.8	352.4
Margins						
EBITDA / sales	%	15.1%	19.1%	21.3%	21.9%	21.5%
EBIT / sales	%	9.3%	12.7%	15.2%	15.3%	15.1%
NPAT / Sales	%	5.8%	5.5%	6.9%	7.3%	7.5%
DCF Valuation	**A$/share**	**7.24**				

E = Morgan Stanley Research estimates
Source: Company data, Morgan Stanley Research

Spotlight on Solar Technology

Summary & Conclusions

We have upgraded Origin to Overweight, with a price target of A$8.60. Our thesis is as follows:

1. The stock price has been de-rated over the past year, and represents value on the basis of current production.

2. There is upside potential from the company's emerging solar photovoltaic technology, which is not reflected in the current price. This upside could be substantial, as evidenced by the recent listing of Suntech Inc on the NYSE.

We see little downside risk. The share price is underpinned by current assets and trading more or less in line with market multiples of +/16x 2006E EPS. What is far harder at this time is quantification of the upside potential, and the time-line over which it may be realised.

Stock Price Has Reset and Represents Fundamental Value
From a stock price perspective, 2005 and 2006 YTD has been a period of significant underperformance relative to pure E&P names and the broader Australian market. Refer to Exhibit 2. This comes after a very strong run from 2000 to 2004, during which EPS grew at 23 % CAGR. Seeds of the reversal were sown in late 2004, in the Contact Energy acquisition, the upstream BassGas project delays, and perhaps a greater appreciation in the market of the company's long-run growth objectives in the 10-15% range.

We believe the stock has been de-rated enough now to account for the technical risks and earnings revisions associated with BassGas, Contact Energy, and perhaps other new projects such as Kupe. As 2006 unfolds we would expect strong growth in production and upstream earnings, and a recovery in EPS growth, which, in isolation, should provide a level of stock price appreciation over the next year.

Exhibit 2
Origin Performance vs. Australian Market (%)

	Energy	All Ords	ORG
CY 2003	23.5	10.4	27.2
CY 2004	42.6	23.1	46.0
CY 2005	47.9	15.1	9.0
YTD 2006	7.5	4.0	(6.0)

Source: FactSet, Morgan Stanley Research

Solar photovoltaic technology is an emerging area for Origin. This has advanced beyond the R&D stage and has entered a production phase, albeit with limited scale at this time. The critical challenge is to achieve cost-effective scale production. **Negotiations are underway with parties to assist Origin in up-scaling production and accessing international markets.** Positive news on the outcome of such negotiations could provide the catalyst for a re-rating.

Solar Photovoltaic Technology: "SLIVER"

Synopsis
SLIVER is the registered trademark of Origin's solar photovoltaic (PV) array technology. Origin claims this is revolutionary, and would appear to offer a number of competitive advantages compared with solar arrays currently available to the market, namely:

- **Up to 90% less silicon.** The cost and procurement of Silicon is a critical issue for photo voltaic array manufacturers, globally.
- **Higher efficiency.** The electric conversion efficiency does not appear to be compromised by the use of less silicon. Origin claims efficiencies of 19%, which is higher than for arrays currently in the market, which are in the 15-16% range.

Company Description

Origin Energy is a vertically integrated energy company, focused predominantly on gas exploration, production and retailing in Australia, and electricity generation and retailing in Australia and New Zealand. It has no direct ownership of regulated assets, but has a 19% shareholding in gas distribution company Envestra Ltd.

Industry View: In-Line

We believe there is limited further sector outperformance from current levels, given high valuations and our expectations of weakening oil prices.

MSCI Country: Australia

Asia Strategist's Recommended Weight: 27.8%
MSCI Asia/Pac All Country Ex Jp Weight: 31.6%

- **High performance when partially obscured.** Origin claims the unique design and construction of its Silicon arrays significantly improve performance when the panel is partially shaded.

Potentially, the SLIVER technology may deliver a step-wise reduction in solar array costs, without detriment to performance.

A potential disadvantage is in reliability. SLIVER Silicon wafers are machined to a thickness of 50 microns, which is much thinner then current commercially produced wafers (which are 250-300 microns thick).

This makes Origins SLIVER arrays more difficult to manufacture and prone to breakage. Achieving scale in the manufacturing process is critical if Origin is to successfully commercialise the SLIVER technology.

What Is Origin Doing in Solar Technology ?
Origin is a 'conventional' gas and electricity producer, and its history and involvement in solar technology is not widely known or appreciated, in our view.

It would be wrong to dismiss this involvement as peripheral or non-core. Origin's previous parent, the building materials company Boral, developed an interest in solar panels early on, when such panels were expected to be integral to roofing and building design. It was several years ago when Origin developed a relationship with the Australian National University, at a time when the ANU was seeking backers for its technology.

Broadly, the ANU pioneered the technology through the R&D phase. Origin has taken the next step of attempting commercial production. In December 2003, Origin announced plans to build a A$20m manufacturing plant, with the objective of demonstrating commercial production. Capacity of the plant will be 5MW p.a from a single process line, but with scale up potential to 25 MW p.a. While 5MW p.a is subscale, 25MW p.a may be viable as there are commercially viable producers overseas with production capacities in the 30-50 MW p.a. range. Refer to Exhibit 3 which ranks the top ten producers globally.

Exhibit 3
Market Share of Solar Cell Production, 2004

Company	Production (MW)	Market share
Sharp	324.0	25.8%
Kyocera	105.0	8.3%
BP Solar	84.9	6.8%
Mitsubishi Electric	75.0	6.0%
Q-Cells	75.0	6.0%
Shell Solar	72.0	5.7%
Sanyo	65.0	5.4%
RWE Schott	63.0	5.0%
Isofoton	53.3	4.2%
Motech	35.0	2.8%
Suntech	35.0	2.8%

Source: Photon, Morgan Stanley Research

The plant was completed in late 2005, and has subsequently produced PV panels with outputs ranging from 40 to 60 watts. ORG plans to produce larger panels in 2006. PV cells with power outputs from 70-200w are commonly available, and typically a large number of these would be required to power a typical on-grid residential or commercial load.

As an energy retailer, the commercial rationale for Origin is obvious. Origin sells gas and electricity to 2m customers, with the bulk of it from fossil fuels. Consumers and legislators are demanding increased choice in 'renewables', and are prepared to pay a premium. Windmill farms have flourished and geothermal power is advancing. Hydro power plants have changed hands for high prices. Origin is well aware of this and has made significant investments in geothermal (via Geodynamics), hydro (via Contact Energy) and wind (via offtake contracts) power.

The Suntech Analogy
At this point, a cynic may write off the Solar interest, as too 'hi tech'. The IPO of Suntech Power last December gives pause for thought, though. Suntech is a China-based, NYSE-listed 'conventional' Solar PV array manufacturer. We see four points of relevance when considering Origin.

1. **Potentially rapid path to commercial profits**. Suntech made its first PV arrays in late 2002, and was profitable by 2004 on sales of 29.5 MW. Rapid increases in scale are common among other producers, too, as a result of a 35% CAGR in global demand for PV cells since 1994.

2. **The key issue is silicon.** The STP prospectus highlights that the cost and availability of silicon of a certain type and grade is critical. The bulk of the world's silicon is consumed in semi-conductors, and PV producers have difficulty breaking into supply. In

particular, for Suntech, around one-third of IPO proceeds were allocated to forward-purchase silicon. Origin's SLIVER arrays claims to use 90% less silicon, so may be a technical solution to the cost and procurement issue.

3. **A story.** Australia is a global leader per capita in the use of Suntan cream, Sunblock, beer and solar cells. The common elements to all is abundance of sun. 'Solar Challenges' have been an international event for over 20 years. In early events, strange-looking fibre-glass vehicles, with solar panels adorning the roof, would 'race' from Darwin to Alice Springs, thus demonstrating the mighty power of the sun. After several days on the road, the lucky winner would be handed a beer, and probably a degree in electrical engineering! Fast-forward 20 years, and today several Australian teaching institutions have advanced centres devoted to PV R&D. The University of NSW has licenced a number of its technologies and Suntech has adopted them. Current or former UNSW academics serve Suntech in a technical capacity.

4. **Large value realization and 'tech multiples'.** Suntech has a market cap of US$6.5B, which represents a P/E in the order of 190 on trailing 2005 earnings. Suntech has manufacturing capacity of 120MW p.a., some 24 times the size of Origin's single facility. In comparing capacity versus time, Origin is about where Suntech was in 2003, and the latter's growth has accelerated exponentially since. There are other listed PV cells producers, and very high earnings multiples are commonplace. Refer to Exhibit 8.

Exhibit 4
Suntech: Key Statistics

	2002	2003	2004	2005 (2/4)
Sales (Mw)	0.9	6.4	29.5	41.3
Revenue (US$m)	3	14	85	137
Gross Profit (US$m)	1	2	5	15
Gross Margin (%)	5	19	30	33
Av Selling price/ mw pv cells	1.78	1.99	2.02	2.97

Source: Company data, Morgan Stanley Research

Next Steps for Origin
Origin faces two broad challenges in reaching commercial success.

1. Achieving reliable, cost-effective manufacturing throughput from the current plant. This is an issue to do with process technology. The use of thin slivers makes the PV arrays less reliable and prone to breakage. In addition, Origin has not demonstrated strength in project delivery in recent years, and its skills in high tech manufacturing may need to be strengthened considerably.

2. Arriving at a marketing strategy. Origin has a market presence domestically but not overseas. The strongest markets for PV products appear to be Germany, Spain, Japan and the US, and this is a function of government subsidies. Without some form of subsidy, green credit or other inducement, electricity from PV arrays is not competitive compared with fossil fuels. Coal and gas-fired generating capacity can be installed for US$0.5-1mn/MW. PV arrays and modules start at US$3m/MW. Moreover, other necessary equipment, such as regulators, transformes and installation, can easily double the final cost to a customer, taking the potential cost to over US$6/MW. This makes PV power an order of magnitude more expensive than conventional fossil fuel electricity.

We would expect Origin to seek partners that can help out on both fronts. However, there are many permutations as to how or when the next steps wil be taken. We have no definitive perspective on the forward time-line.

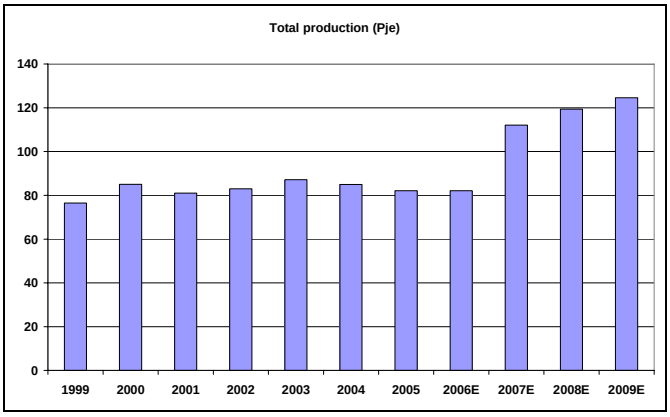
Therefore, from a financial/modeling perspective, we do not include any positive earnings contribution from SLIVER during our forecast period. In fact, we have a negative contribution as Origin is expensing fully the costs currently being incurred. In a forecasting sense, we think this is a very conservative approach.

Greater detail on PV technology and the global industry is shown toward the back of this report. Specific input has been provided by Morgan Stanley's Asia/Pacific technology team, headed by Sunil Gupta in Singapore.

Update on Other Origin Activities
We have taken this opportunity to update our earnings and valuation in light of recent events, specifically as regards upstream oil and gas production, oil and gas prices, and Contact Energy. A number of adjustments follow and result in modest increases in our EPS forecasts (+7% and +2%, respectively, for 2006 and 2007). These and other changes are detailed in the following section.

New Projects to Drive Higher Production
Production growth is expected after the current quarter, as a number of major developments are completed during 2006. Not all of these projects have gone as planned, with delays and capex over-runs evident, particularly for the BassGas project and Kupe. These problems have resulted in lost profit and impacted negatively on stock performance, but as these projects are successively commissioned, the associated technical risk should subside, in our view. Exhibit 5 shows our E&P segment production profile. New projects should result in production growth from last year's 82 PJe to around 125 PJe in 2009E.

Exhibit 5
Origin: E&P Production Volumes (PJe)



E = Morgan Stanley Research estimates
Source: Company data, Morgan Stanley Research

The impact on E&P profitability should be broadly commensurate, lifting EBIT from around +/- A$100m p.a. historically, to A$150-160m p.a. after 2007E.

Project update:

- **BassGas project:** commissioning continues at an advanced stage with this problem-plagued project. First commercial production is expected in March, followed by full production in April. Our production forecast has been pushed back again by another month, in line with the current timetable.
- **Thylacine/Otway gas project** is on track for a mid-year start-up. Offshore installations were impacted by poor weather around year-end, and from here delivery of first gas on time will depend on weather patterns; however, slippages, if they occur, are likely to be minor, given the advanced status of development.
- **Cooper Basin:** oil production forecasts have been revised following announcement by Santos of an enhanced oil exploitation program beginning in 2Q06. Santos has contracted three specially equipped drilling rigs, at least one of which is expected to be active in parts of the basin where Origin has equity. We assume South Australian Cooper basin gross production begins a gradual turn-around from the current 8-9 kbopd range, to a forecast peak of 14.5 kbopd by year-end 2008. Given the mature nature of the Cooper basin region, we believe this contribution to production and earnings may be less visible to the market, when compared with new projects.
- **Development of the Kupe field** remains uncertain, following receipt of preliminary costings of around NZ$800m for the project, which is far higher than the original concept of a NZ$400-500m project. Given the impending shortages of natural gas emerging in New Zealand from 2008, we would still expect this project to proceed, although later than originally hoped. Three development wells are planned for the first half of 2007 and a rig has been secured. A final investment decision is target for the first half of 2006, with production to commence during 2008. We assume 2009 start-up, with a minimal impact on Origin's upstream earnings until the 2009 fiscal year.

Coal Seam Methane: Re-Valued
A significant part of our overall valuation increase is due to upward revisions to production profiles from Origin's various coal seam gas projects, plus changes to realized prices and costs in light of recent operating data from other CSM companies and presentations given by Santos late in 2005. The latter detailed a very aggressive uplift in production from the Fairview project, where Origin has a 24% equity working interest. Santos has announced a three-phase development plan to increase Fairview gross production, from the current 27 TJ/day, to over 140 Tj/d by 2012.

Near to Fairview, Origin's 100% Durham Downs / Spring Gully project is ramping up to higher production levels to meet the growth in volumes to AGL from May 2005, QAL from November 2006, and Incitec mid 2007.

Origin's CSM projects are now valued at A$675m, for 1,450 Bcf approx of reserves, of which 580 PJ is contracted. This is in context with Santos' October 2005 A$640m acquisition of Tipperary Corporation. Santos' CSM fields in eastern Queensland are analogous to Origin's in terms of reserves, market contracts, gas prices and field opex and capex.

Origin recently acquired additional coal seam interests in eastern Queensland, buying a 40.6% stake in the Argyle project from Pangea Resources for A$70m. Certified 2P reserves are 117 PJ, with 30 PJ contracted to Incitec under a 10-year contract to commence late 2007.

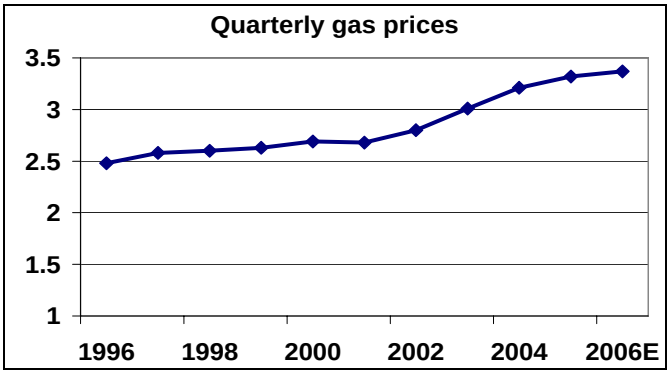
Consistent with our approach to valuing uncontracted CSM reserves for Santos, we assign 20c/GJ for Origin's uncontracted coal seam gas, totaling around 870 Bcf by way of volume. This recognizes the longer-term strategic value of this gas, given its relatively close location to markets and pipeline infrastructure, compared with remote gas from PNG and the Timor Sea.

Gas prices remain on a rising trend, averaging over A$3.52/GJ in the December quarter. The growth trajectory in prices is above our forecast, as we had historically assumed coal seam methane prices would be lower than for conventional gas. This may not be correct for Origin, as it supplies from a portfolio of CSM and conventional gas and so may be able to realize better prices than spot marketers. Scrutiny of reports from other smaller gas producer in eastern Queensland show price realizations of over A$4/GJ in the past quarter. Refer to Exhibit 6.

There is sufficient evidence and data, in our view, to revise upwards our gas price forecasts, in the order of 10c/GJ for the following three years, and this may still be conservative.

Exhibit 6

Annual Average Gas Prices (A$/GJ)



E = Morgan Stanley Research estimates
Source: Company data, Morgan Stanley Research

Contact Energy and New Zealand Slowdown

Rising interest rates and a rapidly slowing New Zealand economy are likely to have a negative impact on Contact Energy sales volumes. Contact's stock price has been underperforming, too, trading recently in the A$6.50-6.70 range, well down from the A$8 peak reached in July 2005. Our previous valuation had used A$7.50, and this has been reduced to A$6.70 in our current valuation. We have trimmed our revenue and profit contributions, too, in line with consensus projections. Forecast EBIT growth of 14% from 2006 to 2008 has been flattened to nil. Consensus estimates since last September have been wound back and are now 10% and 14% lower at the NPAT level, for 2007 and 2008, respectively.

This is a reflection of current economic conditions, but longer term we remain very positive towards Contact because of the nature of upstream gas supply dynamics. The country is running out of gas, and efforts by E&P companies in recent year to locate fresh reserves are now being undermined by rising global development costs. Domestic natural gas prices are on an upward spiral, as imports of LNG or CNG are the only solution, other than importing coal and converting existing plant away from gas. All generators in NZ face this issue, but Contact's hydro and geothermal portfolio (around 40% of Contact's generation capacity), in particular, does not.

Valuation

Our revised valuation is A$7.24 compared with A$6.62 previously. Refer to Exhibit 7. Our key assumptions are:

- WTI oil price of US$50/bbl for the balance of 2006, falling to US$45/bbl thereafter, and a A$/US$ rate of 74c.
- Future EBITDA/sales margins for retail in the 8.2-8.4% range, consistent with prior four-year average of 8.2%.
- Listed investments in Contact Energy, Geodynamics, Envestra and Magellan at current market prices. Contact Energy valued at A$6.70/share, and a NZ$/A$ exchange rate of 90c.
- Future cashflows discounted from January 1, 2006.
- Solar technology is shown at around book value.

We have increased our one-year forward price target by 27%, to A$8.60. This represents 18x 2007E EPS. On our analysis, this implies an approximate 10% premium to the market multiple, which we view as fair, given the upside potential implicit in the solar technology project. We would expect positive news flow on solar technology progress to act as a catalyst for the shares.

Risk Factors

The key risks to our valuation and forecasts result from competition and churn in the contestable retail gas and electricity markets. Increased competition may reduce margins.

Macro risks result from commodity oil prices, LPG prices, and A$/USD and A$/NZ$ exchange rates. Spot oil and LPG prices are materially higher than our current assumptions and lend a positive bias to these risks.

There are a number of capital-intensive upstream gas production and electricity generation projects planned or underway, exposing the company to the risk of capex over-runs or project delays.

Exhibit 7

Origin: Valuation

PRODUCTION ASSETS 1-Jan-06	NPV A$m	RESERVES m boe	NPV per boe
UPSTREAM- Production			
South Australia Cooper Basin	232	31	$ 7.41
South West Qld Cooper Basin	192	19	$ 9.96
Katnook & Ladbroke Grove	9	1	$ 7.77
Beharra Springs	37	4	$ 9.88
Perth Basin- Hovea oil field	43	2	$ 20.78
Perth Basin- Jingemia oil field	51	2	$ 28.70
Surat Basin	37	4.1	$ 8.92
Bowen Basin/Denison trough	38	5.5	$ 6.83
Peat, Spring Gulley & Fairview CSM	539	116.7	$ 4.62
BassGas	403	24	$ 16.72
Copooper Basin tail	35	20.3	$ 1.72
Onshore Otway	25		
UPSTREAM- Developments & acreage			
Uncontracted CSM	174	150	$ 1.16
Thylacine & Geographe	517	40	$ 13.07
Kupe gas project	131	34	$ 3.89
Exploration acreage (2x capex)	120		
TOTAL UPSTREAM	**2583**	**453**	**$ 5.70**

GENERATION	NPV A$m	CAPACITY MW	NPV /MW (A$m)
Osborne	50	90	$ 0.56
Bulwer Island	56	18	$ 3.09
Worsley	30	60.0	$ 0.50
Ladbroke	70	80.0	$ 0.88
Roma	40	74.0	$ 0.54
Quarantine	80	96.0	$ 0.83
Mt Stuart	95	288.0	$ 0.33
Other various small cogen.	24	18.0	$ 1.33
Solar & renewables	61		
TOTAL GENERATION	**506**	**724**	$ 0.70

RETAIL		Customers	$/customer
LPG	555	289	1700
Gas	810	900	900
Electricity	895	913	980
other		0	0
Retail stores, green & other	50		
TOTAL RETAIL	**2310**	2102	1075

NETWORKS	
Networks- Envestra @ market price	151
OEAM	60
SEA Gas	101
TOTAL NETWORKS	**312**
INVESTMENTS & FINANCIAL ASSETS	
Contact- at market	1806
Other investments (Magellan & Geodynamics	32
Interest bearing debt (Origin share)	-1813
TOTAL INVESTMENTS & FINANCIAL ASSETS	**25**
TOTAL ENTERPRISE VALUE	**5735**
SHARES ON ISSUE	**791.651325**
VALUE PER SHARE	**7.24**

Source: Morgan Stanley Research estimates

Exhibit 8

Comparative Valuation: Solar Cell Producers and Related Tech Stocks

		Rev Growth			P/Rev			EPS Growth			P/E		
Company	**Price**	**05E**	**06E**	**07E**	**05E**	**06E**	**07E**	**05E**	**06E**	**07E**	**05E**	**06E**	**07E**
Integrated Companies													
SolarWorld*	167	71%	34%	21%	6.2	4.6	3.8	131%	27%	18%	45.9	36.0	30.5
Cell/Module Manufacturers													
Suntech	42	163%	184%	90%	24.8	8.7	4.6	2%	272%	103%	190.2	51.1	25.2
Sunpower*	35	601%	172%	57%	3.6	1.3	0.8	N/M	N/M	93%	N/M	112.2	58.1
Motech*	580	75%	83%	28%	11.3	6.2	4.8	391%	81%	16%	70.6	39.0	33.5
Q-Cells*	85	110%	100%	100%	11.6	5.8	2.9	-22%	54%	33%	83.0	53.8	40.5
Ersol*	62	100%	90%	90%	11.2	5.9	3.1	294%	140%	44%	86.7	36.1	25.1
Kyocera*	9,080	0%	8%	5%	1.5	1.4	1.3	42%	25%	5%	26.1	20.9	19.9
Sharp	2,020	6%	11%	15%	0.8	0.7	0.7	18%	18%	30%	24.4	20.7	15.9
Wafer Manufacturers													
MEMC*	27	10%	17%	14%	5.0	4.2	3.7	1%	38%	12%	25.8	18.7	16.7
SUMCO*	6,110	13%	13%	9%	3.3	3.0	2.7	64%	38%	16%	34.6	25.0	21.5
Silicon Manufacturers													
Tokuyama	1,982	9%	4%	2%	2.1	2.0	2.0	5%	36%	11%	43.8	32.1	29.0
Assemblers & Installers													
Conergy*	106	93%	43%	26%	1.9	1.4	1.1	98%	51%	27%	38.6	25.5	20.1
Sekisui Chemical*	929	3%	3%	5%	0.6	0.6	0.5	-6%	26%	13%	23.9	18.9	16.8
Carmanah*	4	125%	73%	N/A	4.2	2.5	N/A	85%	170%	N/A	101.4	37.5	N/A
Solartron PLC*	8	53%	-43%	N/A	1.5	2.6	N/A	-33%	33%	N/A	14.3	10.8	N/A
Solon*	35	98%	65%	19%	1.6	1.0	0.8	116%	60%	40%	35.7	22.2	15.8
Solar-Fabrik*	12	23%	83%	25%	1.5	0.8	0.7	85%	224%	44%	59.7	18.4	12.7
Internet													
Google	434	106%	61%	41%	21.4	13.3	9.4	228%	47%	35%	78.6	53.3	39.6
Yahoo	35	43%	31%	27%	13.5	10.3	8.1	61%	-19%	81%	61.2	75.3	41.5
Baidu	52	167%	68%	64%	6.7	4.0	2.4	167%	129%	86%	376.4	164.4	88.3
eBay	44	39%	29%	34%	13.5	10.5	7.8	42%	17%	31%	51.0	43.4	33.1
High Growth Asian Tech Companies													
Largan	608	49%	116%	30%	17.0	7.9	6.1	60%	173%	36%	65.5	24.0	17.7
HTC	679	66%	30%	26%	4.0	3.1	2.5	N/M	33%	47%	33.5	25.2	17.1
PPT	82	78%	47%	16%	4.4	3.0	2.6	343%	75%	8%	29.3	16.7	15.4
Catcher	236	97%	42%	26%	6.8	4.8	3.8	174%	44%	23%	21.9	15.2	12.4
FIH	13	88%	71%	24%	1.9	1.1	0.9	49%	90%	26%	33.1	17.4	13.9
High Quality Asian Tech Companies													
Hon Hai	215	62%	42%	25%	1.0	0.7	0.6	30%	61%	33%	31.0	19.3	14.4
TSMC	64	3%	23%	16%	5.9	4.8	4.1	5%	35%	19%	20.7	15.4	12.9
Samsung Electronics	716,000	2%	18%	12%	1.8	1.5	1.4	-26%	16%	15%	15.2	13.2	11.4
Infosys	2,831	34%	31%	25%	8.1	6.2	4.9	32%	28%	19%	31.1	24.4	20.6

E = Morgan Stanley Research estimates, except for companies marked * (for which IBES consensus estimates are shown)
Source: FactSet, Morgan Stanley Research, IBES

Solar Industry: Growth Drivers

The solar cell market has grown at CAGR of 35% since 1994. Refer to Exhibit 12. We believe that the solar cell industry could continue to grow by 30-35% pa in volume terms until 2020. Strong growth is being driven essentially by incentive programs provided by various governments around the world. These governments provide incentives for three key reasons, in our view:

1. Environmental reasons (Kyoto Protocol)

2. Balanced energy policies

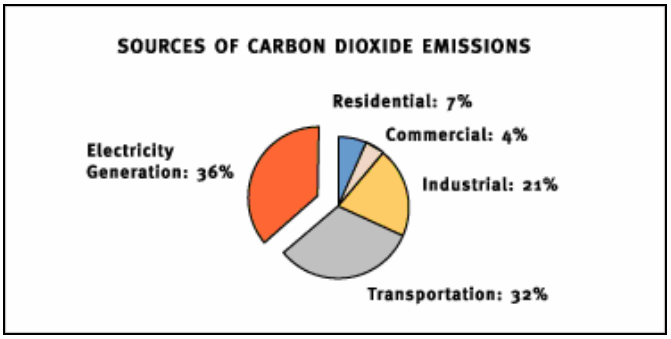
3. Incubation of solar technology to make it cost-competitive

Environmental Reasons

It is widely understood that the cost of global warming is being felt directly as well as indirectly. The single largest contributor to global warming is pollution from energy generation. We cannot reverse global warming without a transition to renewable energy.

Exhibit 9

Sources of CO_2 Emissions



Source: EPA

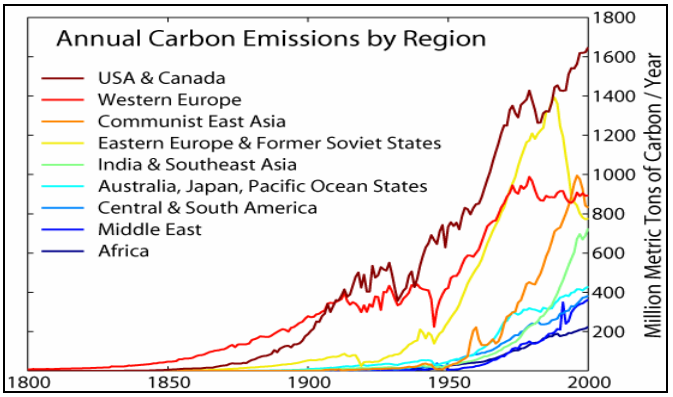
Kyoto Protocol. The Kyoto Protocol is an agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared with the level in 1990 (compared with the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% reduction). The goal is to lower overall emissions from six greenhouse gases – CO_2, methane, nitrous oxide, sulfur hexafluoride, HFCs, and PFCs – calculated as an average over the five-year period 2008-12. National targets range from an 8% reduction for the EU and some others to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland.

Each country has agreed to limit emissions to the levels described in the protocol, but many countries have limits that are set above their current production. These "extra amounts" can be purchased by other countries on the open market. This rewards countries that meet their targets, and provides financial incentives to others to do so as soon as possible.

Countries also receive credits through various shared “clean energy" programs and "carbon dioxide sinks" in the form of forests and other systems that remove carbon dioxide from the atmosphere.

Exhibit 10

Global Carbon Emissions

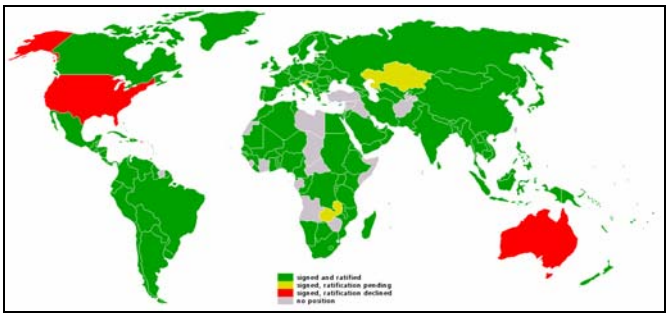


Source: Carbon Dioxide Information Analysis Center

Current status. The treaty was negotiated in Kyoto, Japan in December 1997. The agreement came into force on February 16, 2005 following ratification by Russia on November 18, 2004. As of September 2005, a total of 156 countries have ratified the agreement (representing over 61% of global emissions). Notable exceptions include the US and Australia.

Exhibit 11

Current Status of Kyoto Protocol



Note : Dark green indicates countries that have signed and ratified the treaty and yellow indicates states that have signed and hope to ratify the treaty. Notably, Australia and the US have signed but, currently, decline to ratify it.
Source: Kyoto Protocol

Considerable support from EU. The EU produces around 22% of global greenhouse gas emissions, and has agreed to a cut, on average, by 8% from 1990 emission levels. The EU has consistently been one of the major supporters of the Kyoto Protocol, negotiating hard to get other countries to agree.

In December 2002, the EU created a system of emissions trading in an effort to meet these tough targets. Quotas were introduced in six key industries: energy, steel, cement, glass, brick making, and paper/cardboard. There are also fines for member nations that fail to meet their obligations, starting at €40/ton of carbon dioxide in 2005, and rising to €100/ton in 2008. Current EU projections suggest that by 2008 the EU will be at 4.7% below 1990 levels.

Balanced Energy Policy – Increasing Energy Security
Investing in solar power diversifies sources of energy. Currently such power accounts for less than a tenth of 1% of global electricity consumption.

Incubating Solar Technology to Make It Cost-Competitive
The cost of solar energy has declined by more than 70% since 1980 and should continue to decline with technology advances. Driven by strong industry growth and profitability, the industry is attracting new capital and technology innovation to reduce its cost structure and improve conversion efficiency. Over the past decade, cost declines have been only about 5% pa, but we expect these cost declines to accelerate to 6-7% pa. As a result, we expect solar power to become economically viable without incentives in a few countries before 2020. From the perspective of governments, if the industry is supported until it becomes cost-competitive, it could resolve a major issue.

Global Incentive Structures

While grid electricity costs are still a lot lower than those of solar electricity, demand is being stimulated through various incentive programs provided by governments. Typical incentive programs include feed-in tariffs, tax refunds, subsidies for PV systems and low-interest loans. Of these, the most widely adopted and successful measure is feed-in tariffs. Under this structure, users sell back electricity to the national grid at a preferential price and hence are able to generate reasonable economic returns. As a result, PV system can be considered an attractive investment, with an internal rate of return, or IRR, of as high as 7% in some European countries. We believe that the global incentive programs for the solar industry will likely improve in the future. We expect countries such as China, US states (other than California) and EU countries such as Greece to join the fray.

Exhibit 12

Solar Cell/Module Production Capacity Worldwide

MW	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Europe	20.1	18.8	30.4	33.5	40.0	60.7	86.4	135.1	193.4	308.0
Japan	16.4	21.2	35.0	49.0	80.0	128.6	171.2	251.1	363.9	618.0
US	34.8	38.9	51.0	53.7	60.8	75.0	100.3	120.6	103.0	139.0
Others	6.4	9.8	9.4	18.7	20.5	23.4	32.6	55.1	83.8	129.0
Total	**77.6**	**88.6**	**125.8**	**154.9**	**201.3**	**287.7**	**390.5**	**561.8**	**744.1**	**1,194.0**

Source: PV News, Morgan Stanley Research

Exhibit 13

Major Markets' PV Incentives and Targets

Country	Electricity Consumption		Incentive Program	% from Renewable		PV as % of Renewable	Current PV Installed (MW)	PV Target	Likely Cross Over Year
	2004 TWh	2010 TWh		2004	2010				
Australia	236	288	No feed-in tariffs	8%			52		
Austria	60	62	Feed-in tariff: 0.60 €/kWp < 20 kWp. 0.47 €/kWp > 20 kWp	67%		0.04%	19		2020
Belgium & Lux	90	101	0.45 €/kWh feed-in tariffs in both Belgium & Lux	3%					
Canada	568	573	no feed-in tariffs	59%			14		
China	2,187	3,669		1%			35	1,000 by 2020	
Czech Republic	84	105	0.19 € /kWh feed-in tariff guaranteed for 15 years	4%	8%				
Denmark	40	43	no feed-in tariffs	24%			2		
Finland	86	105	0.0042 €/kWh tax refund and up to 30% investment subsidy	26%		0.01%	3		
France	572	631	Residential PV installations, or €0.225/kWh, Industrial PV installations, or €0.3/kWh.	15%	21%	0.03%	26		2017
Germany	607	660	0.518 €/kWh for roof tops and 0.406 €/kWh for open in 2006. Will reduce by 5% each year	10%		1.16%	794		2022
Greece	60	78	0.078 €/kWh on islands and 0.07 €/kWh on the mainland. Grants for 40-50% of total cost.	8%		0.10%	4		
India	651	882	50% capital subsidy for solar home systems		10% (2012)				
Italy	300	347	Feed-in tariffs is € 0.445/kwh for 2005-06 and reduces by 2% every year from 2007. Will last for 20 years from 2005.	17%		0.07%	31		2013
Japan	1,110	1,207	Grants for domestic PV roofs, and net metering support provided by utilities	10%			1,132	4,800 by 2010	2017
Mexico	210	260		20%			18		
Netherlands	98	112	0.068 €/kWh feed-in tariffs	6%		0.67%	49		
Norway	110	103		99%		0.00%	7		
Poland	154	165		3%					
Portugal	46	58	€ 0.30/kWh feed-in tariff for plants bigger than 5kW and € 0.51/kWh for smaller plants	29%		0.03%	3		
Russia	931	980							
South Africa	245	291							
South Korea	374	559	KRW 716.4 /kWh feed-in tariff, guaranteed for 15 years	2%				1,300 by 2012	
Spain	278	389	€ 0.414/kWh) for <100kW PV systems, will remain in effect for 25 years	22%		0.08%	37		2021
Sweden	148	148	no feed-in tariffs	49%		0.00%	4		
Switzerland	66	67	CHF 0.15/kWh (0.095 €/kWh) feed-in tariff + financial support	55%		0.06%	23		
Taiwan	218	304	no feed-in tariffs						
Turkey	152	222	0.05 €/kWh feed-in tariffs for 7 years	32%					
United Kingdom	400	448	no feed-in tariffs	4%		0.04%	8		
USA	4,150	4,635	Netmetering + grant for $2.80/W (PV) + 15% for owner occupied. Reduce by $0.20 every 6 months from 1 Jan 05	9%			365		
USA - California	4,150	4,635	Netmetering + grant for $2.80/W (PV) + 15% for owner occupied. Reduce gradually over next 10 years.	9%			365		2021

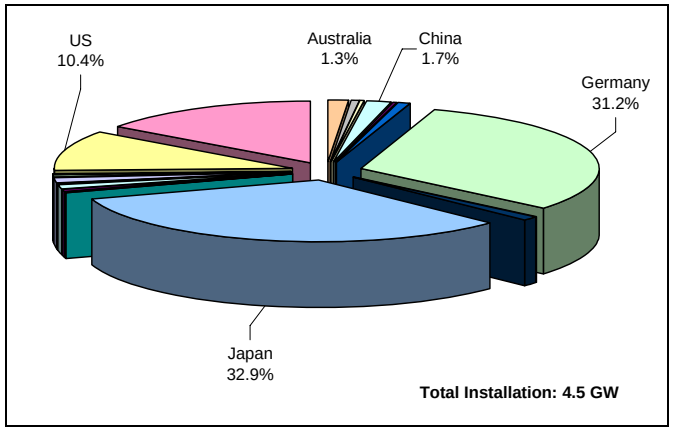
Source: Morgan Stanley Research, EPIA, Greenpeace

Current Global Market

As with many high-growth markets, exact estimates on the current market size are not available. Our rough analysis, which draws on estimates from a number of sources, suggests that there is currently around 4.5 GW of installed capacity globally. Of this amount, we believe that around 1.3 GW was installed last year.

Exhibit 14

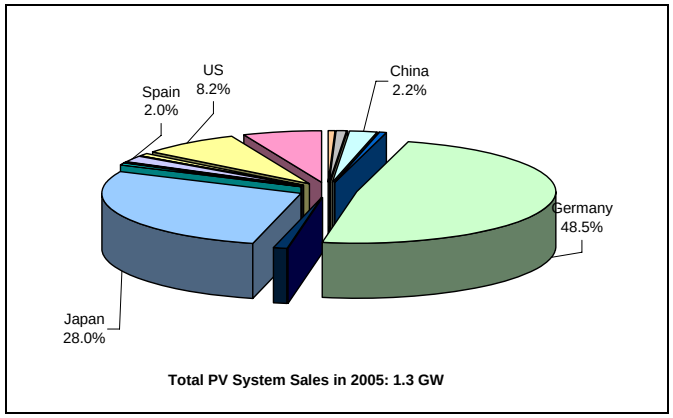
Global PV Installed Base, 2005



Source: Morgan Stanley Research estimates, based on data from IEA-PVPS, World Energy Council, Greenpeace

Exhibit 15

PV Equipment Sales, 2005



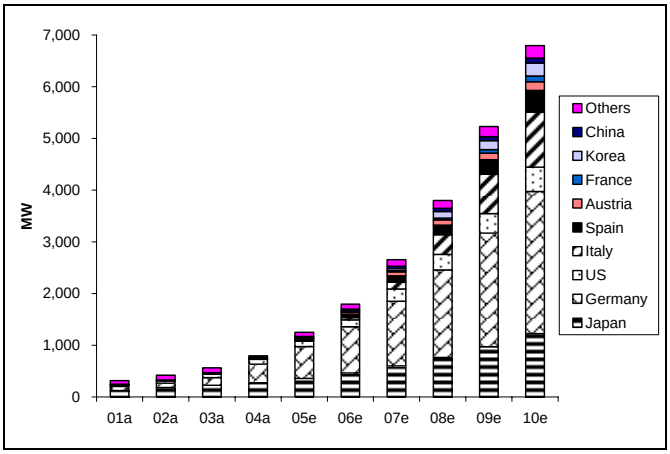
Source: Morgan Stanley Research estimates, based on data from IEA-PVPS, World Energy Council, Greenpeace

We believe that last year Germany was the biggest market for new system installations. We estimate that Germany installed between 550MW and 600 MW last year, followed by Japan with about 35 MW.

Germany has been the largest market for the past few years due to a very attractive incentive program, which ensures high IRR on installed systems, particularly in southern Germany. However, with a 5% reduction in feed-in tariff and increase in system prices, we believe that Germany has become less appealing. We think some of the growth shortfall this year could be filled by Spain, Italy and perhaps California, given attractive or new incentives in these markets.

Exhibit 16

PV Equipment Sales



Source: Morgan Stanley Research estimates, based on data from IEA-PVPS, World Energy Council, Greenpeace

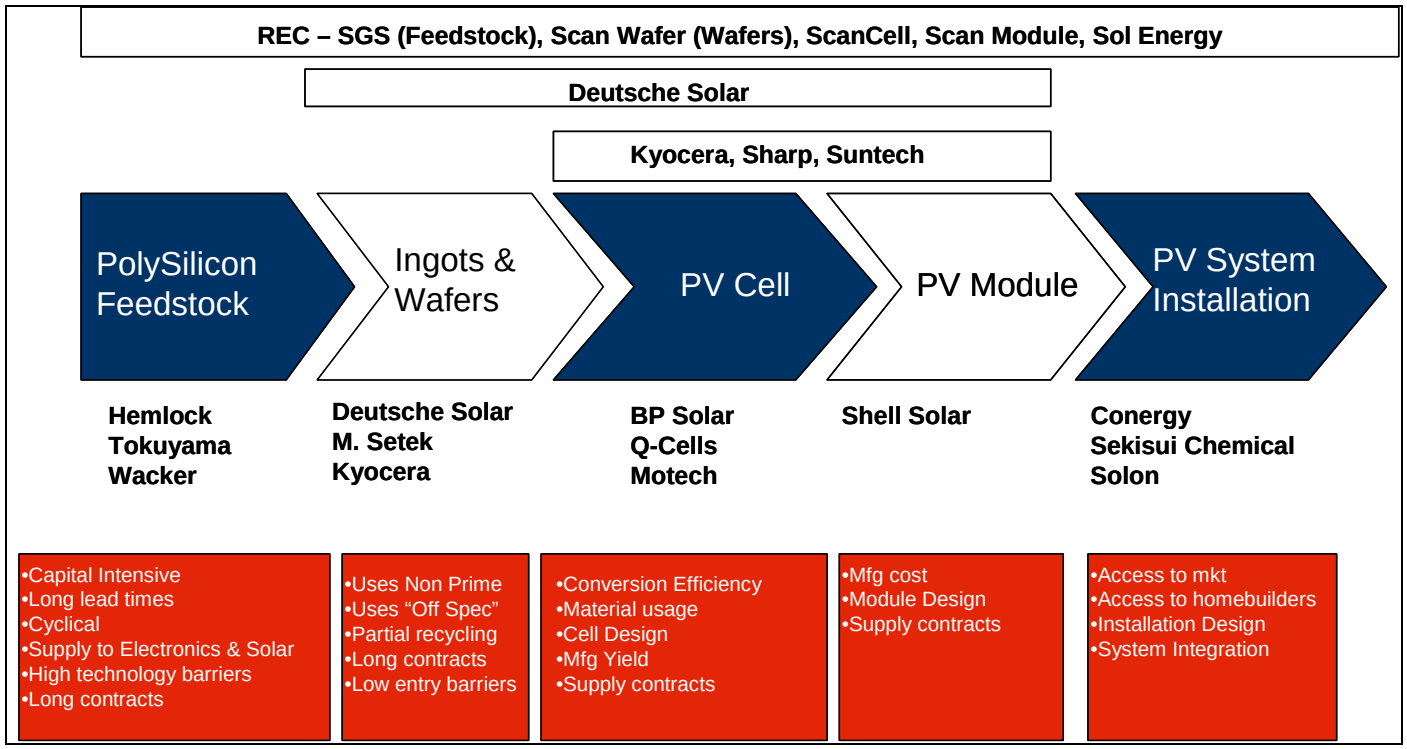
Raw Material: Shortages

PolySilicon is a crucial raw material in the industry. Currently there is severe shortage of polySilicon and we expect this to last until 2008. As a result, the ability to secure polySilicon and solar grade wafers has become a crucial success factor in the industry.

The solar industry shares polySilicon supply with semiconductor industry. Due to significant value add on raw wafer by the semiconductor industry, we believe that the semiconductor industry is in a far better position to pay higher wafer prices.

Until 2005, the solar industry was able to compensate for polySilicon production shortfalls with inventory built over the past lean cycle; we believe 2006 is likely to be the first year that industry demand is not fully met.

Exhibit 17
Solar Food Chain

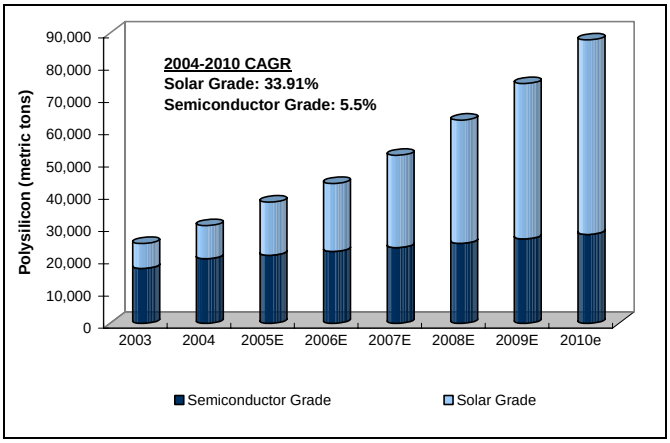


Source: Company data, Morgan Stanley Research

Due to very rapid growth in production of solar cells (30%+ CAGR for next decade and 40%+ for next two years, on our estimates), we expect polySilicon demand to grow very strongly. However, we forecast demand from the electronics industry to grow at just mid single digit levels. As a result, the solar industry should become a bigger consumer in the polySilicon market.

While in the past the solar industry was able to grow at an unrestricted pace despite limited production of polySilicon, we believe that in 2006 and 2007, this could become a real constraint. In 2005 the shortfall was satisfied by inventory from past years. However, inventory now appears to have been depleted, and hence will likely be unable to cover the demand shortfall fully in 2006. We see a risk that this shortage may limit solar industry production growth to low teens (as compared with potential demand growth of 40%+).

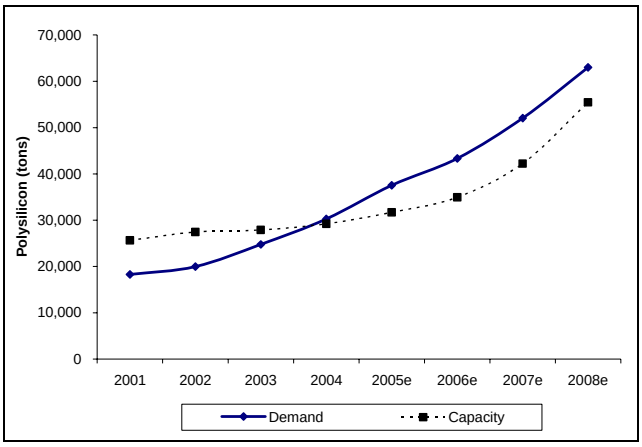
Exhibit 18
Global PolySilicon Demand



E = Morgan Stanley Research estimates
Source: Company data, Morgan Stanley Research

Exhibit 19

Global PolySilicon: Demand & Supply



e = Morgan Stanley Research estimates
Source: Company data, Morgan Stanley Research

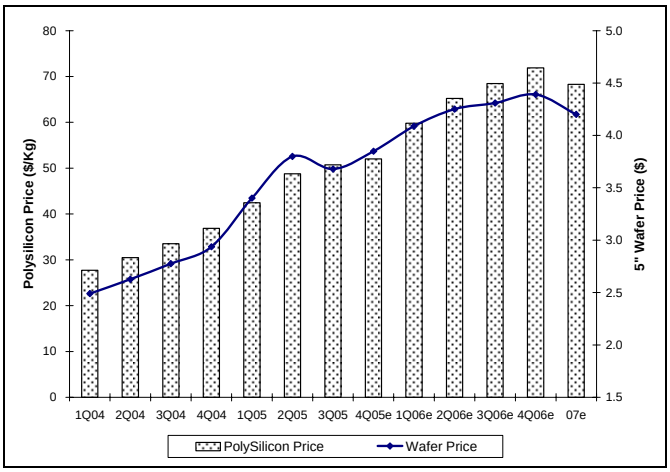
Cost Structure: Suntech

We made references to the critical issue of silicon cost & procurement. From our understanding of the Suntech cost structure, this becomes evident. Around 70% of costs is for raw material inputs. Refer to Exhibit 21. Labour and other factors are far less important.

PolySilicon contract prices are currently close to US$60 per kg and could easily rise to more than US$70 per kg over the rest of the year, in our view (implying a 17-20% increase).

Exhibit 20

Suntech: Raw Material Prices



e = Morgan Stanley Research estimates
Source: Company data, Morgan Stanley Research

Exhibit 21

Suntech: Cost Structure

	2005	2006
Revenue	100%	100%
COGS	67.5%	70.4%
Wafer Cost	48.0%	50.6%
Other Raw Materials	10.1%	10.3%
Labour Cost	1.1%	1.1%
Other Overheads	6.8%	6.5%
Depreciation	1.3%	1.5%
Gross Margin	32.5%	29.6%
Operating Expenses	11.6%	8.2%
R&D	1.5%	1.7%
Sales & Mktg	2.1%	2.4%
General & Admin	8.0%	4.1%
Operating Margin	20.9%	21.4%

Source: Morgan Stanley Research estimates

Solar Industry Primer

How Does It Work?

By using a semiconductor material that can be adapted to release electrons, sunlight can be used to generate electricity through photovoltaic (PV) systems. The solar energy knocks electrons loose from their atoms, allowing the electrons to flow through to produce electricity. The greater the intensity of the light, the greater the flow of electricity.

The most common semiconductor material used in photovoltaic cells is Silicon, an element most commonly found in sand and widely used in microelectronics.

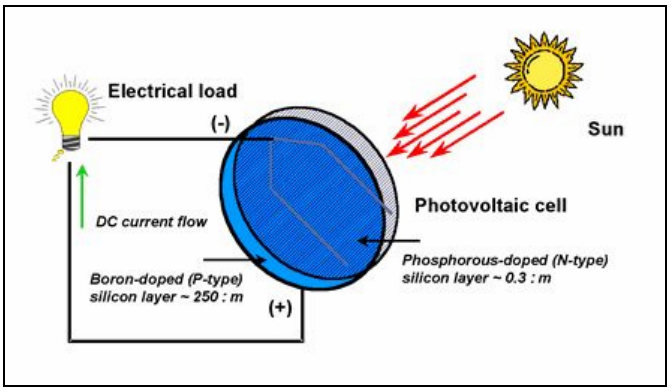
A typical PV module holds about 40-80 cells. About 10-20 of these modules are mounted in PV arrays. PV arrays can be then assembled with inverters as a PV system to generate electricity.

Industry Food Chain

The typical manufacture procedure for solar systems starts with the purification of raw Silicon materials and ends with the solar system assembly and installation, as shown on the next page.

Exhibit 22

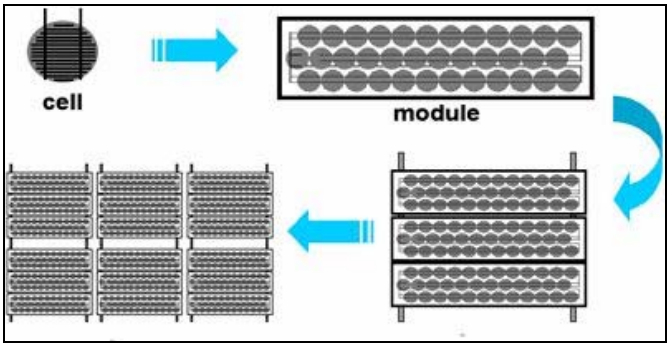
Basic Operation of a PV Cell



Source: Florida Solar Energy Centre

Exhibit 23

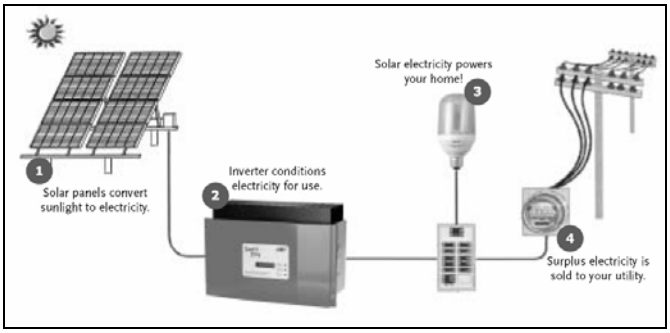
Schematic PV Cells and Modules



Source: University of Central Florida, Real Goods

Exhibit 24

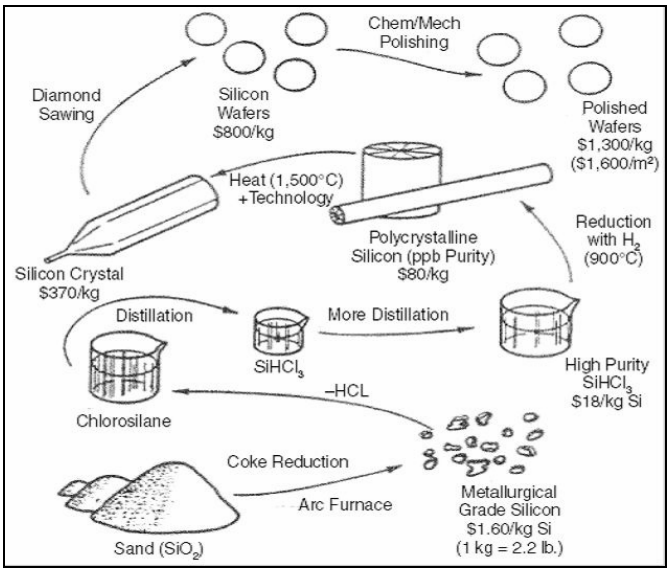
A Typical On-Grid PV System



Source: Real Goods

Exhibit 25

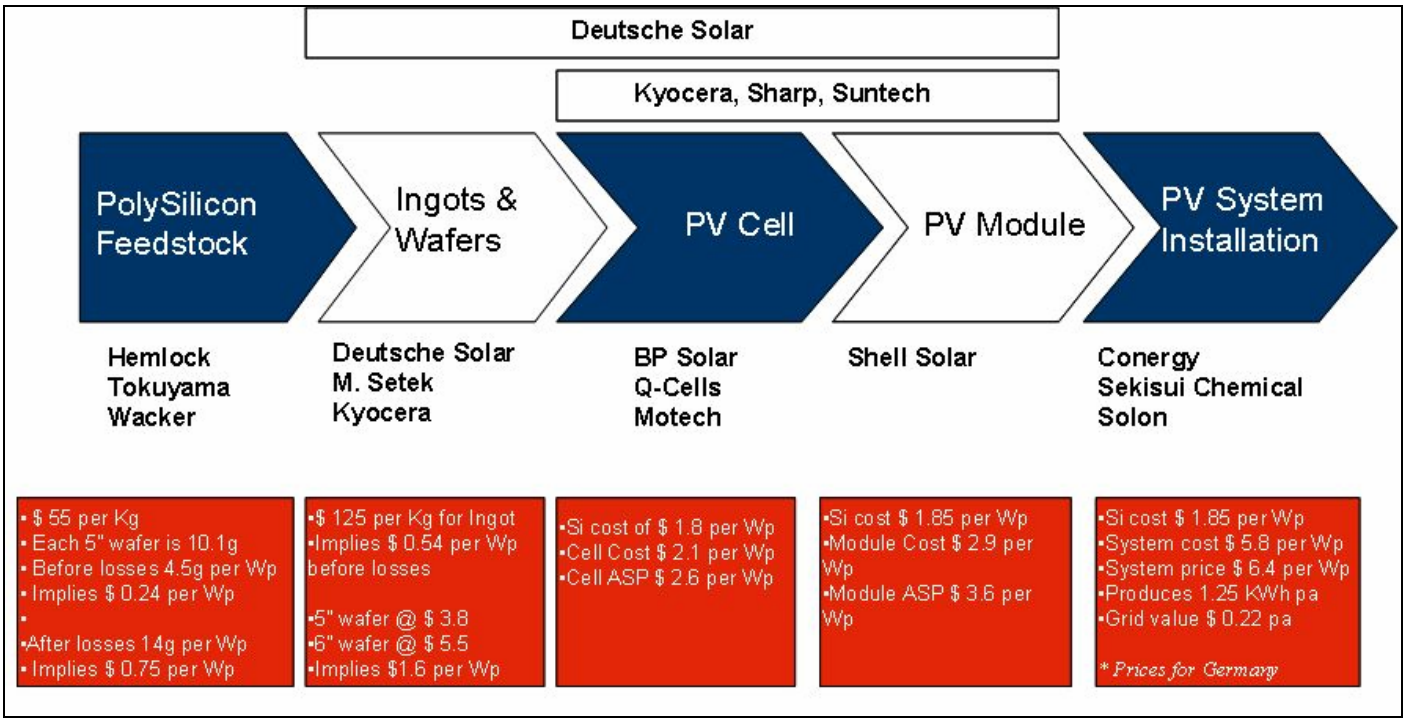
Silicon Transformation



Source: Journal of Materials

Exhibit 26

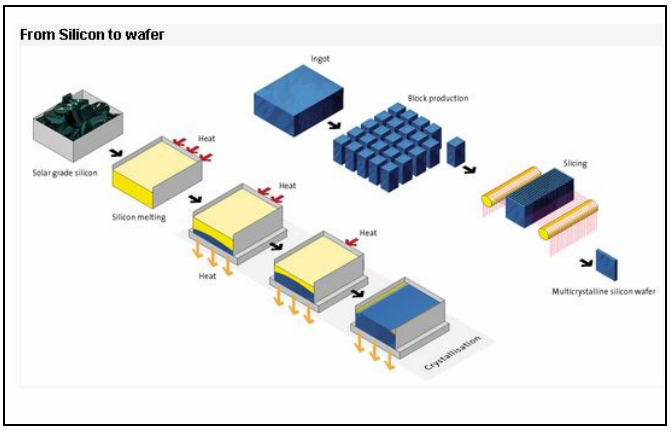
The Value Chain of Solar System



Source: Morgan Stanley Research

Exhibit 27

Solar Wafer Production



Source: ScanWafer

PolySilicon and Solar Grade Silicon Wafers

One third of the global polySilicon supply, nearly 10,000 metric tons, was dedicated to solar grade Silicon wafers in 2004. We expect this to further expand to 12,000 metric tons in 2005, or 36% of global supply. Major polySilicon suppliers include Hemlock, Tokuyama, Wacker-Chemie, REC, and Mitsubishi polySilicon. Leading wafer producers are Deutsche Solar, M. Setek, Kyocera and ScanWafer.

Exhibit 28

2004 Market Share of Solar Wafer Production

Company	Market Share
Deutsche Solar (SolarWorld)	14%
M. Setek	14%
Kyocera	10%
ScanWafer (REC Group)	10%
BP Solar	9%
PV Crystalox	8%
Shell Solar	7%
JFE	4%
Sanyo	4%
Sumco	4%
RWE Schott Solar	3%
Sharp	3%
Others	10%

Source: SolarWorld, Morgan Stanley Research

PV Cell/Module Production

In 2004, 78% of the PV cells were manufactured in Europe and Japan. Major cell makers are largely conglomerates, such as Sharp and Mitsubishi, or energy giants, such as BP and Shell. Among them, Sharp, occupying 26% of the global market in 2004, has been the industry leader for more than a decade. On the other hand, dedicated cell makers, such as Q-Cells in Germany, Suntech in China and Motech in Taiwan, have grown exponentially during these years.

Exhibit 29
2004 Market Share of Solar Module Production

Company	Market Share
Sharp	23%
Kyocera	10%
Shell Solar	7%
Mitsubishi Electric	6%
Sanyo Electric	5%
Isofoton	5%
MSK	4%
BP Solar	4%
Solon	3%
S.M.D.	2%
Photowatt International	2%
Other 50 companies	29%

Source: IEA-PVPS, Morgan Stanley Research

Solar Technologies

PV cells can be made either from crystalline Silicon or thin film. The former is widely used (89% in 2003) by far, and can be made from ingots, casting or grown ribbons. On the flip side, thin films are expected to be a key focus in the future, with advantages such as low material consumption and light weight.

Exhibit 30
2003 Market Share of Different Cell Technologies

Type	Market Share
Crystalline Silicon	
Polycrystalline	56%
Monocrystaline	33%
Thin Film	
Amorphous	5%
Ribbon-/sheet	4%
CdTe	1%
CIS	1%

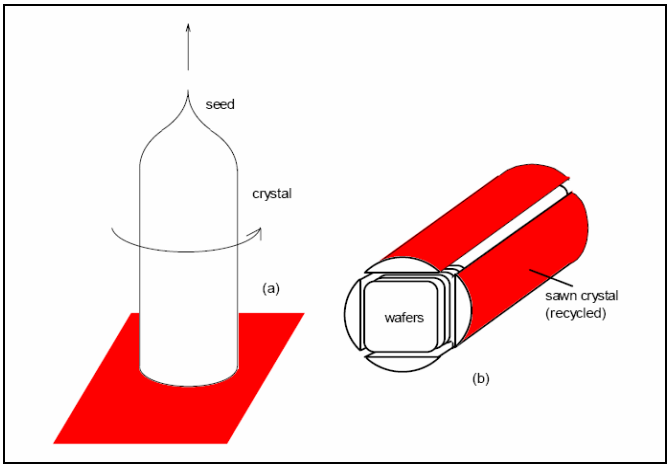
Source: EPIA, Morgan Stanley Research

In our view there are three key generations of solar cell technology, namely bulk Silicon, thin film and nanotechnology.

1. **Bulk Silicon** – Monocrystalline and Multicrystalline. Crystalline Silicon processes benefit from ample availability, broad understanding and compatibility of material technology developed from microelectronics, despite not being the best performer for solar cells. Typical efficiency for mass production ranges from 13% to 17%, while the physical limit sits at 30%, and laboratory results can be as high as mid 20%.

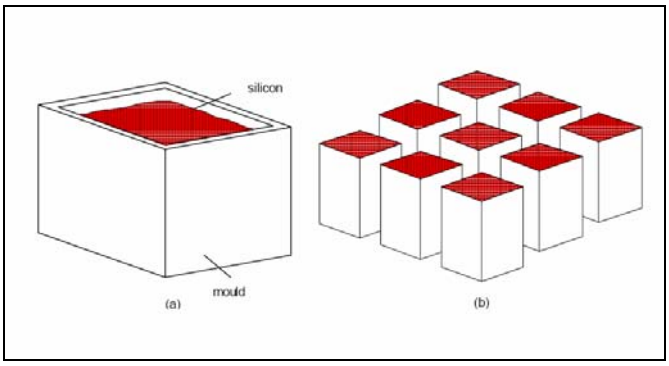
   There are two basic types of crystalline Silicon: mono-crystalline and multi-crystalline (polycrystalline). Typical mono-crystalline Silicon is produced by ingot growth, as shown in Exhibit 31. Solar cells made from monocrystalline Silicon can normally achieve higher conversion efficiency than multicrystalline ones. However, the productivity is significant lower and hence the material cost is higher. SunPower and Shell Solar are among the main manufacturers of this type of cell.

Exhibit 31
Manufacturing Process for Monocrystalline Silicon Wafers



Source: University of New South Wales, Morgan Stanley Research

Exhibit 32
Manufacturing Process for Multicrystalline Silicon Wafers



Source: University of New South Wales, Morgan Stanley Research

On the other hand, multicrystalline (polycrystalline) is made from casting. Although the productivity is higher and material cost is lower, the conversion efficiency is not as good as that of monocrystalline.

1. **Thin film technology** – Solar cells can be also made from the deposition of thin layers (less than a few microns) of photo sensitive material, such as a-Si

(amorphous Silicon), CIS (Copper Indium di Selenide) and CdTe (Cadmium Telluride). Thin film processes consume significantly less Silicon and enjoy a lower production cost compared with bulk Silicon. However, the conversion efficiency of 5-10% is also much lower. At approximately 10% in 2003, the market share of thin film technology is still fairly low, but it is expected to increase dramatically in the future.

2. **Nanotechnology** – The application of nanotechnology helps create components via molecular self-assembly as well as nano templates with structural order extending through all three dimensions. The molecule level arrangement allows the absorption of a substantial fraction of the incoming sunlight despite the ultra-thin layers, since the charges need to be transported only several nanometers, leaving little opportunity for a loss. The laboratory result of conversion efficiency is 12%. The nanosolar SPV cell cost is estimated to be US$0.36 per Wp. However, at the present stage, the process technology is still far from maturity for mass production.

Energy Conversion Efficiency

A solar module's energy conversion efficiency is defined as the maximum electricity output divided by the input sunlight energy. Nowadays, typical conversion efficiencies for solar cells and modules are 15-17% and 11-15%, respectively.

Exhibit 33

Module Efficiencies

Type	Typical module efficiency
Crystalline Silicon	
Polycrystalline	11-14%
Monocrystaline	12-15%
Thin Film	
Amorphous	5-7%
CdTe	6-7.5%
CIS	9-9.5%
a-Si/μ-Si	10%

Source: EPIA, Morgan Stanley Research

Key Technology Challenges

The key technology challenges for the PV industry primarily cover the need for breakthrough improvements that can dramatically reduce the solar system's costs and improve its efficiency and reliability. In order to achieve the goal, it is believed that the industry is focused on the following areas:

1. **Increase Conversion Efficiencies.** Develop new technologies and design more advanced equipment to manufacture, on a large scale and cost-effectively, PV cells with higher conversion efficiencies.

2. **Reduced Silicon Usage by Using Thinner Silicon Wafers.** Developing process technologies to address manufacturing challenges associated with reducing the thickness of Silicon wafers, including cell warpage and the breakage rate of thinner Silicon wafers.

Exhibit 34

Technological Targets Toward 2030

	2010	2020	2030
Crystalline Silicon solar cell	20%	25%	25%
Thin film Silicon solar cell	15%	18%	20%
"CuInSe" solar cell	19%	25%	25%
"III-V" solar cell	40%	45%	50%
Dye-sensitized solar cell	10%	15%	18%

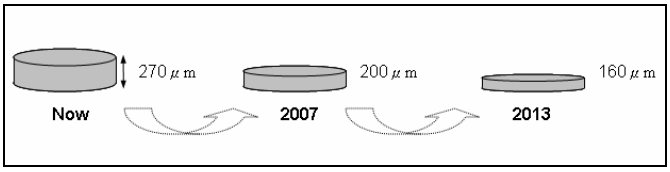
Source: NEDO Japan, Morgan Stanley Research

3. **Utilize Low Cost Solar Grade Silicon.** Develop innovative Silicon purification technologies to produce solar grade polySilicon (rather than high purity electronics grade polySilicon). If successful this development will substantially reduce Silicon cost while maintaining and enhancing the conversion efficiencies.

4. **Develop Thin Film Silicon PV Cell Technologies.** Develop manufacturing technologies for the next-generation thin film Silicon PV cells, which would significantly reduce the consumption of Silicon materials and manufacturing costs.

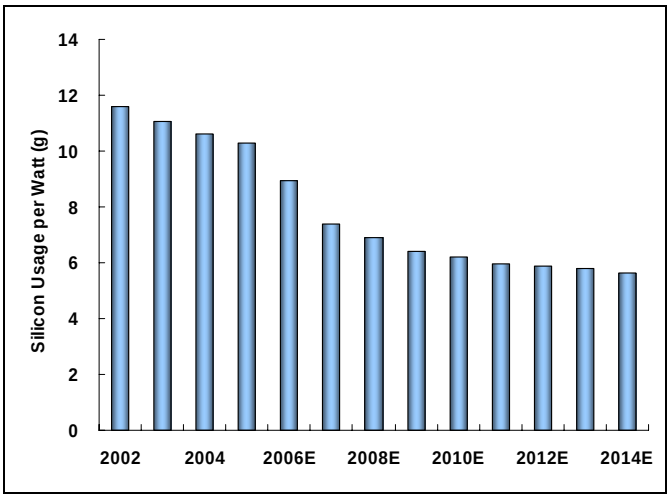
Exhibit 35

Reduced Silicon Usage



Source: Morgan Stanley Research

Exhibit 36
Trend of Silicon Usage per Watt



E = Morgan Stanley Research estimates
Source: Company data, Morgan Stanley Research

In addition, we believe there are some more untested PV technologies that might be dominant in the future despite uncertain viability at this point, including:

1. **Nanotechnologies:** Various start-ups are trying to commercialize nanoscale technologies for multiple applications, including grid-connected and building-integrated markets. From inorganic semiconductor nanocrystals to self-assembling nanostructures to dye-sensitized nanometer-scale crystals, all are attempting to produce lightweight, flexible, and low-cost cells in high volume; some plan to use roll-to-roll manufacturing processes, which directly cut costs.

2. **Sputtering:** Borrowing technology used to place a magnetic coating on computer disk drives, a couple of early-stage companies are adapting this process for manufacturing solar cells. These techniques use automated, continuous-flow processes for placing a thin coating of solar-collecting material, like CIGS thin-film cells, on cheap, thin, lightweight substrates. The goal is to produce cells with the efficiencies of Silicon but at a quarter of the cost.

3. **New Silicon-based technologies:** A few companies are building on Silicon's proven track record for high durability and efficiency with new manufacturing approaches that require significantly less of this high-cost material. One company is using tiny Silicon balls attached to aluminum foil substrates to make its low cost, flexible sheets of cells. Another startup has a process that leverages advanced deposition of low-cost Silicon feedstock in a continuous flow process.

4. **Organic semiconductor thin-film:** One start-up is working on depositing conductive polymers over inexpensive Mylar film. They are hoping to make a thin-film organic semiconductor device that uses the principles of polarization to organize incoming photonic energy and then change it into electricity.

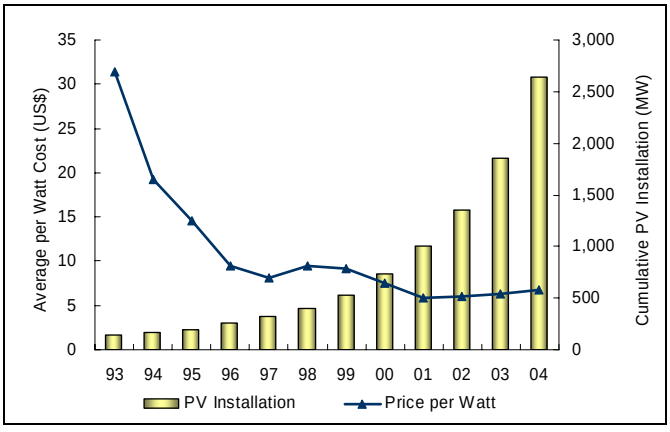
5. **Concentrator cells and collectors:** Other companies are using optics to magnify solar energy onto cells – and one company claims to be using mirrors to concentrate solar energy to a stirling engine, which then generates electricity.

Cost of a Solar System?

The most expensive components for typical on-grid solar systems are the solar module and the inverter, which account for 80-85% of the total cost. The solar module, consisting of arrays of solar cells, converts the sunlight into electricity. The electricity generated from the solar module is then conditioned by the inverter from DC (Direct Current) to AC (Alternating Current), a form suitable for everyday use, and then fed into the circuits to power the electrical appliances.

Thanks to the rapid growth of global PV demand, the per watt cost of the solar system fell dramatically from US$31 in 1993 to US$6 in 2001. Nonetheless, due to the supply tightness in the industry, the solar system price has essentially stabilized in the past four years, followed by a gradual increase to nearly US$6.5-7, recently.

Exhibit 37
Solar System Cost per Watt



Source: Photon, NEDO, Morgan Stanley Research

The actual cost of an installed system may vary widely depending on installation complexity, location, component availability, and the size of the installed system. The US Department of Energy (DOE) estimates that a 2kW system costs US$8-10 per watt to install, while a 5kW system can cost US$6-8 per watt installed. Based on our latest surveys, we believe the retail price per watt for a 2-3kW home solar system (including tax and labor cost) should be in the range of US$6.5-7.0.

Exhibit 38

Retail Prices for Home Solar Systems (US)

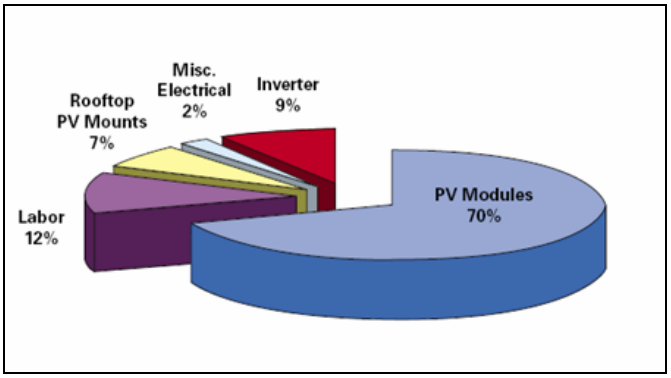
Product	A	B	C	D	E	F
Capacity (kW)	1.90	2.66	2.28	2.85	3.04	3.42
Inverter (kW)	1.80	2.50	2.50	2.50	2.50	4.00
Price (US$)	**12,893**	**17,258**	**15,218**	**18,686**	**19,992**	**23,011**
Per watt Cost (US$)	6.79	6.49	6.67	6.56	6.58	6.73

Source: Affordable Solar, Morgan Stanley Research

Among all the constituents, we believe the PV module, accounting for 70-75% of the total cost, will be the only one to witness a price hike in the next couple of quarters, due to the production constraint of solar wafers. Consequently, the cost-down benefits from other components (we believe mostly from inverters and passive components) appear less effective given the relatively small contribution. Hence, we believe the solar system cost is unlikely to decline much in next 1-2 years.

Exhibit 39

Typical Cost Structure of Grid-Tied PV System



Source: Home Power, Morgan Stanley Research

Morgan Stanley
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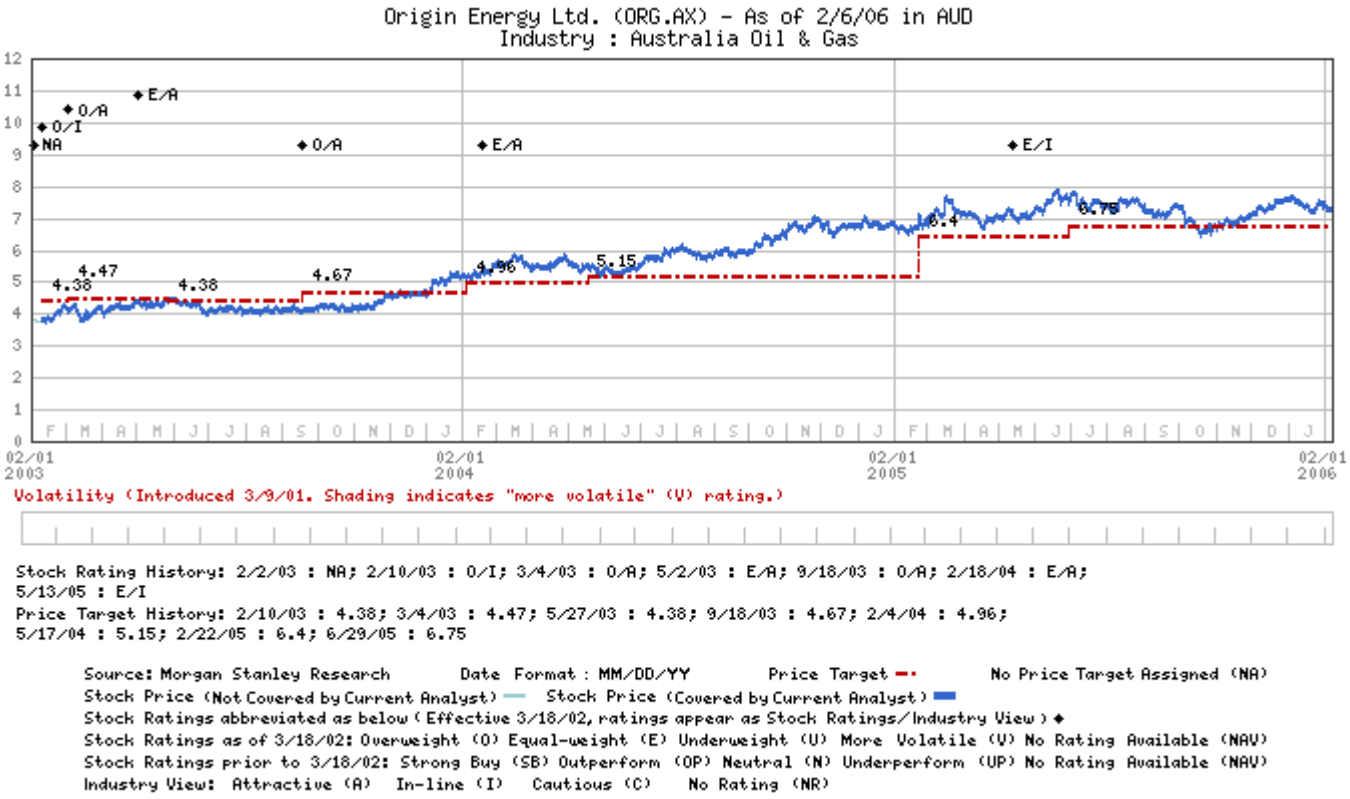

Stock Rating History: 2/2/03 : NA; 2/10/03 : O/I; 3/4/03 : O/A; 5/2/03 : E/A; 9/18/03 : O/A; 2/18/04 : E/A; 5/13/05 : E/I

Price Target History: 2/10/03 : 4.38; 3/4/03 : 4.47; 5/27/03 : 4.38; 9/18/03 : 4.67; 2/4/04 : 4.96; 5/17/04 : 5.15; 2/22/05 : 6.4; 6/29/05 : 6.75

Source: Morgan Stanley Research Date Format : MM/DD/YY Price Target No Price Target Assigned (NA)
Stock Price (Not Covered by Current Analyst) Stock Price (Covered by Current Analyst)
Stock Ratings abbreviated as below (Effective 3/18/02, ratings appear as Stock Ratings/Industry View)
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Industry Coverage: Australia Oil & Gas

Company (Ticker)	Rating (as of)	Price (02/07/2006)
Stuart Baker		
Origin Energy Ltd. (ORG.AX)	Overweight (02/07/2006)	A$7.08
Oil Search Ltd. (OSH.AX)	E (02/23/2005)	A$3.63
Caltex Australia Ltd (CTX.AX)	O (10/05/2004)	A$17.80
Santos (STO.AX)	E (07/05/2005)	A$12.95
Woodside Petroleum (WPL.AX)	U (07/20/2005)	A$42.75

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