

SOLAR INDUSTRY GROWTH ANALYSIS, SRI LANKA

**JAMES R. FINUCANE
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Table of Contents

BACKGROUND	3
• Objective	3
• Context.....	3
• Activities	3
• Data	4
• Main findings	5
• Main recommendations.....	5
THE STATE OF THE INDUSTRY	6
• Sales trending down	6
• Revenue projected to decline in 2005	7
• Change in sizes and range of products following mid-2004 removal of GEF grant.....	8
• Customer profile.....	9
• Market interest in smaller size systems.....	10
• Prices.....	11
• Costs.....	12
• Profitability	14
• Finance costs and working capital cycle.....	16
• Competitive structure of sector	18
• Consumer finance.....	18
• Consumer finance constraint.....	19
• Profitability of consumer finance.....	21
• Technical and aftersales service performance issues	22
• CEB grid extensions in rural areas.....	23
• Government subsidy schemes	24
• Business environment	25
RISKS TO SUSTAINED GROWTH	25
• Consumer financing	25
• Planned removal of GEF grant for systems larger than 21 Wp – 40 Wp systems..	26
• Possible removal of government subsidy.....	26
• Technical performance capabilities.....	27
GROWTH REQUIREMENTS AND RECOMMENDATIONS	27
• Intensify capacity building for SHS consumer finance, especially SEEDS	27
• Continue GEF grants for systems up to 40 Wp, and up to 60 Wp if resources permit, through the end of RERED.....	28
• Continue technical capacity building for solar companies	28
• Develop an interim subsidy mechanism as a step towards a sustainable mechanism	29

SOLAR INDUSTRY GROWTH ANALYSIS REPORT JUNE 15, 2005

BACKGROUND

Objective

The objective of this assignment, to quote from the terms of reference, is “to conduct an analysis of the (Sri Lanka) solar industry with particular focus on: (1) state of the industry; (2) impact of the phase out of GEF co-financing grant on the industry; and (3) suggestions for the sustained growth of the industry.”

Context

The growth of the solar industry in Sri Lanka is supported under the Renewable Energy for Rural Economic Development Project (RERED), which became effective in October, 2002 and is scheduled to close at the end of 2007. The industry has seen significant growth in SHS sales over the first 2.5 years of implementation. However, there is concern that the removal at the end of June 2004 of one of the project’s main instruments, namely grants of \$70 for units with capacities in the 41 Wp to 60 Wp range, along with the planned removal at the end of 2005 of similar grants for units with capacities in the 21 Wp to 40 Wp range, international supply price increases and possibly other factors including grid extensions, will weaken the industry’s sustainability. There is also some concern as to whether the growth of the industry is contributing to market deepening and increased access by the rural poor. In this context, recommendations are sought on how the growth of the industry can be sustained.

Activities

Prior to arriving in Sri Lanka on April 28, 2005, I reviewed background documents made available by the DFCC team at the Administrative Unit (AU), which is responsible for managing RERED implementation, under which this assignment was contracted.

Over April 28 – May 13, I conducted individual meetings with:

- eight of the ten accredited solar companies
- five finance organizations (SEEDS, LOLC, LOFC, Ceylinco Leasing and Sanasa), which are participating credit institutions (PCI’s)
- the Ceylon Electricity Board (CEB)
- the Uva Provincial Council
- the AC Nielson team conducting the market survey
- the head of the solar industry association,
- the Sri Lanka Business Development Centre, which has been a lead provider of consultancy services, and
- several other consultants and industry experts.

During a two day field trip I visited 15 solar centers of seven of the companies in the Balangoda, Bandarawela, Mahiyangana, Girandurokotte, Dehiattakandia and Hingurakgoda areas. I also visited the SEEDS office in Mahiyangana.

Prior to departing Sri Lanka on May 13, I discussed my initial findings with the AU and with Amali Rajapaksa of the World Bank team in Colombo.

Also, with the AU and the AC Nielson team I reviewed the preliminary findings of the market survey; the draft final report was provided to me on June 7.

The AU's Jayantha Nagendran and Kapila Subasinghe kindly provided background information and guidance and arranged many of the meetings. I would like to acknowledge their support and insights. Also, I would like to acknowledge the information and time made available by the solar companies, PCI's, and others who met with me; a list is attached.

Data

This report is based on information provided by: (i) the solar companies and PCI's during interviews, and in some cases documents provided by the companies and PCI's; (ii) the AU during interviews and in some cases from additional information provided from the AU records; (iii) the market survey conducted by AC Nielson over March – April, 2005 (which is referred to in this report as the "AC Nielson market study"); and (iv) other reports and studies, most importantly aide memoires of World Bank supervision missions over 2002 - 2004.

The solar companies participating in RERED are private companies or partnerships, or departments or subsidiaries of larger corporations. Audited financials of their solar operations were not available. Similarly, audited financial reports on the solar pv operations of the participating financial organizations (PCI's) were not available. In many cases, series information on sales and loans that was available was incomplete.

Nonetheless, while the information available certainly was sufficient to clearly indicate key aspects of market trends, the estimates in this report on sales, loans, profitability, market shares, and other performance aspects are estimates.

Additionally, the solar industry in Sri Lanka, which is young, with three of the main companies having less than three years experience in the market, is much in flux, as it continues to adjust to the removal of the GEF grant for 41 Wp to 60 Wp systems, the planned removal of the grant for 21 Wp to 40 Wp systems, significant international price increases and supply shortages for modules, and limited consumer finance supply. This argues for caution in extrapolating from even recent trends to forecast future patterns.

Main findings

Main findings are:

- a) Sales levels peaked during 2004 and trended downwards over the last quarter of 2004, continuing during the first quarter of 2005.
- b) Total revenue for the sector for 2005 is projected, conservatively, to be down 6%, in dollar terms, based on the extrapolation of the results through the end of the first quarter. The decline may be sharper.
- c) Gross and net profit margins have been reduced, as the solar companies have contended with higher supply costs, increasing competition, continued limited affordability and the mid-2004 removal of the \$70 grant for the systems with capacities in the 41 - 60Wp range, following which the 40 Wp systems became the leading market product, replacing systems with 50 Wp to 60 Wp capacity.
- d) Consumer finance supply is a major constraint to continued growth, and may be contributing to reduced sales levels.
- e) Survey findings indicate low or moderate levels of customer satisfaction with technical performance.
- f) Retail SHS price movements are not out of line with overall consumer price movements in Sri Lanka; however, solar companies with steep import supply cost increases have not been able to fully pass through dollar cost increases to customers.
- g) Cash flow has been an issue for some companies, in some cases made more so by timing of disbursements of consumer finance and grants, although these concerns appear recently to have been, in the main, addressed.
- h) Significant PV market opportunities will remain for foreseeable future, given targets and pace of rural grid extension programs.
- i) There is no significant consumer demand for systems 20 Wp and smaller.
- j) no significant consumer demand for systems 20 Wp and smaller.
- k) The market is competitive, with new entrants gaining market share and no significant barriers to entry.

Main recommendations

The focus of recommendations (pp. 25 – 28) is on what can be done over balance period of RERED to strengthen sustainability of the industry after project closing.

- a) Intensify capacity building for consumer finance, especially SEEDS. There are clear indications that consumer finance constraints are hindering industry growth, and may be contributing to sales and revenue declines.
- b) Continue GEF grants for systems up to 40 Wp, and up to 60 Wp, if resources permit, through the end of RERED
- c) Continue technical capacity building for solar companies
- d) Develop an interim subsidy mechanism as a step towards a sustainable mechanism post-RERED

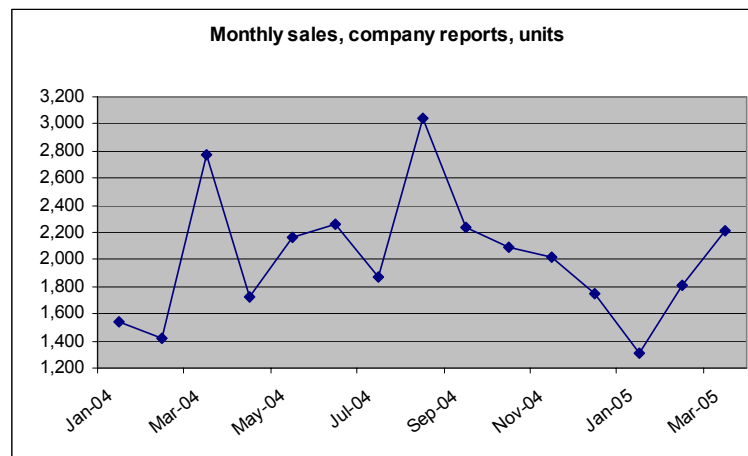
THE STATE OF THE INDUSTRY

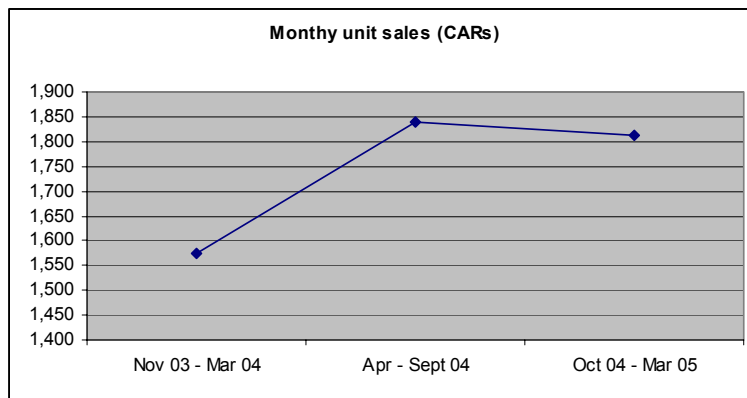
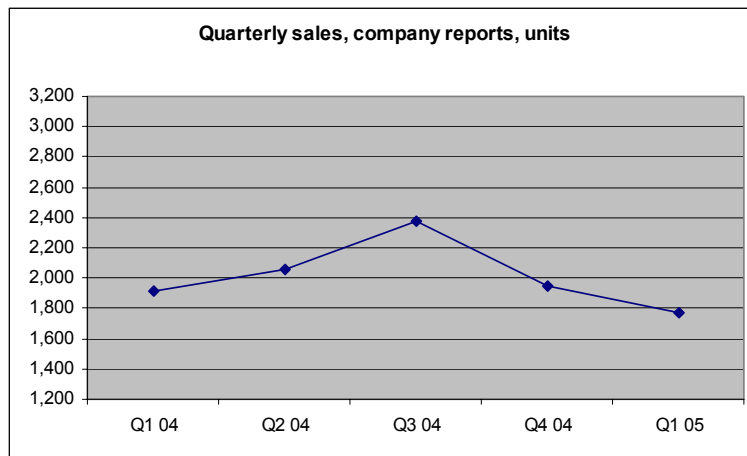
Sales trending down

Sales over calendar year 2004 averaged 2,085 units per month, based on reports from the companies, with significant variances on a monthly basis. Based on the trends reported in aide memoires, this represents a significant increase over the 2003 rate.

Sales levels, as reported, increased through the third quarter 2004, with monthly sales over that quarter averaging 2,380 units. Since then they have declined, as seen most clearly in the second of the following three charts, which groups sales on a quarterly basis. The third chart, which reports monthly sales in terms of CARs (customer acceptance receipts) processed by the AU, which lag actual sales, shows a similar but less sharp peaking.

During the first quarter, 2005, monthly sales levels averaged 1,775, a 7.2% drop from same period sales in 2004, which averaged 1,914 units. A main factor in this lower level appears to be supply constraints on consumer financing. An additional factor appears to be difficulties in sourcing panels.





Revenue projected to decline in 2005

Total revenue (calculated based on the sales prices plus, for eligible systems, the GEF grants) for the sector increased in 2004 to an estimated \$13.3million. Annual sales revenues for 2005 are projected to be down 6.0% to \$12.5 million.

However, there is a high probability that the revenue decline will be more than 6%. As with the decrease in unit sales, main factors in the level of sector revenue are the supply constraints on consumer financing and difficulties in sourcing panels given high international demand; these factors are expected to grow in pressure over 2005. Likely possible causes of a larger than 6% revenue decline would be higher than 7.2% drop in unit sales and, secondly, a currency depreciation to lower than an average of Rs 104 / \$1 for the year.

Sales revenue, 2004 - 05

year	firms	units	revenue	revenue	
			per unit	SLR	\$
2003	4	16,000			9,800,000
2004	8,9	24,899	51,688	1,286,975,855	13,300,000
2005	9,10	23,097	56,288	1,300,084,838	12,500,000
Change 2004 - 05		-7.2%		1.0%	-6.0%

Estimates are based on company reports for 2004 and 2005 and aide memoires for 2003. The 2005 estimate incorporates a 7.2% decline, based on reported first quarter performance. Average revenue per system includes \$70 per unit grant for eligible systems. Average exchange rate for 2004 is 96.54; it is 104 for 2005.

An additional factor in the revenue decline is the removal from July 2004 of the GEF grant of \$70 for systems in the 41 – 60 Wp range. However, approximately 80% of systems sold continue to be eligible for the GEF \$70 per unit grant. Thus, with the Rs price increases, the average revenue per unit has increased, in spite of the fall in average system sizes. Nonetheless, the increase in Rs revenue per unit is insufficient to counter the drop in unit sales and currency depreciation.

Estimated Market shares estimates for revenue estimates

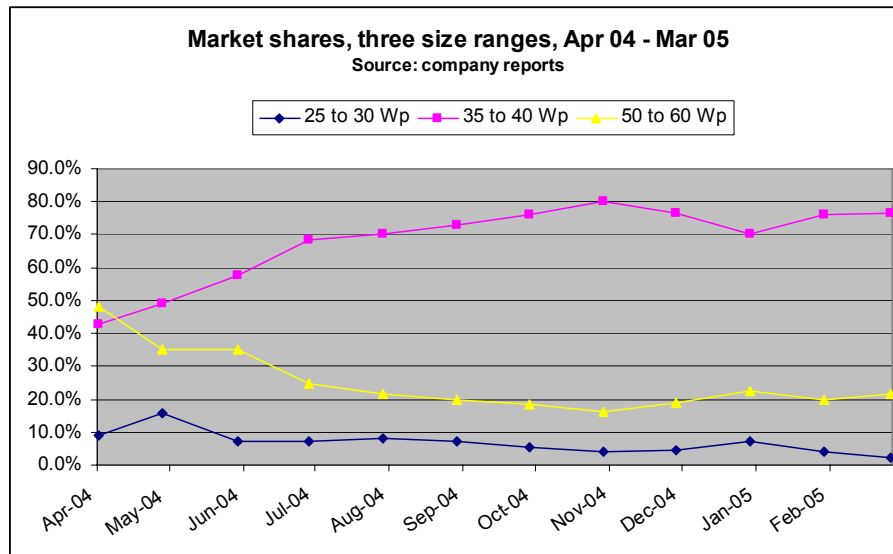
	25 – 30 Wp	35 – 40 Wp	50 – 60 Wp
2004	8.2%	58.2%	33.6%
1st Q 04	10.0%	35.0%	55.0%
2nd Q 04	10.8%	49.8%	39.5%
2nd half 04	6.0%	74.0%	19.9%
2005	4.5%	74.2%	21.2%

Change in sizes and range of products following mid-2004 removal of GEF grant

The average capacity (Wp) size of units declined over 2004, in response to the removal of the GEF grant for systems larger than 40 Wp. Of the total 44,911 systems installed under RERED for which CAR's had been processed by the AU as of the end of March, 2005, 85% are reported as being larger than 40 Wp in size.

SHS panel capacity	Grants for solar companies for SHS sales		
	Oct 2002 – June 2004	July 2004 – December 2005	2006 - 2007
10 - 20 Wp	\$40	\$40	\$40
21 - 40 Wp	\$70	\$70	0
41-60 Wp	\$70	0	0

However, with the removal of the \$70/Wp grant for systems larger than 40, the distribution of the products sold changed dramatically. Based on the available sales reports, sales of systems 40 Wp capacity and smaller had taken, on a monthly basis, 78% of the market by March 2005.



While the main approach of the companies has been to shift their marketing emphasis to 40Wp systems, at least one company appears, based on discussions and the findings of the AC Nielson survey to have continued targeting mainly the 50 Wp and larger systems. This strategy, based on information from several of the companies, may confront a particularly strong consumer finance constraint, as it often appears to them that the credit policy of SEEDS is to require that in cases of units with sales prices over Rs 50,000 that the customer be an income tax payer, which largely excluding most farmers. SEEDS, however, stresses that it has never had a policy of requiring that a borrower be a tax payer.

There has been a narrowing of the product range in terms of capacities offered over the past year. Several firms report that early efforts on marketing small systems, mainly 25 Wp and 35 Wp, have been dropped by several companies following no significant consumer response.

Consumer choice has expanded in terms of balance of system components. In particular, a wider range of lights, including LED, are available as the companies seek to add value and compete on non-price factors, given the difficulties in raising prices.

Customer profile

The issue of changing customer profiles has been discussed in Sri Lanka in relation to the removal of the grant, with a question being whether the removal of the grant has led the “better off” customers to purchase smaller systems. The reports of the companies’ sales staff and PCI field staff indicate that indeed the higher income profile customers are shifting to the 40 Wp capacity systems.

To address this, the AC Nielson customer survey covered a number of factors in an effort to determine whether customers who pre-July, 2004, were interested and able to purchase a 41 Wp or larger system are now buying smaller systems because of the availability of the GEF co-financing grant on these smaller systems.

In terms of household ownership of assets, income and expenditures, the results appear, on balance, to support a conclusion that better off customers have migrated from 50Wp – 60Wp to the smaller 35Wp – 40 Wp systems. The text from the AC Nielson draft report is reproduced below:

Finding from AC Nielson customer survey of SHS customers, April 2005

A close evaluation of 18 key attributes indicates that significant differences exist for 6 attributes between 35-40 Wp system users pre grant removal and amongst the 50-60 Wp system users during the pre grant removal, in Kurunegala. A close evaluation of 18 key attributes indicates that significant differences exist for 5 attributes between 35-40 Wp system users pre grant removal and amongst the 50-60 Wp system users during the pre grant removal, in Ratnapura.

In addition to the significantly higher scores for the identified attributes in a further five attributes numerically higher mean values can be witnessed in Kurunegala and Ratnapura respectively. The conclusion to be drawn is that the 50-60 Wp users are of a significantly higher profile in comparison to the 35-40 Wp system users prior to the grant removal in Kurunegala and Ratnapura.

In Kurunegala 35-40 Wp system users post the grant removal are significantly (39%) higher than the 35-40 Wp system users pre the grant removal in addition to the six attributes where the values are numerically higher. Hence it can be concluded that the 35-40 Wp system users post grant removal are of a significantly higher profile in comparison to the profile of the 35-40 Wp pre grant removal users in Kurunegala.

Market interest in smaller size systems

Based on company interviews, there is no significant market interest in systems smaller than four lights. Although most companies have at times offered and promoted three light and smaller systems, there is little market demand at these capacity levels. Indeed, there is no reported interest in two light systems. Four light systems in Sri Lanka require panels in the 35 to 40 Wp range.

There are no reports of sales of the smaller (20 Wp) systems following the removal of the grant for the larger (41Wp to 60Wp) capacity systems.

Supply costs of smaller systems are increasingly out of line with those of larger systems, mainly as module producers increasingly focus on the high demand, high value European, Japanese and North American markets, which demand large size panels. There are a limited number, internationally, of certified suppliers of small size panels, and their ex-factory prices are above \$4/Wp, if available.

Prices

Unit SHS retail prices in Sri Lank Rupees increased 10 – 30%, over the past 12 months, with sharp increases beginning during the second half of 2004 and the initial months of 2005.

Based on price data from three leading comparisons, the retail price increases of the larger systems, above 40 Wp, are larger than the increases for the small systems, reflecting the removal of the GEF grant for the systems larger than 40 Wp.

SHS unit retail price increases, April 04 - April 2005, Rs				
Company	30 Wp	40 Wp	50 - 60 Wp	aver increase
X	10.2%	4.4%	13.8%	9.5%
Y	26.7%	31.0%	33.9%	30.5%
Z	3.2%	10.7%	19.8%	11.2%
aver. Increase	13.4%	15.4%	22.5%	17.1%

However, with the removal of the grant, the increase in revenue earned per unit for the smaller systems ranged from 12% to 14%, while the increase for the larger systems was 9%

SHS per unit revenue (price + grant) increases, Apr 04 - Apr 05, Rs				
Company	30 Wp	40 Wp	50 - 60 Wp	aver increase
X	9.7%	4.9%	1.9%	5.5%
Y	23.2%	27.7%	19.5%	23.5%
Z	4.0%	10.3%	5.0%	6.4%
aver. Increase	12.3%	14.3%	8.8%	11.8%

Total revenue per unit in \$/Wp ranged from \$10.32 to \$15.23 during 2004, and from \$10.58 to \$17.42 by April 2005.

Minimum and maximum revenue, \$/Wp			
	2004	2005	% change
minimum	10.32	10.58	3%
maximum	15.23	17.42	14%

The increases in SHS retail prices are in line with recent broad price movements in Sri Lanka. General inflation has accelerated (year-on-year rate of 17.3% as of end February, 2005). Kerosene prices were increased in May 2005, to Rs 28.5/litre, by 14%. In some cases, the SHS unit price increases have been accompanied by quality increases, through the inclusion of higher quality components (e.g., brighter lights, better batteries). On the rural incomes side, market prices of the main agricultural commodities increased comparably during the second half of 2004, according to Central Bank reports.

SHS retail prices and revenue per unit, 2004 – 05, three example companies

system WP	example 1			example 2			example 3			
	30	40	60	25	40	50	30	40	50	60
Retail prices SLR										
Jan 04	27,500	42,000	53,000	30,000	42,000	56,000	31,000	42,000	48,000	57,000
Apr 04	29,500	45,000	58,000	30,000	42,000	56,000	31,000	42,000	48,000	57,000
Apr 05	32,500	47,000	66,000	38,000	55,000	75,000	32,000	46,500	57,500	67,500
change, Apr 2004 - 05	10.17%	4.44%	13.79%	26.67%	30.95%	33.93%	3.23%	10.71%	19.79%	18.42%
Prices with grant (revenue per unit)										
Jan 04	34,258	48,758	59,758	36,758	48,758	62,758	37,758	48,758	54,758	63,758
Apr 04	36,258	51,758	64,758	36,758	48,758	62,758	37,758	48,758	54,758	63,758
Apr 05	39,258	53,758	66,000	44,758	61,758	75,000	38,758	53,258	57,500	67,500
change, Apr 2004 - 05	8.27%	3.86%	1.92%	21.76%	26.66%	19.51%	2.65%	9.23%	5.01%	5.87%
Prices with grant in \$ (revenue per unit)										
Jan 04	355	505	619	381	505	650	391	505	567	660
Apr 04	376	536	671	381	505	650	391	505	567	660
Apr 05	377	517	635	430	594	721	373	512	553	649
change, Apr 2004 - 05	0.51%	3.59%	-5.39%	13.03%	17.58%	10.93%	-4.71%	1.39%	-2.52%	-1.72%
Prices with grant in \$/Wp (revenue per unit)										
Jan 04	11.83	12.63	10.32	15.23	12.63	13.00	13.04	12.63	11.34	11.01
Apr 04	12.52	13.40	11.18	15.23	12.63	13.00	13.04	12.63	11.34	11.01
Apr 05	12.58	12.92	10.58	17.21	14.85	14.42	12.42	12.80	11.06	10.82

Staff of all the solar centres visited appear confident of the market strength and reported not being concerned about recent price increases or the possibility of grid connections. There is widespread recognition of the competitive nature of the business, with the different staff able to explain their products' competitive advantages (e.g., price, product quality, product range, after sales service, reputation). The staff were concerned about the impact on sales of low inventory levels and constraints in arranging consumer finance.

Costs

Increases in costs are much discussed among several of the solar companies. Along with overhead costs, the components of which tend to track consumer price inflation, and which have been impacted by increases in transport costs and duties, international supply price increases are frequently mentioned as pressuring margins.

In interviews, companies reported a wide range of supply prices for modules of the most popular size (40 Wp) from \$3.61/Wp (landed cost) to as high as \$5.5/Wp, with price increases on the order of 8% to 20% over the period January 2004 to April 2005. Prices for smaller modules are higher, with companies quoting up to \$7/Wp for 10 Wp modules.

The dollar costs of imported balance of system components have reportedly increased 5 – 20% over the past 12 months. Companies importing regularly and in volume, particularly in container size lots, benefit from supplier discounts. The full landed cost of the modules represents on the order of order of 50% of the installed system cost in Sri Lanka, with variances by company.

The increases in module supply prices are partly linked to prices of solar-grade silicon, which have increased from about \$9 per kilo in 2000 to \$25 currently, and to as much as \$60 for small-quantity shipments, according to industry reports, e.g., <http://www.renewableenergyaccess.com>. The silicon represents 6 – 10% of an installed system. The increases in prices of solar grade silicon are driven by the growing market demand for PV products in Europe, Japan and North America and the growing demand for silicon in other industries. Price pressure is not expected to be relaxed in the near term.

The solar companies also report 30% to 40% increases in prices of batteries from local suppliers, which reflect the 40% increase in lead commodity prices over 2004.

Also, increases in VAT (from 10% to 16% in January 2004) and import duties (a 5% duty on panels was reintroduced in mid-2003) have contributed to increased supply costs.

The transaction costs of handling, on average, smaller size systems were not cited as a cost push factor in discussions with the companies. The 40 Wp systems would have roughly the same handling and installation costs as would the 50Wp and 60 Wp systems which had the largest market share prior to the removal of the grant for those systems. Also, the business model for the 40 Wp systems and the customer profiles are similar to those of the companies prior to July 2004.

Responses to cost increases Under the competitive market conditions, companies report that they are not able to fully pass through to customers the supply cost. Certainly, companies confronting 20% increases in dollars in module costs have not been able to pass the through such levels of increase.

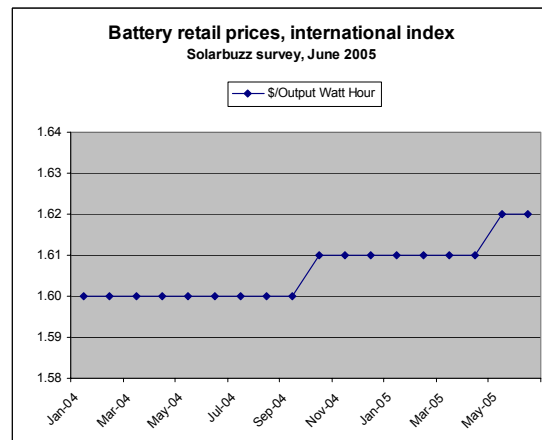
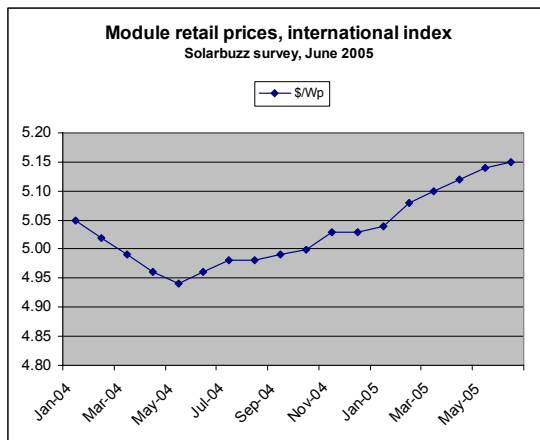
SHS per unit revenue (price + grant) increases, Apr 04 - Apr 05, \$				
Company	30 Wp	40 Wp	50 - 60 Wp	aver increase
X	1.8%	-2.6%	-5.4%	-2.1%
Y	14.3%	18.6%	10.9%	14.6%
Z	-3.4%	2.4%	-2.5%	-1.2%
aver. Increase	4.3%	6.1%	1.0%	3.8%

From interviews and the field visits, the measures being adopted by the companies to adjust, other than reducing margins, focus on seeking lower cost suppliers, improving working capital financing, mainly by attempting to reduce delays in disbursements of consumer loans and payments of government subsidies, and lowering distribution costs (e.g., moving to lower rent outlet locations, restricting inventory levels, holding back wage and commission increases) and accepting thinner margins. At least one company has adopted as a main strategy the practice of offering different choices and “solutions” to the customer, allowing the customer to build a system by adding lights or choosing a different size or quality of battery.

All the companies visited in the field reported low inventory levels. Most of the solar centers visited had few replacement components (e.g., bulbs, light fixtures); three of the 15

solar centres visited had no complete systems in stock. The depleted inventories reflect cash flow constraints, in some cases internal policies that have been put in place establishing that new stock is not sent to the field until payment has been received for earlier stock, and difficulties in sourcing panels due to the international supply demand imbalance

Internationally, the steep commodity type price increases for silicon and lead have not been fully reflected in retail price increases of PV modules or batteries. The most comprehensive, regular international survey of retail prices reports a 2% increase in retail module prices over January 2004 – June 2005) and a 1.25% in battery prices over the same period. These modest price increases reflect the difficulty of increasing prices in highly competitive markets, forcing companies to find other measures to maintain acceptable margins.



Profitability

Detailed data provided by a mid level company indicates gross margins of 20% with net profits on the order of 4% of sales. Other companies indicated gross margins in the 15% to 25% range. These numbers include the GEF grant as revenue and are before any profit tax.

All companies indicated that they are pricing to market, given the competition, rather than applying a fixed markup to supply costs. The result will be pressure on margins, as the companies will not be able to pass on all supply cost increases.

Profitability will vary greatly by company, given the wide range of business models and cost structures, with significant differences in supply costs, distribution costs and management overheads. From interviews, most of the companies find current profit margins with the grant to be marginally acceptable, with the more established firms experiencing larger margins in other operations.

A calculation based on information provided by the companies indicates that currently, for a mid-range company, gross profits are on the order of 24%, with net profits less than 12%

on sales. However, with the removal of the grant, and other conditions remaining unchanged, this key net margin falls to a negative amount.

Estimated profit margins, monthly, \$			
		w/grant	w/o grant
	unit sales	350	350
	unit price SLR	47,000	47,000
	GEF grant	70	0
	sales, value	182,673	158,173
	cost of goods	138,796	138,796
	est gross profit	43,877	19,377
	operating costs	9,784	9,784
	operating profit	34,093	9,593
	breakeven, units	78	177
	ST finance costs	8,750	7,829
	depreciation	2,083	2,083
	LT finance costs	2,000	2,000
	profit before taxes	21,260	-2,319
	gross profit	24%	12%
	net profit on sales	11.6%	-1.5%

Assumptions

	exchange rate		104
	supply cost panel, landed	\$/Wp	5.2
	average panel size	Wp	40
	BOS cost	\$	125
	Other "cost of goods" (commissions, installation, transport,etc)	\$	60

Finance costs and working capital cycle

Cost of borrowing for companies and consumers has remained relatively stable. The average weighted lending rate of the commercial banks declined from 15.7 to 14.8% over 2004, and continues in that range. The working capital cycle for the companies ranges from three to six months, with supplier terms usually covering the 30 to 60 days on goods.

For companies with the longer cycles, the reportedly sometimes three to four months from time of installation to receipt of full payment from the finance organization, usually SEEDS, is viewed as a major cost. This is a particular problem when the companies have installed the systems without collecting a down payment, as usually required by the finance organizations, and without having collected the preliminary finance information from the customer. This practice may work as a sales method, but it clearly contributes to the longer cash flow cycle. For a company with approximately 350 unit sales per month, a one month delay in clearing accounts receivables has a cost of approximately \$2,750, equivalent to approximately 11% of net profits for the month. For a larger company, the added financing costs would be proportionately larger.

Time taken is inclusive of the time taken by the company to collect the down payment from the client as well for which SEEDS can not be blamed.

Fixing the SHS without collecting the Down Payment and without having any agreed financing arrangement is the main problem in this regard.

The example calculation of the monthly working capital financing costs of a mid range company selling 350 SHS systems per month is below. The assumptions are the same as the example used in the section on profitability.

Working capital requirement and financing cost, monthly, \$			
Items	units	factor	w/ grant
Minimum cash	month operating costs	1.0	9,784
Accounts receivable	95% month sales	2.5	433,849
Inventory	month COG	2.0	235,592
Other current assets	unit	1,000	1,000
Total current assets			680,224
Accounts payable	month COG	1	117,796
Other current liabilities	operating costs	1	9,784
Total current liabilities			127,580
Working capital requirement			552,645
Monthly financing costs	monthly rate on Rs	1.6%	8,750

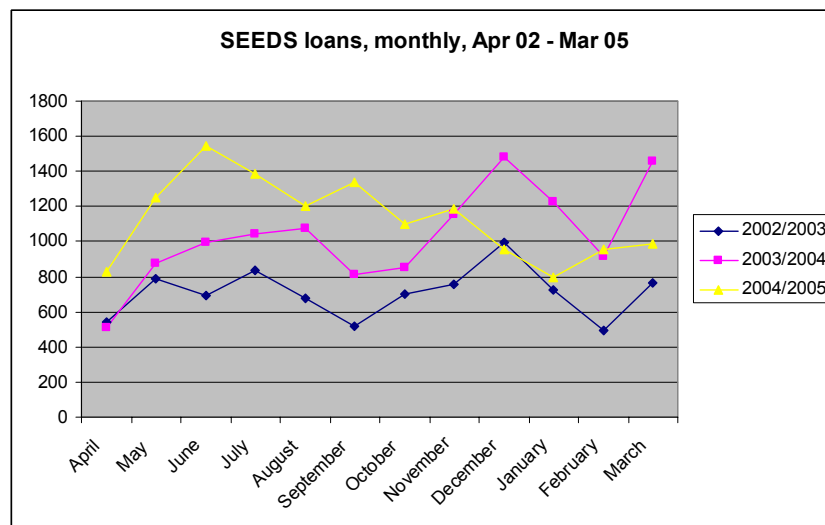
When the cash flow cycle is extended, possible short term steps for the companies include delaying payments to suppliers and delaying inventory restocking, both of which have been adopted by the solar companies.

The principal cash flow in for the solar companies has been the loan disbursements by SEEDS. Companies report that delays in disbursements reached as much as four months in

2003 – 2004. Currently, however, the disbursement times reportedly are in the range of six weeks to two months. (Note: the working capital estimate in the profitability estimate in this report assumes a 2.5 month period for clearing of receivables.) SEEDS, on the other hand, reports shorter disbursement times, with approvals within two weeks and disbursements within an additional two weeks to one month. SEEDS also reports that in many cases the documentation is not complete when first submitted, and secondly, that in a good number of cases the customer is not present when the SEEDS officer arrives to conduct the necessary appraisal prior to approving a loan, which then requires a further visit, extending the time period.

The sense, from discussions with the companies and SEEDS, is that currently the SEEDS disbursement periods are now considered reasonable, although the companies continue to press for faster disbursements and SEEDS continues to seek ways to shorten the processing period. The companies report that they are taking care to ensure the documentation is complete, SEEDS reports that it has streamlined its procedures over recent month.

The sense also is that disbursement delays may be caused by non solar company related factors, perhaps funding or other internal SEEDS issues, which are a signal, among others (recovery rate, on time repayment rate) that SEEDS solar portfolio may be vulnerable. As the below chart indicates, over the past three years, the levels of disbursements have varied significantly on a month to month basis.



The opening of a Sundaya unit in Sri Lanka, which was in its early stage during my May 2005, is expected to reduce import costs of those companies that have been importing finished components in less than container size lots. Perhaps most importantly, it is expected to contribute to reduced inventory holding costs. Sundaya, which is a major supplier to several of the companies of BOS components, is expected to assemble luminaries and possibly controllers in Sri Lanka and to operate a wholesale facility.

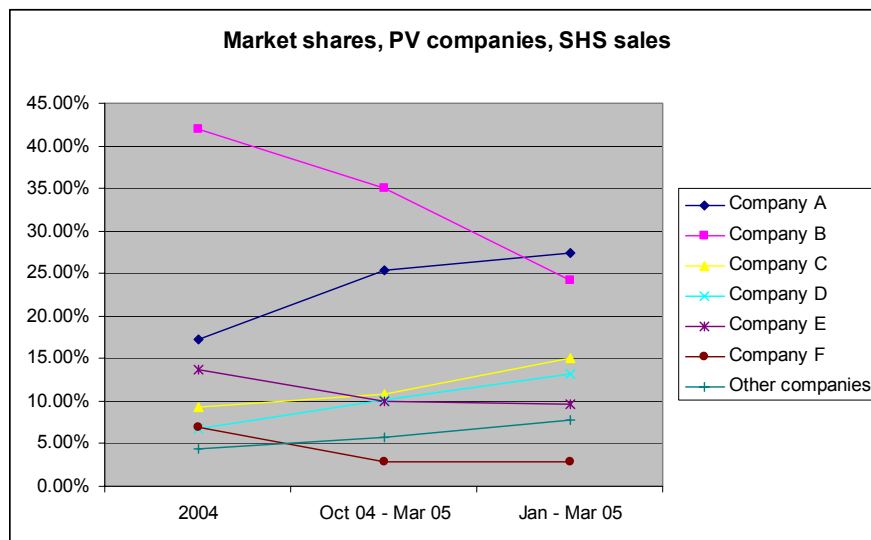
Competitive structure of sector

Two companies account for 55 -60% of SHS unit sales as of the end of the first quarter, 2005, three companies have 10 – 15% market share each, with the balance five companies together sharing 5 – 10% of the market.

This industry structure is dynamic, with movement in rankings among the top four firms over the past year and with new firms entering and posing a competitive threat in selected market areas.

Solar company market share ranking, by unit sales

Company	Jan –Mar 05	Oct 04 – Mar 05	Year 2004
A	1	2	2
B	2	1	1
C	3	3	4
D	5	5	3
E	4	4	6
F	6	6	5

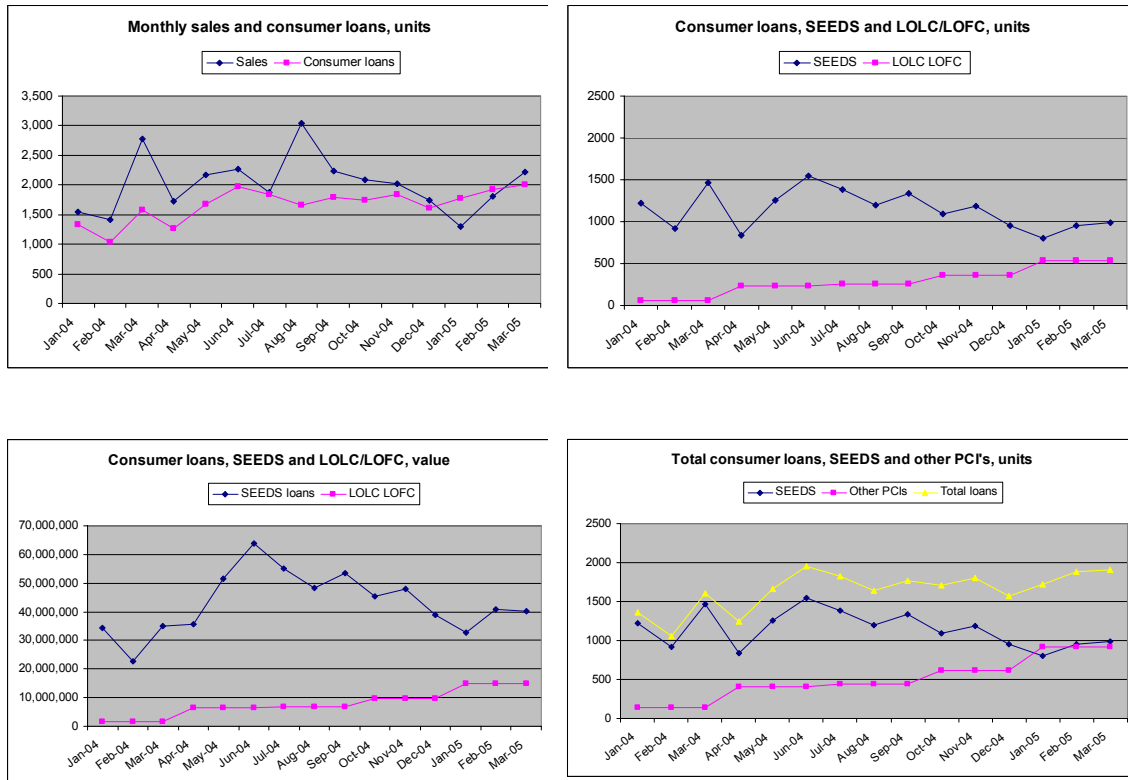


Consumer finance

Consumer finance for SHS purchases has also become more competitive, with additional participating credit institutions (PCI) providers and with a decline in the market share of the main provider.

SEEDS continues to be the main provider of SHS loans, averaging approximately 1,200 loans per month over 2004. However, levels over the over the six months ending March 2005 were on the order of 900 – 1000 per month.

Based on monthly data on loans and value of loans from SEEDS, and on quarterly data from LOLC LOFC, there has been a gradual loss of market share by SEEDS. Estimates of total consumer loans by all PCI's indicate that SEEDS' market share, which was in 2003 (December 2003 supervision aide memoire) on the order of 90%, had by March 2005 declined to approximately 50%.



The other PCI consumer finance providers report intentions to continue in the market for SHS loans. At least one PCI that had halted new advances due to weak performance is now entering with a revised business model. Based on interviews and the reviews of business plans, the motivations differ, from the perceived profitability of the SHS loan market to the development of opportunities for cross marketing other financial products to this market segment. At least one of the PCI's is re-entering the market after the poor performance of initial efforts, with a revised business plan.

Several of the solar companies are considering developing programs of vendor credit, both to capture additional profits and to ensure financing for their customers.

Consumer finance constraint

SEEDS remains the only PCI with a strategy and capability in terms of systems and outreach, in the near term, to be a major provider of SHS loans. It is the only PCI for which SHS loans are major part of their organization's overall business strategy. In the near term,

the growth and sustainability of the SHS sector in Sri Lanka will continue to be linked to the performance of SEEDS.

The entry and growth of other providers, who now have close to a 50% market share of consumer solar loans, is a positive sign. Based on discussions with LOLC/LOFC, Ceylinco and Sanasa, it is clear that while several of the other providers will aggressively target particular SHS niches in terms of companies and locations, at least in the near term they will be limited by their appetite for risk, corporate strategies and other opportunities.

Meanwhile, SEEDS confronts growth constraints, notwithstanding that it has indicated that it would aim to advance 18,000 to 20,000 solar loans per year.

- First quarter loans in 2005 were down 24% from the same period level in 2004, which only in small part reflects tsunami impacts.
- It appears to continue to operate a largely paper based system.
- SEEDS solar loans are on average larger than its other loans, but the performance is weak
- The level of recoveries of solar loans now at a marginally acceptable level for SEEDS, reportedly 92%, and in several areas the rates are below 80%.
- On-time payments of solar loan installment reportedly are less than 50%. SEEDS informs that this number is incorrect, but has not yet provided the corrected data; in any event, it is clear that the percentage of payments made on-time is relatively low; for comparison, in BRI's microfinance operation in Indonesia, on time repayments fell from 98.5% to 97.5% during the 1997 – 99 financial crisis. Similarly, in Colombia, during the worst of their financial crisis in late 1990's, on-time repayment rates of the best performing MFIs stayed above 97%. In any event, SEEDS informs that the on-time repayment rates and total recovery rates for the solar loans are lower than for their other loans.

Installment payments not collected on time incur additional collection costs, with multiple visits to customer homes. Each payment requires a collection visit by a SEEDS representative to the household, and each missed payment requires at least one repeat visit. SEEDS reports that the reasons for the weak on-time payment performance are many, ranging from system performance, including not being in line with expectations, to the advent of the grid, with a broad group of technical performance issues being the main cause.

The AC Nielson consumer finance study found that customers who had purchased 35 – 40 Wp systems in the three survey areas over January – August 2004 had on average missed between 1.7 and 1.9 payments by April 2005. The 450 customers surveyed were broken down into nine groups; in the best performing group, 90% of the customers had not missed a single payment; in the worst performing group, 55% of the customers had missed at least one payment. In most cases, the surveyors were able to verify the responses against the actual loan books of the customers.

Significant investments have been made by RERED and others in SEEDS capacity building and continue to be made with RERED support for systems development. SEEDS is one of the main, if not the main success story internationally of solar consumer lending. Nonetheless, the decline in SEEDS advances for SHS loans, both in value and units, that began during 2004, the reported delays in disbursements during some periods over 2003 – 2004, and the relatively weak performance of the solar loan portfolio when compared to SEEDS other loans, are indications that future expansion of solar lending may be limited.

The SHS consumer finance providers report very limited interest in financing small systems. Partly this is a matter of unit transaction costs, with only SEEDS geared or interested to finance small loans (say, less than \$250), and with SEEDS not certain that it is actually interested to offer small solar loans, as it struggles to shore up its current solar loan portfolio. Also, this is a matter of the perception that the customers who would be seeking small loans would have a higher risk profile and offer fewer future opportunities for the cross marketing of other financing products. In the medium and longer run this positioning may shift, as more financial institutions target lower incomer rural consumers, but over the coming several years there will be no significant interest by PCI's in advancing small solar loans.

Profitability of consumer finance

The PCIs have different legal status and different sources and costs of funds other than the RERED refinance line. They have different business models for SHS consumer financing, with some using a loan construct while other use a finance leasing approach. They have different requirements for collateral and creditworthiness appraisals, different collection methods and different agreements with the solar companies.

The one PCI experienced in solar consumer financing that provided detailed information on net profit calculations over three years indicates a net profit on interest income earned in the range of 19% - 26% over the period, after accounting for interest expense, other expenses, and provisions, from SHS advances of average size Rs 50,000. This PCI is experienced in solar lending and its projections are taken as reasonably based. An implication is that financing solar consumers may be, with a viable business model, a more profitable venture than selling SHS.

The accounts of SEEDS for its solar portfolio were not available, although the assumption is that net profit margins on interest would be lower given the indications of problems with recoveries in some locations and with the need for additional effort on collections of solar loans as compared with other loans in its portfolio.

A second major PCI consumer finance provider reported that 50% of the payment schedules of its 4,700 customers had to be rescheduled, with waiving of interest payments over interim periods, an additional 7% of the accounts were closed due to non-payment, with the major reason reportedly being system performance, related to either unrealistic expectations of service levels at time of purchase or poor aftersales service in cases of problems, with a smaller group being closed due to advent of the grid and inability to pay.

Potentially more problematic for the future, the credit risk exposure to the PCI's is largely underwritten by buyback agreements with the solar companies, under which the companies agree to pay the PCI an agreed amount to cover the loss;. Under these arrangements, the company takes ownership of the system, removes it from the household and, according to the companies, refurbish and resell the main components. The strength of this underwriting is based on the capabilities of the solar companies to honor their buyback commitments and the strength of the legal documents themselves. These documents appear not to be standardized, and the terms apparently differ from company to company and PCI to PCI.

Currently, according to the information from discussions with the companies and PCI's, the level of defaults is manageable.

Technical and aftersales service performance issues

There are a number of reports of problems with the technical performance of the systems and the timeliness and adequacy of aftersales service. For instance, SEEDS reports that a survey of defaulters in 2002 found that 67% of customers were not satisfied and that its field officers report that this pattern continues.. These contribute to reports of low or moderate levels of customer satisfaction. As indicated above, at least several PCI's have concluded that weak performance, related to either wrong expectations, which may in some cases be linked to aggressive selling of the product, or weak aftersales service.

In discussions, several of the PCI's reported the view that customer loan repayment problems continue to be linked to weak technical performance of the systems, with "technical performance" interpreted broadly, along the lines of the areas covered in the AC Nielson survey.

Most recently, the AC Nielson survey of 450 customers, representing a valid sample of a universe of 3,437 customers in the survey areas, found low customer satisfaction levels on the technical performance of the SHS in all three of the survey areas. The survey aimed at gathering customer satisfaction with performance through questions addressing the following seven areas:

- The number of electrical appliances that are usable
- Stability of the electricity
- Quality of the electricity
- Breakdowns
- The time spent by the company for repairs
- Provision of information on system related and usage
- Input given on technological issues

On a scale of 1 to 5, with 4 being considered commercially a viable level of customer satisfaction, the SHS systems in the survey areas averaged scores of less than 3 and less.

**Finding regarding customer satisfaction on technical aspects
from AC Nielson survey of Sri Lanka SHS customers, April, 2005**

In the Sri Lankan context, on a 5 point scale, 4.00 or above is the average that is given to the most successful product or service. In Ampara, the customers are most dissatisfied when it comes to the technical aspects 3.69 is the maximum mean score given and that to on attributes that are not very important of the customer. The possible reasons could be over expectation, either created by the Vendors or the influencers or the customers them selves. Furthermore, the technical capability may not be sufficient for their requirement. Hence the reasons for such a low satisfaction level have to be explored in the future studies as it does have important bearing on the Solar Industry Growth analysis.

Area	35-40 Wp purchased Jan – June 2004	35-40 Wp purchased July – Aug 2004	50 - 60 Wp purchased Jan – Apr 2004
Kurunegala	2.4	2.6	2.6
Ratnapura	2.9	3.0	3.0
Ampara	2.4	2.4	2.4

CEB grid extensions in rural areas

CEB continues, with funding from Chinese and ADB sources, and reportedly additionally from US sources in the near future, to carry out grid extensions in rural areas. However, this appears to pose no serious constraint to continued growth of the market for PV systems as, according to CEB plans, 20% of households will not be connected to the grid even after CEB targets are met in 2010. CEB considers the final 15% to 20% of the households to be uneconomic for grid connections, even with a low IRR hurdle rate of 10%.

In the absence of significant subsidies, CEB's appetite for rural electrification will be extremely limited. At present, CEB reports that the average tariff paid by rural consumers is Rs 3 – 4, compared with Rs 6 – 7 for urban customers, with most rural customers consuming less than 30 units, and thus all at the lowest band rate of Rs 3. The average supply cost is cited as Rs 8.0.

CEB estimates that in 2006 there will be 1.5 million unelectrified Sri Lankan households. At present, funding is agreed or in the pipeline for two on-going RE projects (total of 1,056 "schemes"), with a third and fourth project as possibilities, adding another 450 schemes. This three to four years of investment would represent on the order of 90,000 to 180,000 households, assuming, following a review of the Deepaloka schemes, that each scheme covered 60 to 120 households. This level of funding, all of it donor funded, would be an achievement for CEB, and there is no expectation that it would continue to be repeated. This level would be equivalent to, say, 10% of the estimated 2006 unelectrified households.

Additionally there are issues of CEB's financial capability to implement its current plans.

The issue of grid based rural electrification reducing the market for SHS is more one of timing and deployment than scale. There appear to be no reliable methods established for CEB to inform the market in a timely manner of the rural areas that will be electrified in even the near term, thus causing situations in which customers purchase SHS units only to be grid connected within a short period. The AU and at least some of the companies and PCI's have access to the Deepaloka information, with some details of individual rural electrification project. The information does not cover scheduling, and in many cases the inclusion in such a 'plan' is no assurance of a community's being connected to the grid. In short, while 20% of the households are not expected to be electrified, the solar companies have no way of knowing with certainty the communities that will not be electrified. Several report using rough rules of thumb (e.g., more than 5 km from the present grid) in selecting market areas, but the political inputs into the scheduling of rural electrification often makes ineffective the use of such decision guidelines. According to reports from the solar companies and the PCI's, this has not reached by a level that represents a serious problem.

Government subsidy schemes

The government program of subsidies for SHS sales, now operating in Sabaragamuwa, North East and Uva Provinces, with the AU responsible for its administration, has increased affordability and thus contributes significantly to sales levels. The subsidy, initially Rs 10,000 per unit, since September 2004, Rs 7,500 per unit, is treated as a discount off the quoted retail price of the system. The discounted amount is paid to the companies by the AU following independent verification of the selling price and the domicile of the customer, using the same procedure and documentation – the Customer Acceptance Receipt – as for the GEF grant. These transparent and efficient administrative arrangements represent current international best practice as a mechanism for channeling official subsidies for rural SHS sales.

The scheme has had some difficulties, for instance in slow release of government funding and in the limited availability of the subsidy funds. Also, there is a concern on the part of provincial level officials that they are not now directly involved in the administration, thus lessening their capability to assist with supervision. From discussions, the companies are well informed of the arrangements for the government subsidies, and report no problems with the disbursement times achieved by the AU once funding has been released by government.

From discussions with the companies, it is clear that the solar companies emphasize the market areas with subsidies for their promotional and distribution activities. The PCI's also report targeting their solar lending to provinces with the government subsidies. Although provincial wise breakdowns of sales over the pre-subsidy and post-subsidy periods were not available for review, it would appear certain, based on the information from the companies and the PCI's that the marketing and distribution efforts and sales are following the subsidies.

Business environment

The solar companies in Sri Lanka operate in a business environment that, in contrast with markets in many other countries that have large potential rural SHS markets, has a number of features that are unusually positive. These include:

- *High awareness level* This is a result of the more than 20 years of private sector promotion of solar in Sri Lanka, and particularly the impacts of the support of the Energy for Services Delivery project, which was the precursor to the RERED project, and the RERED since 1997.
- *Good contract enforcement* Legal arrangements and informal practices have made system removals fairly routine in cases of non-payment
- *Theft of panels is not a problem.* In a number of countries, security of panels in remote areas is a market constraint, often cited by solar companies as constraining sales.
- *Absence of market distorting government programs* for SHS. Sri Lanka is relatively unusual in that there are no existing or recent government or donor schemes that distort PV market development. In many other countries, schemes with non-market based distribution, with large subsidy levels and a single or limited number of government designated suppliers, limit sustainable market development opportunities.
- *Openness to competition* There are no significant policy, regulator, legal or informal barriers to entry for companies, local or foreign, into the Sri Lanka solar market.

There are of course several business environment factors which while not unusual do pose issues for investment in Sri Lanka. These include security in a number of areas, particularly the north and east, and the potential for sharp currency depreciation.

RISKS TO SUSTAINED GROWTH

Consumer financing

The SHS sales will not grow faster than the growth in availability of finance for customer purchases. SEEDS, which will continue to be the main source of financing, reports that it is interested to increase from 30% – 35% to 35% - 40% the share of solar loans in its total portfolio. Based on plans and preparations being made, LOLC, LAFC and Ceylinco Leasing are expected to increase or restart their SHS consumer financing in the near term, with each targeting on the order of 250 loans per month.

However, as described earlier, there are warning signals regarding SEEDS current capabilities to support continued sector growth. Total recoveries of solar loans and on-time

repayment rates are at marginally acceptable levels for SEEDS. First quarter 2005 solar loans are down 24% from the same period 2004, the strength of the underwriting of the loans through buyback guarantees is a possible issue and the solar portfolio loans are performing less well than SEEDS' other loans..

The increase in minimum capital requirements, five fold, from RS 500 million to Rs. 2.5 billion for banks, by 2007, and the increases in minimum capital adequacy ratio, from 9% to 10% in 2003, are designed to strengthen the banking system. They will likely be accompanied by tightening of lending requirements. This will make it unlikely that SEEDS would be able to reach bank status. The absence of an MFI law and regulatory framework are also constraints. More stringent capital requirements and other measures to strengthen the financial sector may also limit the growth of SHS lending by other finance organizations.

Planned removal of GEF grant for systems larger than 21 Wp – 40 Wp systems

The removal of the GEF grant for the 21Wp – 40 Wp range of products at the end of 2005 would seriously impact sales. The companies and the staff in the solar centers report only minimal market interest in systems with less than four lights. Also, the companies do not currently offer products in the 20 Wp and lower range; several have attempted to introduce 18Wp and 14 Wp systems, but following weak response, do not now do so.

There is no significant interest or capability on the part of the PCI's to finance small solar loans.

In the absence of the GEF grant for the 21 Wp to 40 Wp capacity systems, total sales would decline. How sharply of course is the question. Estimated sales of systems in the 41 Wp to 60 Wp range dropped from 5,621 units in the first six months of 2004 to 2,592 in the second half of the year. Even taking into account that the January – June 2004 sales level would have been affected somewhat by the companies anticipating the removal of the grant at mid-year, the decline was sharp. In that case, however, the companies had a product range, especially at 40 Wp, that could meet the needs of a significant block of customers and for which PCI's continued to be interested in financing customers, as indicated by the relatively small drop in total unit sales (7.2%) in first quarter 2005.

Possible removal of government subsidy

The removal of the government subsidy of Rs 7,500 per unit in three provinces would impact sales. My discussions did not include meetings with Finance or other officials on this issue.

Technical performance capabilities

With the growth in the sector the supply of technically trained staff is now relatively small in relation to units sold and cumulative units installed, as compared with the sector at the start of ESD. With tighter margins, as competition increases and companies are not able to pass through supply price increases, there will be a tendency for companies to invest less in training in technical aspects and in customer care, preferring in many cases to poach already trained staff from other firms.

The number of systems requiring battery replacements will, over 2005, reach a monthly average of, say, 1,000 customers, and will continue to grow. The period of battery replacement is often a critical one for ensuring longer term system sustainability, and thus critical to sustaining market confidence in the product technology.

GROWTH REQUIREMENTS AND RECOMMENDATIONS

Intensify capacity building for SHS consumer finance, especially SEEDS

Reinforcing and strengthening consumer finance facilities is a main priority for the sector. Within that, the main priority would be to strengthen SEEDS. The MIS, which is expected to be deployed toward the end of 2005, will assist SEEDS to migrate from being a mainly manually based operation. However, that will not be sufficient. Broader strengthening of systems, staff capabilities, procedures and policies will be necessary to assist SEEDS to grow strongly. SEEDS may receive assistance in this from an international bank specialized in microfinance. A possible concern is that, with best practice advice, SEEDS may limit its PV portfolio and make more stringent its credit policies and collection procedures.

A significant capacity building and technical assistance (TACB) effort should be designed on an urgent basis to assist SEEDS, possibly including supporting the linkage with an established bank or with a bank management firm experienced in microfinance operations. The aim would be to strengthen SEEDS as a sustainable, growing microfinance operation that would include a significant portfolio of solar loans.

SEEDS interest in such an effort has not been discussed, although reports that they are in discussions with an Italian bank, a microfinance specialist, are indicative of an interest in TACB. A next step that might be supported by RERED would be an assessment, carried out jointly by SEEDS and a microfinance specialist at the international best practice level, of the detailed requirements and viable TACB strategies and mechanisms.

A secondary effort would be to strengthen the capabilities of other providers and to continue to recruit additional solar consumer loan providers.

Continue GEF grants for systems up to 40 Wp, and up to 60 Wp if resources permit, through the end of RERED

It is important to continue with GEF grants over a wide product range through the end of RERED. Without a grant link, the project will have a much reduced impact on the sector, including on its technical levels and consumer practices, much less capability to assist address remaining barriers in consumer finance and technical capacities, and reduced capability to assist leverage a transition to a sustainable subsidy mechanism in the future.

Removing the grant for the last market slab (21 – 40 Wp) with demonstrated market demand would, if implemented, likely have the effect of removing the AU from a significant role in monitoring sales, quality and sector growth. Continuing across a full (up to 60 Wp) range would be a more effective exit strategy for the GEF support.

Concerns regarding equity and a smooth transition to a non-GEF grant, post-project context can be addressed by scaling down, rather than removing, the grant at the end of 2005. An option to discuss would be lowering the grant to \$60 at the end of 2005 and then \$40 at the end of 2006, bringing it in line with the grant established for the small systems. With this phasing, structure and level, the grant would be:

- (i) progressive;
- (ii) comprise a low proportion of total revenue per unit, less than 10% for the units in a 40Wp to 60 Wp range, and thus position the companies to transition to the post-project context;
- (iii) maintain the leverage of the AU to ensure compliance with project requirements;
- (iv) maintain the AU's access to sales and performance information flows that would be necessary to facilitate the AU's effective programming and channeling of capacity building support for the consumer finance providers and the solar companies; and,
- (v) serve as the basis of a platform for the AU's continued role in developing support for a sustainable subsidy mechanism.

This type of phasing may present administrative challenges. Nonetheless, these should be resolved, as it will be critical to continue the link with the sector and the companies through an effective mechanism through the end of the project if the project is to achieve its full potential contribution to sector sustainability.

The scaling and phasing strategy would need to be calibrated taking into account the balance GEF grant funds available. In any event, maintaining grants for systems up to 40 Wp capacity will be critical.

Continue technical capacity building for solar companies

In most projects, capacity building and technical assistance is front loaded, developing the implementation capacities to meet project objectives. In the market development RERED project, the rapid growth of the sector has tended to outstrip the investments in capacity

building by the companies, many of which have been supported by the project. Continuing reports of low customer satisfaction with technical performance are an indicator that additional capacity building is needed.

An effort to support the development of technical and aftersales service capacities, particularly at the lower and middle ranges of company staff, is recommended.

Develop an interim subsidy mechanism as a step towards a sustainable mechanism

Assuming that government will continue to be interested in providing a level of subsidy for off-grid electrification, a mechanism would need to be established at least on an interim basis, pending the establishment of a more institutionalized arrangement (e.g., RE Fund, RE Agency). The current subsidy for rural grid electrification has been quoted by sector professionals as Rs 40,000 per household, which, based on international experience, is likely a considerable underestimate.

One option, clearly workable, would be to continue with the DFCC performing the role that it does today. This has proven to be transparent and objective, and would be warranted given that a significant quantum of subsidies would be handled.

A second option would be to transmit the subsidy through the finance organizations (SEEDS, others), as has been done with some tsunami relief funds. The finance organizations verify sales and installations as part of their normal operations and have full documentation on record. A problem with this approach is that it would not cover cash sales, although there could be simple work arounds for that. The strategic problem would be that it would divert some of SEEDS capacities and strategic management concerns from the mission of becoming a larger, growing, efficient microfinance organization.

In either case, there could be arrangements with the NERD center, or other independent body, to provide due diligence on product standards and certifications.

A major effort should be made with RERED support to develop an interim mechanism for official subsidies in the post-RERED period.

Sector performance information The AU's capability to support this effort to develop a sustainable subsidy mechanism will depend in part on the quality, depth and timeliness of its information and its capabilities to make this available to decision makers. At the moment, the performance information provided by the solar companies and PCI's is fairly limited; for instance, for this assessment, only partial information on sales and loans by areas, market segments and time periods was available. The AU is in a position to seek significant information from the companies and PCI's, information that is available and thus would present few additional transaction costs to provide. Concerns of confidentiality can be handled on a professional basis. Information that is currently available can be more utilized. My understanding is that the software developed for the MIS which has the CAR data does not permit manipulation by AU staff to readily prepare tables and conduct analyses. However, from discussions with the AU and the AC Nielson team, it appears that

with some design effort the data can be exported in Excel format and secondly that it can be imported into SPSS, which would allow fairly extensive use for analysis.

A useful next step would be to conduct an assessment with a view to the introduction of revised reporting requirements on the PCI's and, particularly, the solar companies and, secondly, information production and analysis activities by the AU. The introduction of such information changes will be a key measure to ensure an adequate platform for promoting a sustainable subsidy mechanism post-RERED. Also, availability of quality, extensive information will be essential in discussions of related policy issues, for instance the application of VAT for off-grid SHS while grid rural customers do not pay VAT.