



# Sustainable Energy: Less Poverty, More Profits

Highlights of energy access,  
renewable energies and  
energy efficiency in Asia

Examples  
and lessons from  
programs of the  
World Bank  
Group



## **Sustainable Energy: Less Poverty, More Profits**

Is access to modern energy a human right? Though few say so openly, who would deny it?

How does energy meet basic needs and provide the spark for so much human progress? How can it do so more efficiently and equitably than now? How can it do so more sustainably, in both production and consumption?

How can modern renewable energy conquer the marketplace – especially in the bare bazaar of the poor – in the same way it has won the hearts of environmentalists and the minds of many global planners?

How does increasing efficiency stem the loss of our precious energy? Just how deep are the limits to waste?

Some answers, and pointers to many more, lie within this book and its accompanying DVD, prepared for the energy professional, the development professional, the financial professional and, above all, the decision maker.

From the most marginal of modern villages to the maelstroms of modern cities, from the most humble of livelihoods to the most refined research, and from the most frugal of consumers to the most calculating of investors, these pages let the energy stakeholders talk and tell their best practices.

Consumers, producers, suppliers, designers, manufacturers, retailers, planners, financiers, promoters.

They are the energy behind Access.  
Renewables and Efficiency.

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Project coordinator  
Antonie de Wilde

Editor  
Paul Osborn

Design  
Bernard Favre

Research  
Naureen Fatema, Alexander Potter, Joep Verhagen and Luo Xinlian.

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## Foreword

In May 2004, Mr. James D. Wolfensohn, President of the World Bank, spoke of the commitment of the World Bank to *'nothing less of a revolution at the rate and scale with which sustainable clean energy services are expanded to those who lack them and the new dimension in global partnerships that is needed to bridge the modern energy divide'*. His hope was focused on that revolution continuing to take hold and spread, at remarkable speed.

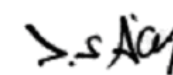
The expansion of any field of engagement, as in all revolutions worthy of their name, depends on many variables and on one constant factor: information and communication.

When we communicate and inform, we know that the best ideas and best practices are in part genuinely innovative, and in part they repeat and replicate the achievements of others.

This is the case in the crucial fields of renewable energy and energy efficiency, on which the World Bank Group is committed to raising its investments by 20% annually over the next five years. Here, the promotion of best practices will be essential to maintaining high quality and having a wide outreach.

Our achievements in World Bank projects in these fields, with key inputs from our clients and with support from our Energy Trust Funds donors, are remarkable – revolutionary indeed. We are seeing how alternative and sustainable energy is playing a key role in reducing poverty and in encouraging profitable endeavour. We are seeing too how catalytic roles in information sharing in project preparation and implementation are working within the World Bank Group.

The examples and lessons from the World Bank Group, described in this book and its accompanying video, are being disseminated to encourage others to close the energy divide. I commend it to you as a source of successful ideas and experiences.



Jamal Saghir  
Director, Energy and Water  
Chair, Energy and Mining Sector Board



# Sustainable Energy

And so here you stand as a decision maker. The question you are asking yourself is 'how'? Not if, not why, but how? How can I mobilize and bring together all the forces of energy supply, energy delivery, producers, consumers, public funders and private capital? The professionals from development, energy and finance? How can I cover their risks, and meet the public needs? Decisions to be made, to be followed through.

This book is about the 'able' in sustainable energy. It is about the 'can do', describing clearly the choices taken by decision makers in various parts of East and South Asia on how to improve access to energy, on how to give more prominence to renewable energy and how to get maximum energy efficiency out of existing systems.

Everywhere, each challenge has its unique features and it also shares many similarities with the challenges facing other decision makers.

Extending energy services to people, households, public services and businesses not yet on the grid is so much more easily said than done. There are many good reasons why the grid has not reached them – distance, geography, time, priorities, costs. It is not, normally, a question of will. It is question of being able.

And extending those services whilst squeezing more efficiency out of them, and adopting new sources of energy at the same time, requires the skills of a juggler. The new forms of energy are subject to new variables for planners and managers, such as wind frequency, rainfall patterns and solar radiation. They offer new possibilities, for clean and decentralized production of electricity, often on a small-scale. What re-training can help energy professionals, schooled in centralized production and distribution to adapt to a scenario where generation and delivery are separate and decentralized?

New possibilities bring new challenges – how can they be meshed into and integrated

**“the ecological imperatives are given”**



with existing services, in terms of feeding in power, of safety and standards, and of maintenance and local management? How, for example in a

rural context, can regional authorities change regulations, and enact new ones, for satisfying private producers of electricity of adequate income from excess power supplied to the grid. Or how, in an urban context, can environmentally aware consumers buy green energy and help finance its expansion?

And where can private funders and private banks, who are now increasingly convinced of the long-term profitability of renewable energies, find the guarantees that their investment will have the due returns? The frameworks which can offer such guarantees, most notably the Kyoto Protocol, offer a scant period, with closure less than a decade away.

This book provides some answers to the questions of how to enlarge the field of engagement of sustainable energy, as the foreword puts it. For the energy decision maker, some of these answers will come, in effect, from other decision makers. That is their strength.

**“the financial attractions deserve wider currency”**

## “the returns on investment need time to grow”

This book is therefore rooted in the daily realities of an energy decision maker, and of her or his professional colleagues in development and finance.

Daily realities like walking into the offices of an Energy Management Company in downtown Shanghai in China where engineers are planning their monthly rounds of visits to monitor the performance of the equipment they have installed in clients' air-conditioning or power supply systems. Their company's income depends on an agreed share of the savings made by their client on their energy bills. Their challenge is in being able to find refinancing for the investment they have made in their clients, from the private financial sector.

Or daily realities like walking into the buzzing front office of one of Bangladesh's 67 Palli Bidyut Samaties – rural electricity cooperatives – in the town of Tangail, where the score of women in the finance department are preparing to computerize the records of 44,000 members, remarkably faithful members. In the Tangail PBS, in the last three years, bill collection rates have fluctuated between 99% and 101% punctuality – early payment is rewarded by small awards of energy-saving lamps. Now if every electricity supplier could boast such a collection rate, what a difference that would make!



This is sustainable energy in practice. The ecological, social and human imperatives of sustainable energy are givens – though we should take care to not take them for granted. The financial attractions, some of them catalogued here, are also known givens, though they deserve wider currency. Now there is a clear mix required of:

- providing access to those without, on a affordable and profitable basis
- favouring renewable energies through commercialization and reliable standards
- maximising energy efficiency in both production and consumption

What matters now is the ability to enact sustainable energy, and this requires sharing knowledge of what is possible, and expanding those possibilities.

And so the examples and lessons in this publication are about the mainstreaming of sustainable energy, by adding to the tool box of every concerned decision maker. ■

# Country examples

# A good business proposition, first and foremost

When the renewable energy sector is confident and not constrained, business opportunities will grow fast. In India, it's become a simple equation: lessen the loads on the sector, and the sector will increase its load of offerings for producers and users. It really is Win-Win.

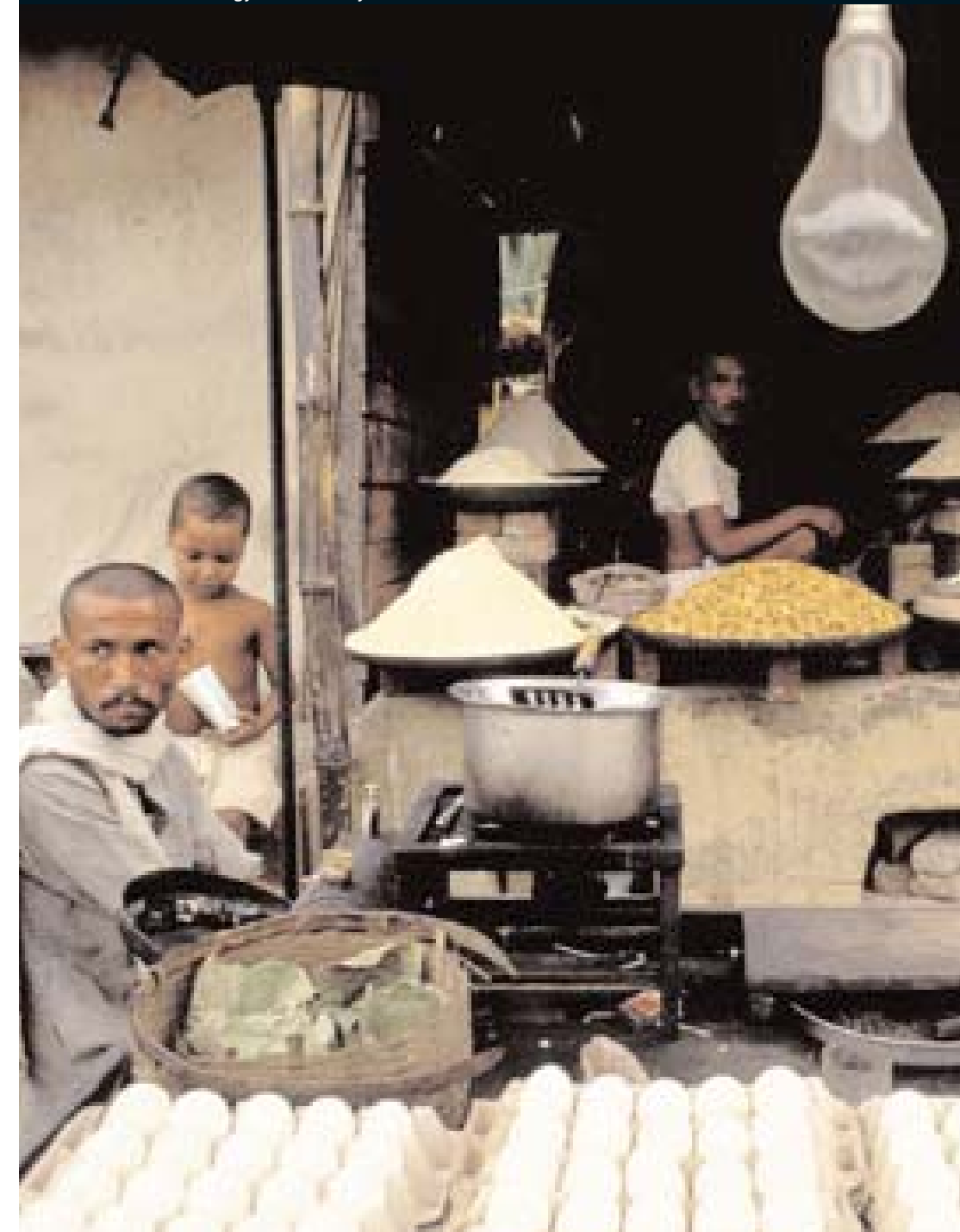


**H**ow often have you noticed how the privatization and public-private-partnerships have changed our languages, with new words, or new meanings to old words? In the world of energy, terms like 'wheeling', 'banking' and 'feed-in' are now part of our verbal mainstream, reflecting how these practices are firmly in the industry's tool box.

The renewable energy scene in India is exemplary of this change, its own amazing dynamic having been unleashed since the liberalization of the national energy market in the early 1990s. The depth and scope, both highly promising, of the attention paid to renewable energy is reflected in the statal India Renewable Energy Development Agency (IREDA). The World Bank made one of its largest ever loans in the field of renewables to IREDA under the Indian Renewable Energy Development Project, and has helped the agency to an important position in developing market opportunities for the private sector. With a facilitating role played by ASTAE, it has accompanied IREDA along a long and fulfilling road, milestoned with adjustments to the needs of the private sector and to the growing involvement of the financial sector in the renewable energy market.

### Go with the blow

The national map of renewable energy in India is well-dotted with projects underway. The resources are enormous, even if, as elsewhere, they are not yet fully mapped. And the imperatives are high, given India's high position in the league of nations with emissions of carbon dioxide from energy consumption growing fast per capita, and





expected to have increased six-fold between 1985 and 2025.

It is in the south of the country that the density of renewable energy activity appears to be highest – though, truth could be, dots on maps may deceive the eyes. In any case, if progress is indeed marked by the interplay between the public and private sectors, it is in the south-eastern state of Tamil Nadu that the superlatives start to flow, or blow, the most. Tamil Nadu is the Number 1 state in India, in renewable energy production, especially from wind.

The prime factor is natural: the terrain and wind regime are extremely favourable. At India's



**“wind provides 27% of Tamil Nadu's capacity”**

operators, they almost never cease to underline the crucial nature of such data in their decisions. After initial official reluctance, a demonstration site was set up followed by wind farms with an installed capacity of 19MW in 8 sites. That sparked off a migration of investors into commercial windfarms. By the end of September 2004, the state had a total of 1,639 MW, having added 277MW in the last six months. This amounts to almost 27% of the state's total installed capacity, from all sources – which, as energy professionals love to point out, is not synonymous with the share of energy actually generated from wind sources. But it's impressive none the less.



southern tip, the monsoons blow from the south-west and the north-east. The state's Renewable Energy Development agency claims that this makes for a plant load factor (PLF) of 25%, whereas the PLF in other states is lower, usually around 21%. The agency undertook detailed wind resource assessment studies, including a series on 67 sites in 1986 and came up with positive data on 41 of them. These studies, more latterly, have been assisted by wind radar data captured from satellites, through the intermediary of an ASTAE partner, Winrock International. In many a conversation with windfarm

*Textiles Made in India by wind power*

The second factor comes from man-made measures. Legislation has enabled private producers to become leading players in Tamil Nadu power supply, both for captive energy (for own consumption, such as in a textile factory generating its own electricity) and with wind farms for feeding in to the grid. This latter process requires not only laws that allow private production, but laws and quality procedures for feeding in and selling energy. This involves 'wheeling' privately-produced electricity over the grid to your factory. The electricity supply company imposes a service charge for 'wheeling', and another for

'banking' the electricity whilst on the grid. These charges are part and parcel of 'private purchase agreements' (PPAs) between private producers and the public utility company, and their introduction was greatly facilitated by the new national Electricity Act adopted in 2003. Their potential has suffered from a lack of agreement on tariffs.

In Tamil Nadu, wheeling and banking charges have been raised from 2% each to 5%. This has not diminished the fervour of private producers, even though it has eaten into their



income. Other measures are more supportive: IREDA itself advances loans of up to 70% of total project cost, for seven to ten years, at up to 10.5%. Alternatively, the Small Industries Development Bank Of India (SIDBI) can provide loans up to

### The bankers' delight

If that most cautious of human breeds, the bankers, had to nominate a Champion for Rewarding and Renewable Repeatable Investments, they could do



everyone a favour and choose S Chandrasekhar, managing director of the Bhoruka Power Corporation in Bangalore in the state of Karnataka.

“When we first went to IREDA for a loan, just as many people did, their rate of interest was 16%. But no other bank would look at me then and so 15% or 16% was ok. The attraction was the customs and excise duty benefits available on imported equipment. But in the last three years,

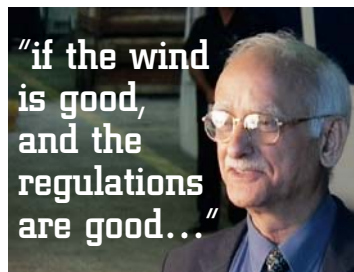
microfinance has become the order of the day, and the banking sector has opened up with interest rates dropping to 10% or 11%.

Now I operate in 10 states, I am profitable, I pay dividends of 20%. After riding out the initial high costs in micro-hydro, I can supply to the utility company at 1.96 rupees a unit. They're working on a basis of 2.90 rupees. So it's a win-win situation, to me, to the bankers and to the utility company.

Renewable energy has now come out of the shadows of being essentially something clean, and something that your country wants to do to get a good name. It is a good business proposition, first and foremost. It is a good business model. This is no more a sector which requires some hand-holding or something. It is a good investment.”

90% of the project cost repayable in 5 years at 14% interest.

The revenue department helps by allowing accelerated depreciation of the initial investment cost of a windfarm: 80% is deductible in the first year. And then, especially for the competition-challenged textile sector, the Technology Upgradation Fund Scheme (TUFs) reimburses eligible textile producers with 5% of their investment. And some icing on the cake, again for the textile sector: textile producers who feed in power to the grid are exempt from taxation on their income for 10 years. No wonder that you'll often see a windfarm adjoining a textile plant.



No wonder either that the executive vice-president of Vestas RRB, the leading manufacturer of wind turbines in India and based in Chennai, Tamil Nadu, Mr S D Singh, sports a wide grin these days, proud of his company's upwards expansion into turbines with a capacity of 2MW and 65 metres tall. "If the wind is good, and the regulations are good, then the industry will prosper."

### Information is power

One key to Tamil Nadu's wind energy surge is widely credited as having been accessible data on wind speeds and heights. In neighbouring Karnataka state, where water resources seem to abound as much as Tamil Nadu's wind, some energy professionals and investors wish that they were as information-rich as their peers. Some early studies, assisted by the World Bank and the Energy Sector Management Assistance Programme (ESMAP) were useful for determining sites for small hydro plants on the major rivers. For smaller run-of-the-river hydrology, a relative lack of data has led to micro-hydro being seen as a cautious investment, says S Chandrasekhar, of the Bhoruka Power Corporation. "You have to ensure than your plant is operational 99% of the time, and because you have to use every drop of water". In such a situation, more detailed data would be of inestimable value.

Yet already, small hydro energy is a leading source of the state's renewables, whose total potential value is estimated at 10,150 MW. According to the Karnataka Renewable Energy Development company, the major potential is in wind (68%) and small hydro (14%). But whereas only 4% of potential wind power is already being captured, more than 13% of small hydro power is in use (196 MW as of end-October 2004). This could reflect a somewhat less proactive regulatory approach to renewables in Karnataka than in Tamil Nadu – more enabling than empowering – and the preference for small hydro as well as the attraction that private capital has found in the private sector power production.

Bankers, water turbine manufacturers and – the litmus test of energy supply – consumers all attest to the benefits of power sources being boosted by independent producers. Fewer outages, less pollution, lower prices. And more time for other things. A woman working under the Bhoruka charitable trust sums up: "Before, the grid came on for about an hour, at unpredictable times. We had to drop everything and run off to get our water. Now we have power 18 hours a day. We get our water when we want, and can spend more time tailoring. Now that we have pumped water for irrigation, we can have two crops of rice a year – and we've started on sugar cane too."

### More watts and jobs, less emissions

Elsewhere in Karnataka, a start has been made in mobilising the potential of another end of the energy spectrum: the transformation of plant material into energy. The



**"renewable energy has come out of the shadows"**

*Water turbines and biomass plants need agreed tariffs for feed-in to the grid*

privately-owned Malavalli Biomass Plant generates electricity through steam from burning agricultural residues, mainly sugar-cane waste, coconut fronds, rice husks and eucalyptus chips, at a rate of 50,000 tonnes annually. Under a Power Purchase Agreement with the Karnataka Power Transmission Corporation it supplies 46 villages – more than 10,000 households – with a reliable supply, for 18 hours a day. A partner company, delightfully named Ambience, has established the Grameena Vidyt Mandall unit as a community-based collection system. Its collection levels excel those previously attained by the more distant electricity board.

*Now we can plan our other work better*



Nothing is left to be waste. By not being left to rot, the residues do not emit methane gas. Their burning emits next to no carbon particulates, whilst the equivalent production of electricity from fossil fuels would emit 27,000 t of carbon dioxide annually. One thousand tonnes of ash are used as organic fertilizer by local farmers. The local economy has grown by US\$ 1 million, and more than 450 permanent jobs have been created.

Project managers report their concerns that an inadequate regulatory framework for biomass power generation may lead to the depletion of forest and ground water resources. They want more research on the organization of supply chains and boiler technology. And they suggest that projects such as theirs are hindered from growth by fluctuations in national and state

policy and regulations towards renewable energy. All are issues demanding action.

To paraphrase that stunning statement by S D Singh, yes, we do need

good natural resources like wind, but we cannot always count on them, can we? And we do need good regulations, and we do need to count on them. And given the return that gives on the investment, so we should. ■

### Coming back to the grid

Mohammed Naimullah is the owner of M N AgroIndustries, a paddy boiling business. Recently, he switched back to the grid as his prime source of energy. Surprising, or a sign of the times? It is, he says, a direct result of rising diesel fuel prices, and the increased reliability of the grid. Sitting in front of his generator room, the prodigal miller recounts his return. "We use to get kerosene for 16 rupees per litre, then a law banned its use, so we switched to diesel. That now costs 28 rupees per litre. We used to be spending between 10,000 and 12,000 rupees on diesel each month, and 5,000 to 6,000 on the grid. The grid supply was poor, we had low voltage problems and there were cuts for 6 to 8 hours a day. Lately, since about 8 months ago, the supply has been better, and the price 4.8 rupees a unit. We can now rely on the grid and a decent supply. You know, there are so many micropower stations online now, so we can trust the grid again. But we do keep our diesel generator on standby."



# Thoroughly modern marketing

A western region of 60 million people, mainly off-grid, a tempting export market, soaring energy demand nationwide, a commitment to be greener, and issues of quality assurance and consumer faith. These are the key features of the solar landscape in China today. It's a scenario that will be defined by market forces, even if they are tweaked along the way.



*Coming for all the fun of the fair – including solar*

It is cold, cold, cold, on the wide open plain of Maqu County in the western Chinese province of Gansu. It is August and the cold varies from biting, rain-sodden cold to just bright sunlit cold, and it is clearly going to get worse as winter rolls in. Soon it will be time for the millions of herders and their sheep and yak to go into winter mode, and life will be quieter for the merchants in market towns like Linxia and Hezhou. But now it's still a good time to party outdoors, and to do business. Solar systems salespeople included.

The long, closing-in rumble of horse hooves across the plains could, if you close your eyes tight and filtered your ears to the wind, be from two thousand years ago, the noise that of an incoming group of herder lads weary after an excursion into the rolling hills beyond the horizon. Or it could be just a few hundred years ago and the young men are the riders in the traditional annual race whose winner will be bestowed the title of King of the Tibetan Plains. Just like the King portrayed on the





massive tapestry on the spectators' stand behind you.

But your eyes are not closed, and your ears will long ago have been prised open by ten thousand shrieks of encouragement and congratulations to the approaching group of lads on horses. The winning rider will soon be adorned in cloths of green and orange and led to the winner's enclosure – the winning horse, as in horseraces all over the world, will be watered and otherwise ignored. The King of the Tibetan Plains no longer reigns, even nominally, over a vast area of land. Now he is a modern sun king.

For the wide red banner at the race's end reads: "The Sheng Guang Co. 'Summer Sea' line of photovoltaic power sources wishes all race participants good luck and encouragement. The solar energy prize for today's lucky Grassland Crusader has been donated by Gansu Province's Sheng Guang Solar Energy Company". Sheng Guang means 'grasslands'.

Many tents and stalls at the race meeting – in fact it is a farmers' fair – are lit by solar units, and several others are selling solar home systems, replete with their low-energy light bulbs, radios and cassette players. More powerful ones feed televisions and even refrigerators.

This is modern marketing, of modern energy. The modern has

been grafted with sublime delicacy onto one of the region's deepest traditions. It has happened, is happening, so quickly that it is a major reason behind the stunning rise in the use of solar energy in China. Not only has China become the world's leading supplier of much solar equipment and components, it has also given its domestic market a massive kick-start.

### Bringing the market to you

That domestic market is now genuinely nationwide, from shiny rooftops of new sixty-floor apartment blocks in Shanghai to the remote western provinces where solar panels were first installed in a systematic way more than two decades ago. The solar pioneers of the seventies and eighties are now at the helm of mass-production manufacturers – as is the case with Ding Kong Xian of Jia Wei Solar China in Shenzhen – and of leading research companies like Beijing Kike Energy New Tech Development, whose Wang Sicheng, now with a tie but still in shirt-sleeves, proudly shows off films of him heaving a solar panel into place at a micro-wave transmission station in 1984.

There are two key factors in the development of the Chinese photovoltaic (PV) market. First, it is to stimulate the use of solar energy in areas, particularly in Western China, where the grid cannot yet



**"the challenge is to provide equipment where marketing and after-sales costs are high"**



reach, not even from local micro-hydro systems. The West has a population larger than most European countries, yet its vast expanses make for a low population density. In the government's long-term development visions, the Western region is slated to grow and become more populated. The use of decentralized solar and micro-hydro systems is, along with transport infrastructure, one of the start-up strategies.

And given the relatively low incomes of many people and their lack of access to loans, and their wish, as modern, if modest, consumers to have reliable means for lighting, entertainment and information, the challenge to the burgeoning solar industry is a complex one: to provide low-cost, high-performance equipment in an environment where per unit marketing and after-sales costs are high.

The development of a sustainable market is the first focus of the China Renewable Energy Development Project (REDP) of the World Bank which, from end-2001 to end-2007, plans to inject even more momentum into China's expansive involvement in renewable energy. That involvement is best expressed in the recently-set government target of doubling the current use of renewable energy from 5% of national capacity by 2010.

The REDP provides financing for 20 MW of wind farms in Shanghai province, for about 10 MWp of PV solar home systems (about 350,000 – and perhaps one-third of all systems in the market) in the three north-



*More time now for making cheese in the kurt*



western provinces and grants for technology improvement, capacity building and management.

### Down at the marketplace

How does this translate into solar white goods on shelves, and panels placed on roofs, or lent against tents? Well, it's a marketplace – and the consumer wants a choice. The REDP is working to set and maintain standards in that market, and down on the street, it is noticing the chill wind of market forces – and responding well. It offers modest grants, set to be diminished towards the end of the project, to accredited PV companies to sell their systems on a commercial basis to rural customers. For each Wp sold, the manufacturing company receives a sub-grant of US\$1.50. The number of such companies has grown from 17 at the start of the project to

### You can keep your hat on, carpet man!

Mr Mayi used to be just a carpet dealer and a haberdasher (hat vendor). He is now in his second year as a solar module retailer too, and delighted in his choice.

"We sell 200 systems a month. 130 of them are too small for REDP support, being only 5 Wp – it's mainly herdsmen who buy them, for 250 Yuan (US\$ 29).

When I sell an accredited model, the manufacturer gives me an incentive payment of 10 Yuan from their grant. I sell their 10 Wp systems for 600 Yuan, a 16 Wp system for 850 Yuan and a 20 Wp system for 1050 Yuan. Trouble is, about 20-23% of these sales are not being verified – there's some slowdown in the system.

I've only ever had two batteries returned to me, but they were from my one non-accredited supplier. Never had a return from my two accredited ones.



about 30. By end-2003, annual sales were 65,000 a year (projected level was 55,000), at an average capacity of 19 Wp (projected: 24 Wp) with selling prices averaging US\$ 7.70/Wp (projected US\$ 14.5/Wp). Project expectations have – in a sign of responsive project management – been revised: by 2007, sales of REDP approved units are likely to be 405,000 units (was: 350,000), with total capacity of 9 MWp (was 10 MWp). Again this represents about 30% of the area's market.

Customer behaviour has, once again, been hard to predict fully. Whilst the total capacity of systems sold was identical to project forecasts (2.4 MWp), the volume of sales is 24% higher over the whole project period so far, and the capacity per system is 21% lower. How come? Observations in the field provide a simple answer: for reasons of portability and, it may be assumed, reliability, the principal customers (herdsmen) have been scaling down their purchases, preferring to buy two small systems to one large one. Now there's a nice little lesson in market research!

The fall in prices can be ascribed largely to unexpectedly intense competition. You'll best see that competition in a walk down the main shopping streets of Linxia and Hezhou. In most shops, different types and brands of solar systems vie for shop space with fans, water heaters, carpets and hats. A handful of shops

**We shall be One, Number One**

**M**s Yao, a lawyer by background and a bit of a visionary, leads Wuhan Rixin Technology. This high-tech photovoltaics (PV) company is based in the 'Optics Valley of China' in Wuhan in central China and got its ISO9001 certificate in 2000



"We have had good support from REDP in training, communication and for participation in exhibitions. But the prime benefit is in contacts.

Most of our shareholders are major players in PV and REDP's support has given us a very good platform. We have two markets for solar panels. In western China, we have three agencies in Xianing, Xinjiang and Inner Mongolia and good sales. In the area of street and garden lighting, we are the best. China has 70% of the world's garden lighting market. We are confident about our future. The PV industry is now where the IT industry was ten years ago and look how much it has blossomed and boomed since then. We want our company to be Number One".

try to make their way by specialising in solar, and entice customers with give-away cassettes – or, one story goes, with priced-down cheese presses, a favourite tool in local evening livelihoods.

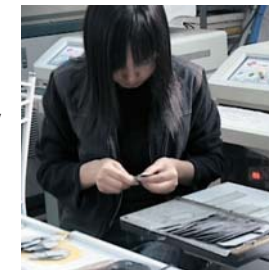
**Good quality can make for great quantities**

Quality is key to, but not limited to the PV market. The need for reliable quality PV systems is mirrored across the whole range of renewable energy technologies, from wind to wave, and not just in China. By insisting on a vigorous process of accreditation of manufacturers, the REDP is investing in building up consumer confidence. For too long and too often, solar retailers have sold, as is their right, low quality SHS, lacking controllers and thus ruining the battery, or without adequate after-sales service, or with simply unreliable components. The goal of a certification system is noble, and must be allowed to take root, even though the vagaries of some consumers,

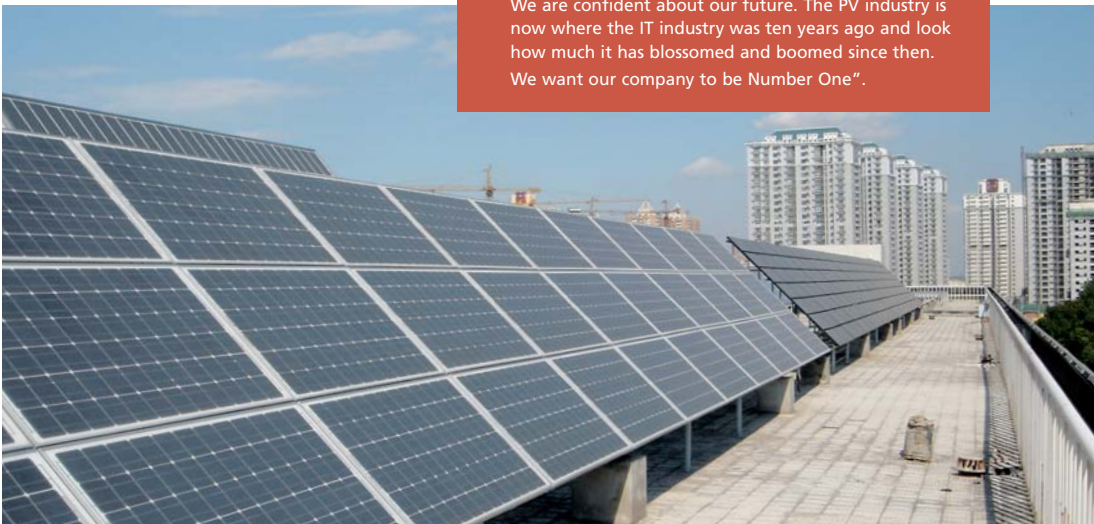
**"noticing the chill wind of market forces"**

Other elements than price wars are also making new demands on the project: the time and expense involved in verifying the sale of an approved device in the books of the retailer place a heavy burden on project monitoring. And other PV projects in the same or neighbouring areas, sometimes part of official roll-out programmes, are providing free or lower-cost equipment – adding a new complication to the market. Part of the project's emphasis on capacity building is aimed at engendering the attitude – in manufacturers, retailers and service agencies – that the era of the solar PV is going to be a long, long day, and we are but witnessing the first cracklings of dawn. ■

*Many hands make light work*



hunting for that ever-elusive bargain of cheap price and cheap prize, may seem to hinder its progress. Yet perseverance will prove to be the only way to guarantee reliable, marketable products.



Mainstreaming is sometimes in the minutiae, even in renewable energy supply. Whether it's the local loans officer listening to the old lady's tales during her monthly visit, or the project manager creating new opportunities for key institutions to loosen up or lose, or sector reform to allow feed-in from private micro-hydro, you'll find that service-mindedness will take you a long way towards success. That's what's happened in Sri Lanka.

**Y**ou probably remember this, maybe it happened to you just earlier this week. You were standing at a bus stop waiting to go to school or market, or you were down at the local grocery store, or in the works canteen, seeing a few pages pinned up on a notice board. Among the local announcements, you would often find the minutes (or report) of the most recent meeting of the local committee of the parish, the village safety group, the works committee or whatever is the name of your local entity. Such notices are a modern tradition, started thousands of years ago. They inform, they communicate and they underscore your sense of community, and of belonging.

So, since we are all one in this global village of ours, where so much is online, go, now, to [http://www.energyservices.lk/pdf/qsmminutes\\_30Aug04.pdf](http://www.energyservices.lk/pdf/qsmminutes_30Aug04.pdf) and you will find such a set of minutes of a meeting, as good as any you'll find down at the store or bus stop.

# Come rain, come shine, come current, come customer care

The document records the Quarterly Stakeholders Meeting of the Sri Lanka Rural Electrification and Renewable Energy Development Project (RERED), held for half a day



**Minutes in a project, minutes of a meeting**

The following excerpts are from the Minutes [report] of the Quarterly Stakeholders Meeting of the Renewable Energy for Rural Economic Development Project, held on 30 August 2004 at the Trans Asia hotel [Colombo]

**Agenda item 5**

**Community based electrification**

- Five training courses covering 38 Electricity Consumer Societies (ECS) have been completed under a RERED-funded capacity building program that is being executed by the Federation of Electricity Consumer Societies (FECS). Five more courses targeting 60 ECSs are planned to be executed before the end of the year. [ ... ]
- The Administrative Unit (AU) informed that 10 village hydro suppliers and 17 developers had registered with the AU. Although registration does not confer any special status at present, it provides a basis for getting to know the players and monitoring their performance with a view to providing technical assistance, such as capacity building and upgrading standards, later on. The RERED Project was in a position to provide such assistance if suitable proposals are submitted to the AU.
- The National Engineering Research Development (NERD) Centre informed that the dynamometer for micro-hydro turbine testing had just arrived and that the facility would be operational by November 2004. The AU noted that suppliers will be required to have samples of their products tested and certified shortly. The AU will issue guidelines once the facility is operational.
- The AU informed that Chartered Engineers providing design and installation verification services for village hydros are required to submit their reports in accordance with the Village Hydro Specification format. This requirement will be enforced in future to improve the quality of analysis and reporting." [ ... ]

in the capital Colombo in August 2004. It notes the meeting was attended by 9 representatives of participating credit institutions (8 of them with 'bank' in their name); by 9 representatives of solar

companies; 3 from industry associations; 17 from project developers, consultants, NGOs and auditors; 12 from government organizations and the World Bank; and 5 from the project's administrative unit. Eleven people have sent notice of being unable to attend. New procedures are discussed; new stakeholders welcomed; people with new approaches to suggest are encouraged; those lagging in their reporting duties are urged to catch up – all in the context of a group meeting of peers. There, in a nutshell, you have most

you need to know about the mainstreaming of renewable energy in Sri Lanka today – a wide range of committed stakeholders from the financial sector, industry, field organizations, civil society and the public sector.

"Oh, it is *only* half a day once a quarter", the project director, Jayantha Nagendran, said disarmingly at the administrative unit based at the DFCC Bank in Colombo. Maybe it is, but it is an important thread in the fabric of the project in which customer care (for 'customer', read also 'stakeholder') is pervasive. And the

**"no longer counter-culture gadgetry"**



One village has four electric saws for hire to local carpenters



broad design of that fabric has been enriched by changes along the way to improve quality and enhance the project implementation process. The introduction of the quarterly stakeholders meeting is one such enhancement.

**A new industry**

One achievement celebrated at the meeting, with the duly diligent modesty of the project management, was the passing of the '50,000 solar home systems milestone' in June 2004 – 50,146 solar home systems (SHS) in fact. Since start of the RERED in 2002, a total of 29,193 SHS had been installed – most of them purchased by households with the use of a microfinance loan. Under the project's predecessor, the Energy Services Delivery Project credit programme, which ran from 1997 to 2002, a total of 20,953 SHS had been installed. The minutes: "This is a commendable achievement for a new industry, at about 1% of the total number of



households in the country are now electrified by solar photovoltaic (PV) systems."

Probably the most commendable aspect of all is the self-applied label of 'new industry'. As is also the case with the project's other lead technology of micro-hydro electricity generation, solar voltaics are now mainstream in Sri Lanka. No longer are they the 'counter-culture gadgetry' which started to take root in the country in the 1970s. Now the 'new industry' is judged by hardcore financial institutions to be a good investment, and an important lever in Sri Lanka's efforts to extend electricity access to at least 75% of its population by 2007.

In that context, the objectives of RERED are a) to improve the rural quality of life by providing access to electricity to remote communities through off-grid renewable energy technologies and b) to promote private sector



power generation for the main grid from renewable energy, alongside assistance on sector reform. The RERED Project, which runs from 2002 to 2007, is funded by a US\$75 million line of credit from the International Development Association (IDA) of the World Bank and a US\$8 million grant from the Global Environment Facility (GEF), and has had a long-standing relationship with ASTAE. Loans for individual investments (sub-projects) are disbursed through Participating Credit Institutions (PCI).

**Energy is a basic need**

By September 2004, commercial and development banks accounted for 100% of the project's refinancing commitments for grid-connected micro-hydro plants – 2,248 million rupees (US\$ 21.7 million), for 85% of the 23 million rupees (US\$ 221,000) allocated to community-based off-grid micro-hydro stations, and 23% of the 824 million rupees (US\$ 7.9 million) approved for solar home systems. Wind power investments have yet to start rolling, the first community-based off-grid project having entered the approval process in July 2004.

Whilst the formal banking sector, led by the DFCC Bank, Hatton National, the National Development Bank, Commercial Bank and Sampath Bank, has established its key role in micro-hydro, the solar sector is still being led by a civil society body: the Sarvodaya Economic Enterprise Development Services (SEEDS). This first emerged in 1986 from the Sarvodaya Shramadana Movement of Sri Lanka, and became a company limited by guarantee in 1986. Its main operational goal is

to provide microfinance credit to rural people who, in the prevailing but thoroughly reformable practices of credit bodies, do not yet have access to finance.

Being part of a delicately woven movement of community groups, SEEDS has an infinitely more developed and committed network of contacts and workers than any commercial enterprise in the country, whether that be a bank or a soft-drink bottling business – the latter being notorious in many countries for having far better delivery systems than any health, social or economic service! And so when, in 2000, the EDS project reviewed its activities (typically, halving its targets of SHS installation) and examined the lack of interest of commercial banks in small solar loans, it was to SEEDS that it turned. Now SEEDS is making more than 1,000 loans a month – regarding them all as meeting one of the ten basic needs which this NGO seeks to meet: access to energy.

**Mainstreaming is mega**

The buzz around SEEDS, as firm and loud as that of the insects in its magnificently flowered but modest gardens, is a really positive one. Some of their field staff, in their endless travels to assess and monitor solar loans – and collect instalments – cause some observers to wonder at their energy and their dedication in going 'the last mile', sometimes 50 times a day, literally. To them it

**"going the 'last mile' sometimes 50 times a day"**



**The benefits of flexible management**

Jayantha Nagendran is the manager of the RERED project. He discusses the flexibility of the project and its willingness to seek new solutions to problems. Aren't there additional costs in being flexible?



"The only extra costs in increased consultation with and involvement of stakeholders is in the quarterly meetings." But even there, there are gains, he implies. "The stakeholder meetings are not just a forum for project management

information but also for networking amongst participants. We like people to engage in dialogue and try to share problems and we use the meetings to try out new ideas. One of the new ideas which emerged there recently and which we have been working on of late is the issue of continued capacity building for the Electricity Cooperative Societies. They have expressed the need for training especially on questions of operation and maintenance, so we have given that assignment, in a contract for one year, to their Federation."

The director of SEEDS, Shakila Wijewardena, beckons others to follow: "It's a win-win situation – if the companies provide good services, good marketing, it's good for SEEDS, and good for the community." And the founder of Sarvodaya Shramadana (which roughly means 'Awakening of All through Sharing Energy' in both Pali and Hindi), Ari Ariyaratne, gives his own touch to the notion of mainstreaming: "We want to build something not micro, but we want to be building something mega!"

The advantages of being close to customers is also crucial to the community-based micro-hydro schemes in the RERED project. Locally-based collection schemes,

through Electrical Consumer Societies, arrange for payment of loan instalments and of electricity supply. At end-2004, they were worried about the impact of government price hikes. They perform so much better than



is special, and normal. If their achievements in solar, as in their other loans for rural enterprise, can help the market to grow and encourage other, more hesitant and less rurally mobile credit institutions to join in – and perhaps tweak their spread a little – SEEDS will be more than happy.

anonymous, and invisible, institutions, and also provide the platform for community involvement in system maintenance, through local village stakeholder meetings, much akin to the one in the Trans Asia hotel. Mainstreaming is an attitude too. ■





Energy for all, yes.  
 And renewable energy, if at all possible, given its new financial allure. But what about the energy errors, innocent to be sure, of yesterday, or the oversights of today? How about pollution, wasteful consumption and the blind inefficiency of existing energy systems? The damage to health, economy and environment? If you think you cannot afford to be energy efficient, find someone who will help you to be and you will both make money. A lesson from China.

# “Save energy, and make money”



**T**he story of energy efficiency is, in China today as in any country, perhaps unromantic yet it is a fascinating journey. It can lead you to rooftops, water tanks, cellars and

machine rooms in a broad sweep of factories and institutional buildings – hotels, airports, schools, department stores, offices. To steel mills, fertilizer plants, lorry companies, railways systems, water treatment works.

It is a journey that appeals equally to many professions. To the engineer with her or his immensely practical mind; to the environmentalist whose passion is to reduce pollution and damage to the atmosphere; to the planner looking for a way to start today what may take years to legislate for; and to the decision-maker wanting to keep diverse interest



groups satisfied and occupied, to make visible progress in the short-term and have some long-term kudos.

**You said we could make money?**

With rising fuel prices on the world market, and demand surges on the domestic front, energy efficiency is a hot topic. In China, it has in fact been a cornerstone of the government's energy policy over the last two decades.

However, in a world where incentives and subsidies are often no longer encouraged nor affordable, the trick is to get investments in energy

efficiency accepted and put into practice. And that in a language that most people, right or wrong, understand. In the phrase coined by one Chinese energy efficiency expert: 'Save energy and make money'.

Fair enough. But. The business models of most institutions are based on paradigms which are free of the need to save energy, or which make no link between energy use and employee health and safety, or the community environment. General environmental awareness has only started to rise in recent years. And, even when a company



realizes it could benefit itself and society through energy efficiency, its business model does not easily allow the necessary investments. And any credit that can be mobilized is usually to be found on informal networks, since banks do not yet have a track record in this field.

Necessity, yet again, is the mother of invention, or inventiveness. In the Chinese context, it is to adapt the notion of energy companies practised, for example, in Europe and North America. It is to create and encourage companies – Energy Management Companies (EMC) – which can make profits through investing in energy

*Spot the savings and share the gain*



**"paybacks tied to energy savings"**

efficiency projects in other companies with paybacks tied to energy savings – in essence, energy service companies (ESCOs). If it works, the mechanism has its own momentum for the idea to spread widely. And wide is, in the case of China, very wide indeed. There are 100,000 large office blocks, stores and hotels with inefficient air-conditioning and heating systems, with

10,000 more expected by 2009. Not to mention countless steel mills, or fertilizer plants, or cement factories with guzzling, belching production.

**Building capacity, capacity building**

The China Energy Conservation Project, launched by the World Bank in 1998, made considerable progress in assisting in the transition of China's energy conservation activities from a system based on planned economy concepts to a more market-oriented system, which can be sustained over time and grow with China's economy. Three EMCs, founded in



Beijing, Liaoning and Shandong, successfully developed growing businesses.

Making the step from a cluster of companies to the broad development of an entire EMC industry is what a new project, Energy Conservation II, started in 2002, has in mind. Nothing less than that. Admittedly, doing this quickly will require China's domestic banks to step in as the industry's primary source of credit. And it will need the massive dissemination of the concept and the experiences achieved along with technical assistance and practical training for emerging

**The man who changes 30,000 light bulbs**

He beams like a sphinx in a bright blue boiler suit, Mr Wang. The chief engineer of Shanghai's Yashin (New Asia) department store is totally unfazed by the sudden invasion of his control room cellar by the people from the Shanghai Shangliao energy management company (EMC), who share, yuan by yuan, the cost savings the store achieves. "They're always dropping in by surprise like this. It makes for a more open relationship", he confides.

"Our goal is dead simple: to save energy and to reduce costs. So we're replacing 30,000 incandescent bulbs with low-energy fluorescent ones over our five floors. We've followed the EMC advice on changing the frequency of the air cooling machines, reducing consumption by 15%. Now we're studying water cooling and storage in off-peak night-time periods, at one-third of peak rates." What about the time he and his team of 15 save on maintenance and replacements? "We think up new savings and we meet here, and often outside working

hours too, to discuss the why's and the wherefores of how these savings are important."

Up on the store's roof, emblematic of what is happening downstairs and across the city, a wee little plant has lodged itself in a crack between two cooling pipes. A defiant,

optimistic sprig of green. Clambering around the pipes, the EMC people don't seem to notice it. We do, and Mr Wang winks at us and shares a silent grin.



**"domestic banks as primary source of credit"**

EMCs – expected to number 60 by 2005. In fact, by the end of 2004, the number of operational EMCs was nudging the 30 mark.

Many start-up EMCs across China are focussing on clients in prestigious sectors, such as hotels, department stores and institutions, and on lighting, heating and cooking – even Guilin's international airport has cut its electricity consumption by one-fifth. This approach encourages new customers to sign up, and it spreads energy awareness. Others

are focused on well-established industries.

That the market appears to be wide open is underscored by the geographical spread of some EMCs' operations. Some, such as the HHBT air-conditioning economizers in Guiyang, have 10 or more branch offices across the country, operating in cities which are host to other EMCs. It is a sellers' market, and the time when demand forces EMCs to better organize their offer is, clearly, some way away. The new trade association of EMCs – the EMC Committee of the China Energy Conservation Association (EMCA) – provides a forum for standards, codes and negotiations on this to take shape.

### Bridge building

Whatever these doubts, time, and international energy prices, are definitely on the side of energy efficiency. Shen Longhai, the director of EMCA, is in no two minds about this. "We have 24 provinces which are experiencing electricity shortages to one extent or another. In 1993 we became a net oil importer and in 2004 we may even exceed 100 millions tonnes of imported oil. So we need to get more energy, and get people to use it more efficiently." In such a market-based concept, he is asked, what is the role of government?



### "We never knew we were an EMC"

How, for years not knowing that they were an Energy Management Company. Cai Xiao Bing is the General Manager of the Huiton Huacheng Building Science and Technologies Company in the central southern city of Guiyang. Unaware he is not, such is his attention to detail. He can tell you the net annual profit on each of HHBT's 66 projects as of October 2004 (15,333 Yuan; US\$ 1,783); their accuracy in predicting energy savings at the start of a project (92%), and the annual savings, at 2004 rates, achieved by their customers in electricity (46 million kWh), in coal (18,340 t) and in carbon emissions (11,346 t). But being an EMC was new to him.

"You know, it wasn't until September of last year (2003) that we knew of the World Bank project, and they came and found us. That was the first time we knew there were so-called EMCs operating here in China.

We had come up with our own system, calling it 'finance-based operations'. We had noticed how a potential client, a hospital in Guilin, was not able to implement our technology [a software control for air-conditioning systems] from their own resources. So we agreed to share the savings and earn from that. Our backer was able to fund this to some extent.

The biggest obstacles to our expansion are the recruitment of qualified engineers, and the availability of loans. What's really needed is a large-scale reform of the banking system!

"Very important. It can introduce rules and policies to promote energy efficiency. But we here at EMCA have an important role too. We are the bridge between the market and the government. We can express the needs of EMCs to government, and they can in turn formulate the appropriate policies and provide necessary support to the EMCs."

Among the longer-term investments and regulations to be put in place are energy efficient production codes for many industrial sectors, including transport and storage, and building codes. In many cities, buildings are still being constructed at the end of 2004 which already

### "will less tempting sectors be approached?"

have contracts with local EMCs to come and install energy efficient systems as soon as they open in 2005 – the main Nanjing shopping street in downtown Shanghai has several such skyscrapers nearing completion where a more stringent building code would have made more sense in the planning and design phase. And work is underway, again with World Bank involvement, on such steps.

What is less clear is how, with a model which thrives on open market principles and practice, less tempting and less immediately lucrative sectors will be approached. It is one thing to reduce air-conditioning energy use by 45% in

your regional newspaper's showcase building, or your home city's leading hotel, and make a publicity splash with it. It is quite another to move into the higher-risk zone of energy-spilling metal workshops in crowded alleyways and to derive the financial gains that will allow the operators to adopt healthier practices.

Maybe there are indeed limits to growth in dealing profitably with the issues of, well, limits to growth, or at least limits to certain kinds of growth. Without doubt, the creativity of entrepreneurs is going to be sorely tested in keeping the EMC industry on a sound growth path. But this is a job well worth, superbly worth, doing, since it faces a fundamental issue of our time. The backing of the British development partner DFID, and ASTAE, is intended to help, on the job.

These are not the noble and necessary tasks of filling rustic gaps in the grid, or of expanding access to energy. This is not, not directly, about developing alternative sources of energy. This is reform at work. This is about turning around decades of mis-directed practices, kilowatt by kilowatt, carbon tonne by carbon tonne, without anyone getting hurt. And with a lot of people making money, creating livelihoods, in the process. ■



The first US\$ 11 million has been disbursed and 27 projects expected in the pipeline in 2004

With a roll-out of more than 20,000 solar home systems a year – that's one every ten working minutes – and 1,000 new rural grid connections being made every day, Bangladesh is moving firmly towards its target of

though the rate has doubled of late. When – and it's still A Big When – the private sector steps in with more vigour, the limit really will be the sky.



## Once every ten minutes is not enough

'Electricity for All by 2020'. Solar is being counted on to fill many a gap in a grid that's buzzing with expansive confidence but cannot reach everywhere. The solar goal is, mind you, still a long shot – even

This is a story about access. It is a fabulous tale, but no imaginary fable, about modern energy being put to work in places many never dared to even dream of a few years ago. It is in Bangladesh, a vibrant if crowded delta on the Bay of Bengal, surrounded by hills to the east, the plains of the Ganges river to the west, and the slopes of the Himalaya mountain range to the north. It is peopled today by some



At the electricity cooperative of Tangail, the customer service desk has a form with 19 pre-selected complaints

140 million people, three-quarters in rural areas.

At the dawn of independence in 1971, Bangladesh had 87,928 villages. A mere 250 villages had access to electricity. By the beginning of 2004, that figure had grown, in a truly dramatic explanation of an exponential curve, to 40,000 villages. This welcome surge in power distribution has been guided and pushed largely by the Rural Electrification Board (REB), set up under the programme (REP) of its same name in 1977. According to Board figures of early 2004, there remained 55% of villages to be electrified including 78% of rural households, including 79% of poor households in electrified villages and 95% of all rural poor; and a total of 400,000 km of new distribution lines to be installed. The term 'remained' is a relative one, in face of the single-minded energy objective of the National Development Policy: 'Electricity for All by 2020'.

The righteousness of this uncompromising goal is being underlined regularly. An evaluation in 2001-2002 of the economic and social impact of the REP provided



**"each new client demands the same high degree of attention"**



many indicators of personal and community progress in electrified households and villages. Income, savings, gender equity, education, health and job opportunities all advance with access to power and light – these points are examined in the following chapter.

The benefits of energy access are clear, but modulating the many demands of a rural electrification programme is a complex process. It involves maintaining a healthy infrastructure and a sound customer base which are both forever growing, like an organic 'body electric'. Whilst each new metre of line, and each new client, demands the same high degree of maintenance and attention, the returns for the energy supplier are proportionately reduced and may not even be 'economically efficient'. A study in 2004 by the Energy Sector Management Assistance Programme (ESMAP) of the World Bank and the United Nations Development Programme on the integration of gender in energy provision makes the point succinctly: "At the present rate of

expansion, it will take 30 years to achieve the government's target of universal electrification. A main challenge for the government is the lack of large market in the rural areas. Despite high levels of demand, rural electrification is usually synonymous with low load. Most rural households connected to the grid use less than 40 KW per month, usually only for lighting."

The challenge is thus two-fold. First, how to maximize efficiency in the electricity grid, both in supply measures and customer returns. Second, how to extend energy coverage to those markets where the grid is going to be a long time coming, if it can ever come at all. Both issues are addressed in the current Rural Electrification and Renewable Energy Development project (REREDP) of the government. The project, set to run from 2002 to 2008, is financed by the national government and local communities to the tune of US\$ 99 million, by a grant of US\$ 8.2 million from the Global Environment Facility and a credit of US\$ 191 million from the IDA of the World Bank Group.

### Keep more customers more satisfied

One remarkable facet of the project is its dependence – and this is an interpretation of sometimes tempered project language – on customer service and user-

friendliness. The larger part of the project (using US\$ 179 million of the IDA credit) aims to assist the REB to expand the reach, capacity and reliability of rural grids, and to improve the operational and financial performance of the country's current 67 rural electricity cooperatives, known as PBSs (Palli

### The store with a board game



Tucked away from the main road in the village of Khashkhamar in south-western Bangladesh is a small grocery and tea shop. Lodged on its roof, near a small two-metre extension of timbers and thatch, is a small solar panel. It feeds a battery, housed in a store cupboard, and powers three lights, a television and a mobile phone charger.

The shop owner is Abdul Hakim. "I sell tea, biscuits, and people watch TV. I have a mobile phone business, charging 5 Taka\* a minute for outgoing calls, 2 for incoming. My business has run very well since I took solar about a year ago. Previously, the phone battery was always running out. I rented it for 300 Taka a month, and had to leave it at the recharging station for 2 to 3 days when their electricity was down.

Now I just pay 474 Taka in monthly instalments for the solar system to Srizony [a microfinance NGO]. My total daily earnings have risen from 300 to 400 Taka. And people stay more after dark – there's more business." He financed his extension with an extra loan from Srizony of 4,000 Taka. It houses a carom board, much in demand of an evening. "I charge 2 Taka per game, and clear up to 40 Taka a day."

\* 5 Bangladeshi Taka (BDT) = approx US\$ 8.5 cents

### A stitch in time saves lines

**M**okbul Ahmed is Marketing Service Director for SINGER Bangladesh, part of the worldwide conglomerate famous for its sewing machines. SINGER is a recent entrant in the Solar Home System programme, whose vendors' loans are refinanced by IDCOL in Dhaka. As the first programme member from the private sector, are they indeed the shape of the future?

"We'd been thinking there's a potential market for this product and early in 2004 IDCOL actually proposed that we enter this type of marketing. Now things are rolling. For our own sake, we have to survive in the market and

so we set our own price to the competitors' in NGOs and microfinance institutions.

At present we have set a price of 23,000 Taka for 50 Wp, for cash sales and in hire purchase schemes for up to 36 months. Pricewise we are competitive, and we have our brand name. The NGOs have their grassroots employees but we have about 300 outlets throughout the country and each one has technicians to give full service.

We do expect some problems in marketing so we shall try promotions like posters or free cassettes And we're planning to go to remote areas to sell there. Later, we may start an assembly plant for solar panels in our factory in Savar, in a joint venture with Sentinel Solar of Canada and Grameen Shakti."

Bidyut Samities) and 8 new PBSs. To a large extent, this thrust will build upon the phenomenal results already being achieved by some PBSs in reducing system losses and in high levels of payment collections. These two sides of the customer service coin, examined in the next chapter, are regarded as exemplary best practice in the world of the grid.

### Upscaling the off-grid

The REB side of the project (which also includes the introduction of some solar home systems (SHS) with some offline customers in grid areas) has potential benefits for all existing grid users and, in a way, it builds upon a structure that was once innovative, is now mainstream and will require constant refinement and renewal.

The more innovative part of the RERED project, labelled 'renewables', is an attempt to upscale the provision of off-grid energy, through promoting the use of SHS in areas unsuited for grid expansion. Administered by the Infrastructure Development Company Limited (IDCOL) based in the capital, Dhaka, it also plans to facilitate the development of small power projects, preferably using renewable energy, owned and operated by the private sector, NGOs and community-based organisations (CBOs), and to promote the productive use of electricity in rural livelihoods and services. This builds upon initiatives for decentralised energy systems (solar, wind and biomass) launched a decade ago by NGOs such as the Bangladesh Rural Advancement Committee (BRAC) and microfinance institutions (MFI) such as the Grameen Bank and which have grown noticeably since. For example, Grameen has set up a

**"a structure that is now mainstream and will require constant refinement and renewal"**

Grameen Shakti ('Energy/Empowerment') which works with, amongst others, a loan from the International Finance Corporation under the IFC/GEF SME program, now known as EBPF.

Under the project, participating organisations (PO) – initially from the NGO and MFI communities – are assisted in marketing SHS to the rural poor, by refinancing guarantees from IDCOL and a cash grant worth 20% of the SHS' value from the GEF. Customers pay a lump sum of 15% of the system's price (depending on configurations, it varies from BDT 20,000 to BDT 24,000 – US\$ 345 to US\$ 414). They



receive a loan for the balance from the PO. That loan, which is refinanced by IDCOL, is usually repaid over three years. Given that most loans have fixed instalments, one of the most frequently heard figures you will hear among SHS owners in Bangladeshi villages these days is '474' – the monthly instalment costs. And those owners are small stall holders selling tea, television shows and games in the evening, recharging their mobile phones; or a poultry farmer feeding her keep more regularly, or an embroidery workshop owner upping his evening productivity. They can all tell you that '474' is an important part of their new equation.

With its focus on a market that is hard to reach and hard to supply, this project provides a fascinating opportunity to see how initiatives from civil society can successfully cross the cusp from being driven by social and ecological profit to being powered as well by other, additional gains. The dedicated fervour which is normal to NGOs is no doubt one of the reasons that the SHS thrust has got off to a thundering start.

The original target of 50,000 SHS being sold during the project's five-and-a-half year length now looks, according to IDCOL, likely to be met by April 2006. The annual rate of



*A single panel provides lighting for four adjoining shops (left). Many single-system users are women poultry farmers*

sales is already twice the targeted level. This, in itself, provides a new challenge to the project managers and participating agencies who have already been stretched to recruit and train sufficient technical field staff – often, by preference, female.

As demand nudges ahead of supply, the programme is growing. The original five POs have been joined by four more, and the first commercial company, SINGER.

The current POs are BRAC Foundation, COAST Trust, Center for Mass Education in Science, Grameen Shakti (Rural Energy), Integrated Development Fund, Srizon Bangladesh, Shubashati, TMSS, Upakulio Biddutayan O Mohila Unnayan Samity and SINGER Bangladesh.

Many eyes are on the SINGER newcomer, keen to see how it fares in the intended market of the poor, and if it will be followed by commercial peers. Crucial here will be the emergence of more financial institutions which recognise that this is a viable sector for refinancing.

### More financial institutions needed

With its explicit choice of language and words like 'commercialization', and a programmed phasing out of subsidized prices, IDCOL is pushing hard to heave this project into a commercial phase. Some participating NGOs, keen to keep their roots intact, tend to regard commercial competitors as a nuisance, despite their own courage at having entered into a commercial area at all. Others grasp the challenge more eagerly.

To some extent, the goal of reaching the poor has been moved out of the spotlight, at least for a while. The more articulate agencies, such as Grameen Shakti, admit that they sell to the financially less-challenged too, citing (a non-existent) cross-subsidization and everyone's right

**"how initiatives from civil society can successfully cross the cusp**



**from social profit to other gains"**

to clean, modern energy as their pretexts. They also grant the comment that the high levels of female ownership and participation which they have in other programmes, such as food processing or mobile telephony, are not as easy to achieve in terms of solar energy. Solar sells, to be sure. But the commercial market is not always where you want it.

The challenge of providing 'affordable solar energy to the poor' can indeed be met, in the RERED project design, by mobilising a critical mass of viable demand, now expressing itself clearly. And more affordability will come not only from the growing economies of scale as sales levels double and re-double. They can also come from the emergence of domestic suppliers and assemblers of solar equipment. The experience of the Char Montaz women's cooperative on an island at the edge of the Bangladeshi delta acts like a beacon on a dark night at sea. Not only have they powered their own village, they now produce solar lamps and controllers for 'export' to their RERED partners. Grameen Shakti is organizing its own production too, and others are thinking that way, as a way to reduce expenditure on imported parts.

One of the telling tales that the Char Montaz people love to repeat is the question-and-answer: "How do I know which island is Char Montaz?" "Just look for the lights. It's the only island with lights."

In the Age of Universal Access which, grid on and grid off, Bangladesh is moving towards, that image could soon become a distant memory. ■

# Less Poverty, More Profits

If one gain from sustainable energy is the reduction of poverty, then we must understand how these virtuous circles of prosperity work, just as the poverty cycle itself. What sets off the spark for households, communities, societies to advance? Nutrition, schooling, charisma, water, market access, finance or, what? The energy dimension is in there somewhere. Because we know what fails for a household and an economy, when there is no energy to count on.



### Poverty hates the light

Poverty is.

According to the Sri Lankan microfinance change agency SEEDS (see page 26), poverty is a state of not having the following basis needs fulfilled: a clean and beautiful environment, basic health care, modest housing, adequate supply of food, spiritual and cultural needs, minimum of clothing requirements, basic communication, adequate supply of clean water, total education and energy requirements.

From the perspective of an institution which is – speaking bluntly – anti-poverty in spirit and economic and financial in nature, then any investment in sustainable energy has to embrace the elimination of ‘energy poverty’ amongst its goals. This is the stuff of profound debate, a process which may be served by the examples in this book.

Poor households spend an inordinate share of their monthly budget on energy. SEEDS estimates that for its clientele of the rural poor, food consumes 75% of their



“space in time, light and livelihood”

expenses, and energy 19%, with variables dependent on the source of energy, be it a generator, replaceable batteries, chargeable batteries, dry batteries, fuelwood, kerosene ... Whatever can be done to introduce cheaper, cleaner, more reliable energy into this scenario is going to pare down several elements in the poverty cycle. It will also create space and opportunity in households’ budgets of time, light, clean air, livelihood and learning.

In 2002 in Bangladesh, a detailed survey was conducted to assess the economic and social impact of the country’s Rural Electrification Programme (see page 44). Its scope and its findings make it perhaps the most detailed publicly available evaluation of such impact in rural electrification in Asia and the Pacific, if not more widely.

### Poverty is less light

The expansion of household connections through rural electrification in the two decades before the survey had been 1,200 fold; from 2852 in 1983 to 3,413,825 in 2002, bringing direct

### Poverty is less quality time

In financial terms (Table 1), the average annual income of a connected household, at 92,963 Taka (US\$ 1,591) has become 2.26 times greater than that of an unconnected household in an electrified village, and 65% times greater than that of an average household in an unelectrified village. Surplus income at 20,287 Taka (US\$ 47) is 85 times more than the average household surplus in an unelectrified village. Household savings, a crucial indicator for household security and investment potential, are on average 28,893 Taka (US\$ 495), are three times higher than the savings of an unconnected household, and twice the volume of a household in an unelectrified village.

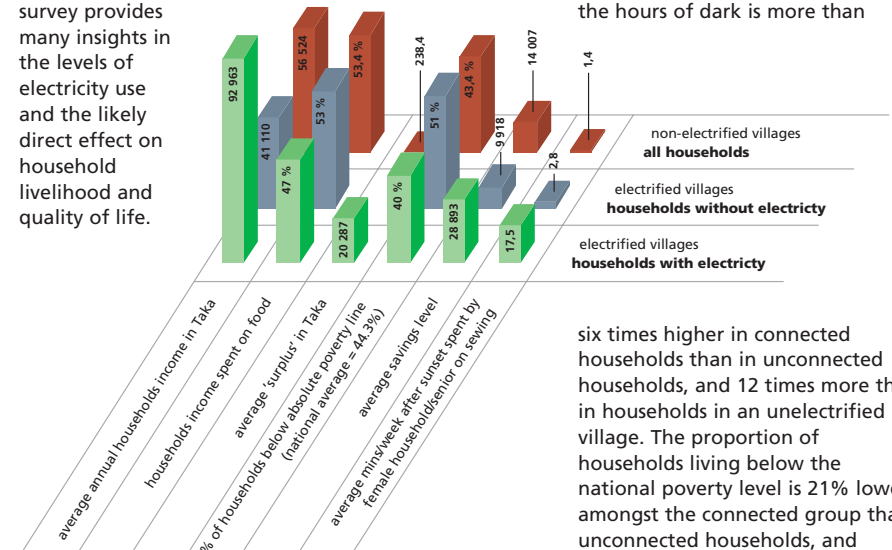
In a fine expression of the difference just a few minutes can make in micro- and ultimately macro-terms, the amount of time spent by female heads of households or seniors on sewing in the hours of dark is more than

benefits to 20.5 million people. A sample of 2,491 households was surveyed in 24 of the country’s 67 BPS rural electrification boards. Parallel surveys were held amongst users of irrigation equipment, in industry and in commerce.

The survey reports that “the direct impacts on households are mostly economic. These are reflected in enhanced income, and employment, and optimized expenditure pattern, surpluses, savings, and asset building. Most indirect impacts are related to the social and cultural aspects of life, which include, among others, such areas as education, health, women’s status, modernization etc. These direct and indirect benefits together produce synergy in economic growth, poverty reduction, and human development.”

Having been held on the basis of ‘with/without electricity’ (households in villages having had electricity for five or more years, and off-grid villages), the survey provides many insights in the levels of electricity use and the likely direct effect on household livelihood and quality of life.

Table 1. Energy and income



six times higher in connected households than in unconnected households, and 12 times more than in households in an unelectrified village. The proportion of households living below the national poverty level is 21% lower amongst the connected group than unconnected households, and



9% lower than the proportion of all households in unelectrified villages.

**Poverty is less schooling, less health**

Levels of education, both in terms of performance and attendance, are significantly higher in connected households (which

have a literacy rate of 70.8% and a school enrolment rate of 64%) than in unconnected households (54.3% and 55% respectively) and in households in an unelectrified village (56.4% literacy). This differentiation (see Table 2) is also found in school dropout rates – 1 in 5 students in a connected household 1 in 4 in an unconnected household, and 28% in unelectrified villages. And students in connected households spend 126 minutes each day on study after sunset -- a perhaps critical extra few

minutes than their peers in unconnected households (23 minutes more) and in unelectrified villages (17 minutes more).

Similar improvements are to be seen in household health (see Table 3). The surveyed measured the general level of awareness of households on what it calls ‘crucial public health issues’, such as where to go for child vaccinations, understanding of HIV/AIDS and its avoidance, danger signs in pregnancy, prevention of goitre or avoidance of arsenic in water. Of 20 such issues, connected households had much higher

awareness: 12.8 issues were familiar to them, compared to 8.8 in unconnected households and 8.2 in unelectrified villages. Equally, the level of infant mortality was significantly better among connected households (42.7 per 1,000 live births) than in unconnected households (53.8/1000) and in unelectrified villages (57.80)\*.

**Lightbulbs and investment climates**

Those extra minutes invested on sewing each week by female leaders and seniors of connected

Table 2. Energy and education

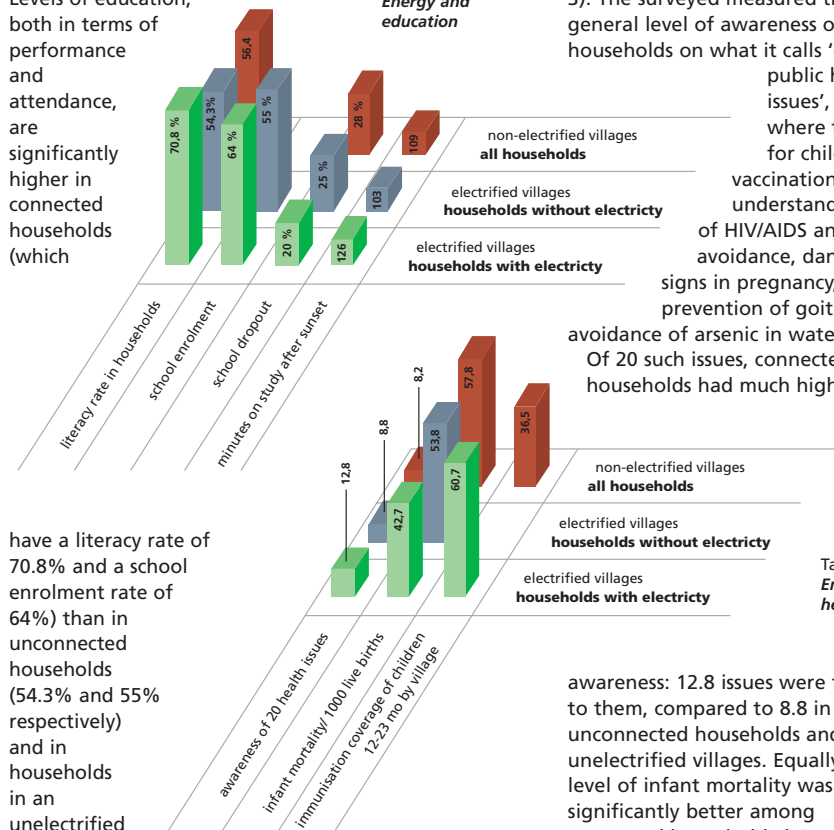
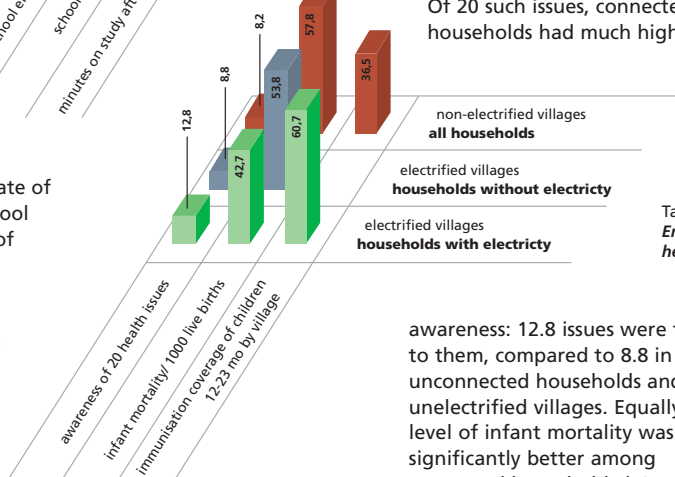


Table 3. Energy and health



**“synergy in economic growth and poverty reduction”**



**Outages hurt**

The availability of energy and energy services is a critical component of the toolkit of positive investment. This was underlined in some key comparative studies of China and India undertaken during a series of Investment Climate Surveys (ICS) by the Asian Development Bank and the World Bank Group. The surveys looked at three sectors: garments and leather goods, electronics and electricals and autocomponents.

In the two largest economies, the differences are startling indeed. The Chinese companies surveyed lose on average approximately 1% of their output due to power outages. Their Indian counterparts lose approximately 9.5% – the smaller SMEs, with between 20 and 49 employees an extra 0.2% to 1.3% more.

There are some differences in the geographical distribution of these frequencies, but the overall distinction between China and India remains stark. Three Chinese cities – Shanghai, Chengdu and Tianjin – report losses from outages between 0.4% and 1.3%, with a fourth city, Beijing, reporting losses of 4.7%. Five Indian cities – Pune, Chennai, Kolkata, Delhi and Bangalore – report losses of between 7.4% and 15.2%, with Mumbai a much lower level, at 4%.

households in Bangladesh express, in a nutshell, the key elements of the entrepreneurial opportunities which a lightbulb can open up. They represent the chance to organize productive and leisure time more freely, to generate a bit more income, to increase savings for a rainy day or – dreams do come true – for an instalment on a new sewing machine.

This change in a household investment climate underscores a comment in the ‘World Development Report 2005: A Better Investment Climate for Everybody’, the World Bank’s major annual publication. Addressing the issue of poverty reduction, it says: “A good investment climate also helps to reduce the costs of goods consumed by poor people, and improves the living conditions of poor people directly.” True enough, and it could have included ‘helps to reduce the cost of energy, and enhance its benefits’ too.

\* Economic and Social Impact Evaluation Study of the Rural Electrification Programme of Bangladesh, by Abul Barkat et al. Human Development Research Centre, NRECA International Ltd. 2002.



### More generators, less competition

The levels of lost output are reflected largely in the back-up measures taken by SMEs, in the form of operating generators. In China, in Shanghai and Beijing, there are no back-up facilities; in Tianjin about 4%. In India, about one in four of the SMEs surveyed in the cities of Kolkota, Pune and Mumbai had generators. In Bangalore, Chennai and Delhi, there were back-up systems in 70% to 80% of the SMEs in question. The ICS report notes, icily, that the enterprises had “responded to the unreliability of power supply from the public grid by running their own generators, tying up significant capital that could otherwise have been deployed in lines of core competence.”

There will be other factors than power availability and investment idling in generators that have affected the competitiveness of the sectors concerned in the two countries. These include energy prices and associated transportation costs. In all, reports the ICS, energy-related costs reduced the Total Factor Productivity of Indian



## “unreliable power ties up capital”

companies in general by 20.4% compared with Chinese enterprises. In the garments and leather sectors, they did so by 22.8% and in the autocomponents sector actually by 25.6%.

Energy is a central factor for economic growth and competitiveness is key to this, however it may be organized. As was noted at the World Summit on Sustainable Development in Johannesburg in 2002, where the energy-poverty nexus became a platform for a good few of the 200-plus public-private partnerships established there, ‘poverty reduction cannot happen without growth’. ■

# Resources

The projects and programmes described in this publication are featured on their own Internet media and Websites.

### **ASTAE**

Asia Sustainable and Alternative Energy program

[www.worldbank.org/astae](http://www.worldbank.org/astae)

This site includes project and programme documents and reports, and a detailed listing of documents and links used in this publication.

### **EBFP**

Environmental Business Finance Program

[www.ifc.org/ebfp](http://www.ifc.org/ebfp)

### **EMCA**

Energy Management Company (EMC) Committee of the China Energy Conservation Association  
[www.emca.cn](http://www.emca.cn)

### **ESMAP**

Energy Sector Management Assistance Programme

[www.worldbank.org/esmap](http://www.worldbank.org/esmap)

### **IREDA**

Indian Renewable Energy Development Agency

[www.iredaltd.com](http://www.iredaltd.com)

### **REDP**

China Renewable Energy Development Programme

[www.ndrcrdp.com](http://www.ndrcrdp.com)

### **RERED (Sri Lanka)**

Sri Lanka Rural Electrification and Renewable Energy Development Project

[www.energyservices.lk](http://www.energyservices.lk)

### **REREDP (Bangladesh)**

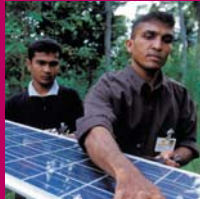
Rural Electrification and Renewable Energy Development Project

Solar PV Home Systems:

[www.idcol.org/files/enrgypro.htm](http://www.idcol.org/files/enrgypro.htm)

Rural Electrification Board:

[www.bangladeshgov.org/reb](http://www.bangladeshgov.org/reb)



The World Bank Group



Asia Sustainable and Alternative Energy (ASTAE)

1818 H Street, N.W.  
Washington, D.C. 20433  
United States of America  
[www.worldbank.org/astae](http://www.worldbank.org/astae)