Welcome to this week's presentation & conversation hosted by the **Canadian Association for the Club of Rome**, a Club dedicated to intelligent debate & action on global issues.

Renewable Energy Adventures: Solar and Small Hydro Stories that Bind Canada and Sri Lanka

Biography: Lalith Ananda Gunaratne is a member of CACOR - a parent, an entrepreneur, curator of global ethical business development and a mindfulness-based leadership consultant. His renewable energy ventures continue the Canada-Sri Lanka collaborations. Lalith is an Engineering Technologist by training and has a Masters in Responsibility and Business Practice from the Bath University - School of Business in the United Kingdom.

Description: The presentation will highlight a lifetime of renewable energy adventures with solar and small hydro that began with a Canadian-Sri Lankan collaboration in 1985 - continuing to date. The entrepreneurship story is captured in this chapter of a book "Ties that Bind" - https://canadiansrilankanpartnerships.wordpress.com/2012/08/11/solar-energy-canada-helps-sri-lanka-make-history/. The presentation will share stories of the technical, business, political and human issues as well the challenges and barriers that were faced and overcome with persistence and a vision. These adventures continue as renewable energy still faces many obstacles.

The presentation will be followed by a conversation, questions, & observations from the participants.

CACOR acknowledges that we all benefit from sharing the traditional territories of local Indigenous peoples (First Nations, Métis, & Inuit in Canada) and their descendants.

Website: canadiancor.com
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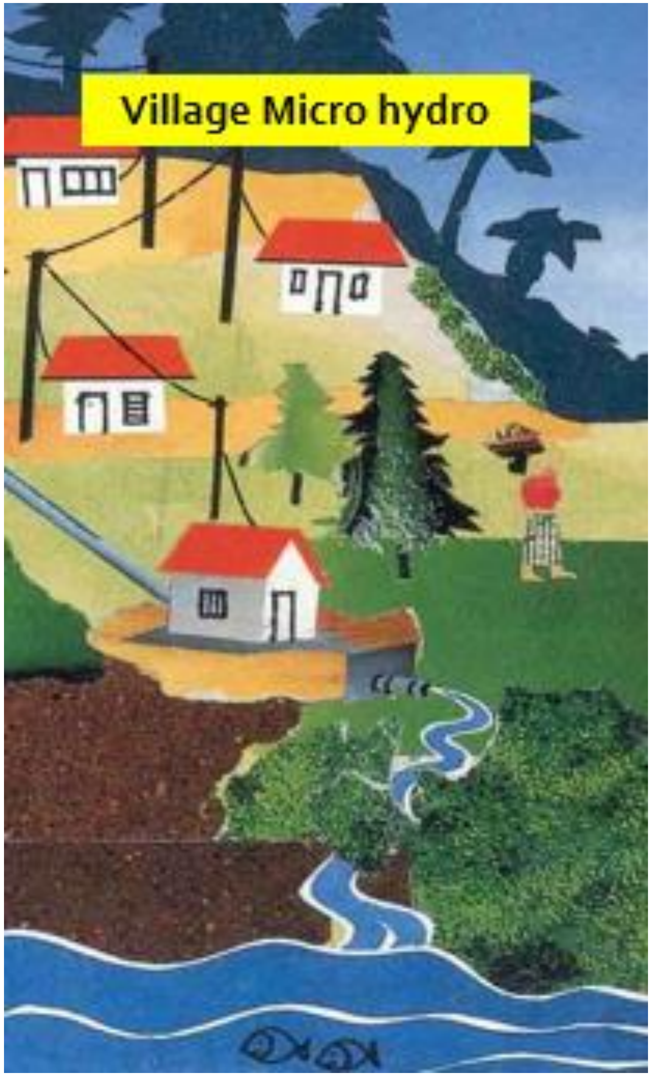
YouTube: Canadian Association for the Club of Rome
2024 April 03 Zoom #191

Renewable Energy Adventures: Solar and Hydro Stories that bind Canada and Sri Lanka

Lalith Ananda Gunaratne

CACOR - Ottawa

3rd April 2024



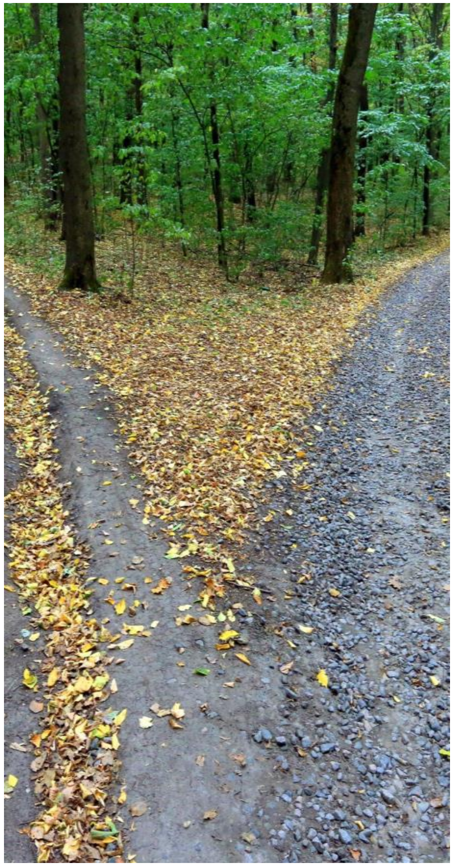
The Seneca College-Ontario Hydro Nuclear Program 1980-1983

We took the one less traveled by….1984

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I,
I took the one less traveled by,
And that has made all the difference.

Robert Frost




DIVERS
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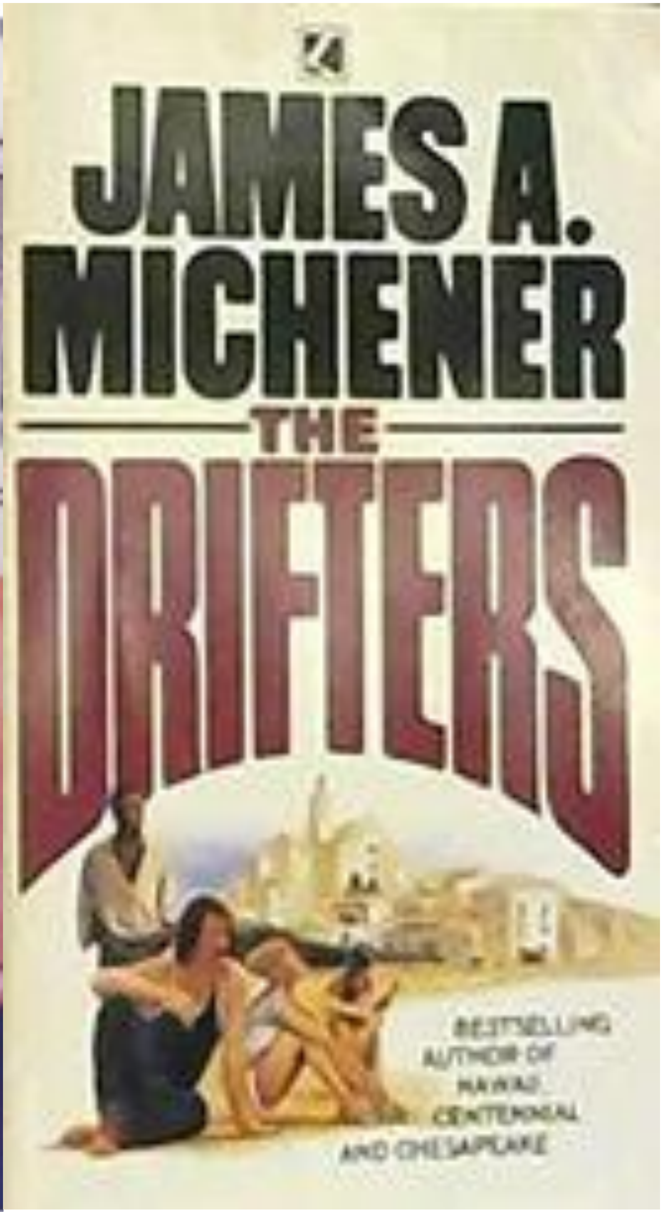

JAMES A.
MICHENER
THE
DRIFTERS
BESTSELLING
AUTHOR OF
HAWAII,
CENTENNIAL
AND CHESAPEAKE

The first concept comes to life - 1985

Fate decided – May 1985

Cheap sclar powered water pump

A mobile solar powered water pump which costs twenty-five times less to use than a conventional pump has been designed by two Sri Lankans.

It consists of a solar panel, a battery, and a detachable pump, all mounted on a three wheeled cart.

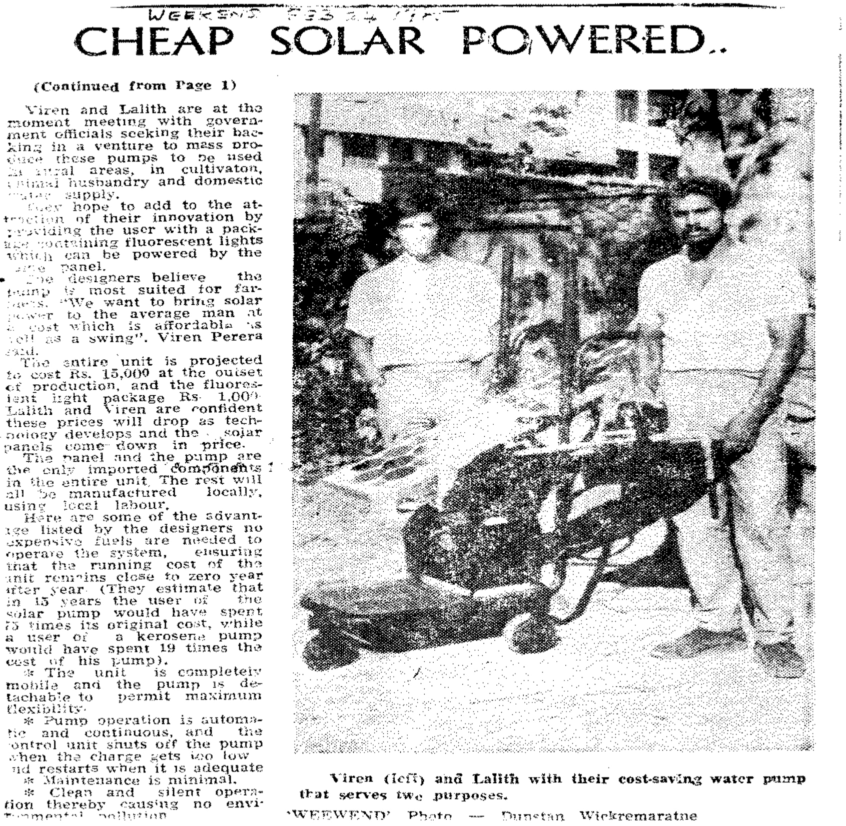
The panel (Arco—M53 Photovoltaic solar module) generates electricity, which is stored in the battery, which also contains an integrated charge control unit. A 12 volt, 60 watt pump is connected to the battery.

The unit can be wheeled to any water source. The user then detaches the pump, which is mounted on a wooden base which floats in the water. The pump when switched on, is capable of pumping 650 gallons of water a day to a height of 40 feet or 2,000 gallons a day to five feet.

The designers, Viren Perera and Lalith Gunaratne returned to Sri Lanka five months ago from Canada, where Viren received a bachelors degree in commerce, and Lalith a diploma in mechanical engineering.

Their pump reflects a blend of engineering and economics, and is both technically and economically advantageous over conventional pumps.

(Continued on Page 3)



WEEKEND [illegible]

CHEAP SOLAR POWERED..

(Continued from Page 1)

Viren and Lalith are at the moment meeting with government officials seeking their backing in a venture to mass produce these pumps to be used in rural areas, in cultivaton, animal husbandry and domestic water supply.

They hope to add to the attraction of their innovation by providing the user with a package containing fluorescent lights which can be powered by the same panel.

The designers believe the pump is most suited for farmers. "We want to bring solar power to the average man at a cost which is affordable as well as a swing". Viren Perera said.

The entire unit is projected to cost Rs. 15,000 at the outset of production, and the fluorescent light package Rs. 1,000. Lalith and Viren are confident these prices will drop as technology develops and the solar panels come down in price.

The panel and the pump are the only imported components in the entire unit. The rest will all be manufactured locally, using local labour.

Here are some of the advantage listed by the designers no expensive fuels are needed to operate the system, ensuring that the running cost of the unit remains close to zero year after year. (They estimate that in 15 years the user of the solar pump would have spent 75 times its original cost, while a user of a kerosene pump would have spent 19 times the cost of his pump).

* The unit is completely mobile and the pump is detachable to permit maximum flexibility.

* Pump operation is automatic and continuous, and the control unit shuts off the pump when the charge gets too low and restarts when it is adequate.

* Maintenance is minimal.

* Clean and silent operation thereby causing no environmental pollution

Viren (left) and Lalith with their cost-saving water pump that serves two purposes.

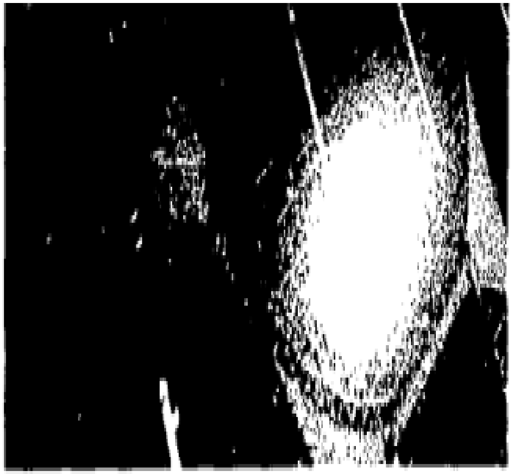
'WEEWEND' Photo — Dunstan Wickremaratne

Serendipitous Introductions to TPK Solar and GGE - 1985

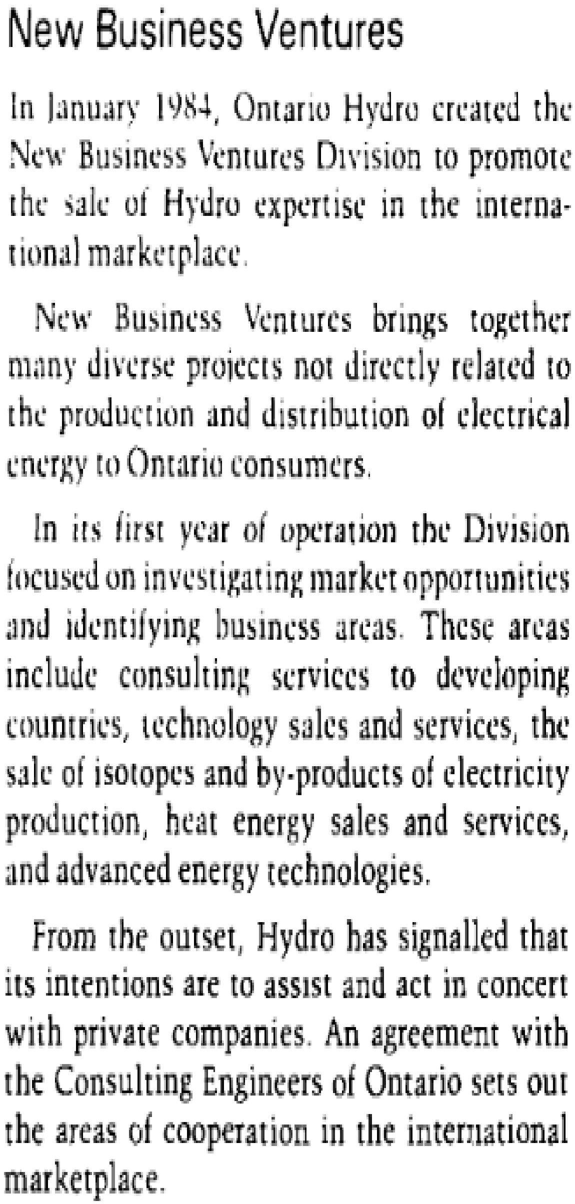
Ontario Hydro Annual Report 1984

https://inis.iaea.org/collection/NCLCollectionStore/_Public/19/037/19037063.pdf

Kortright Center PV System was manufactured and installed by TPK Solar in Napean, ON.



The first grid-connected residential photovoltaic cells in Canada generate 1 kilowatt of power on sunny days to meet the needs of the curator's home at the Kortright Centre for Conservation near Kleinburg, Ont. When power exceeds requirements of the home it is fed into the Vaughan Hydro system. At night, or during periods of inadequate sunshine, electricity is supplied by the utility.



New Business Ventures

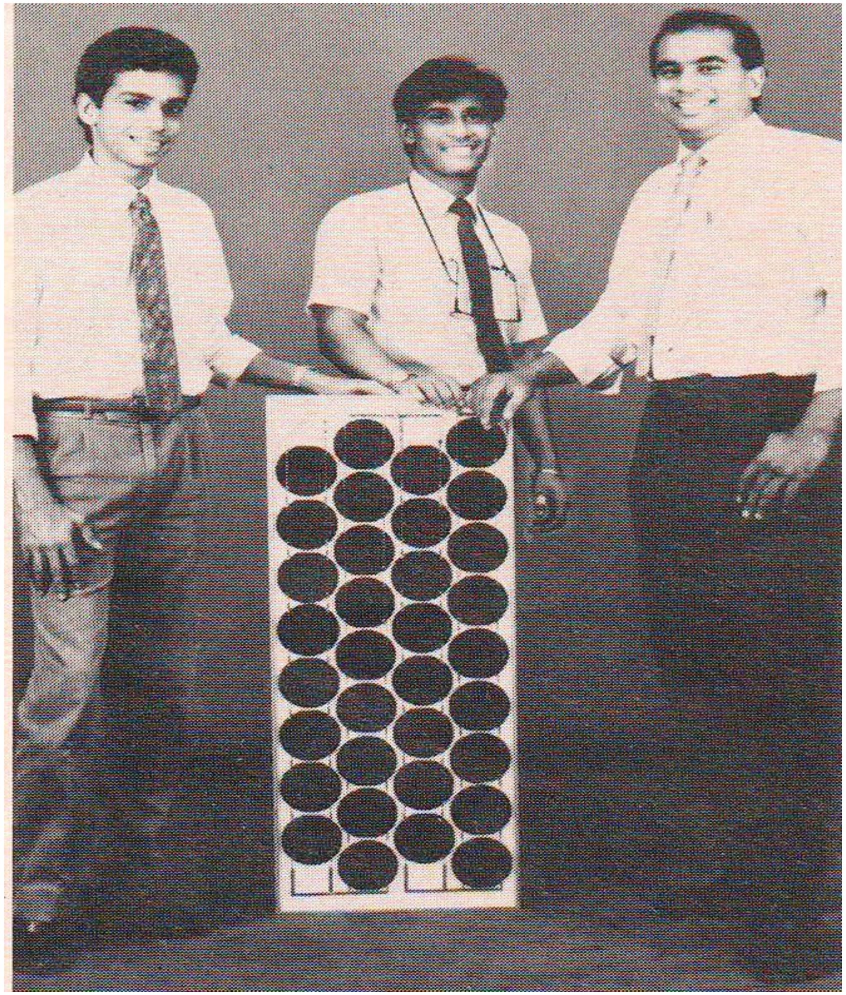
In January 1984, Ontario Hydro created the New Business Ventures Division to promote the sale of Hydro expertise in the international marketplace.

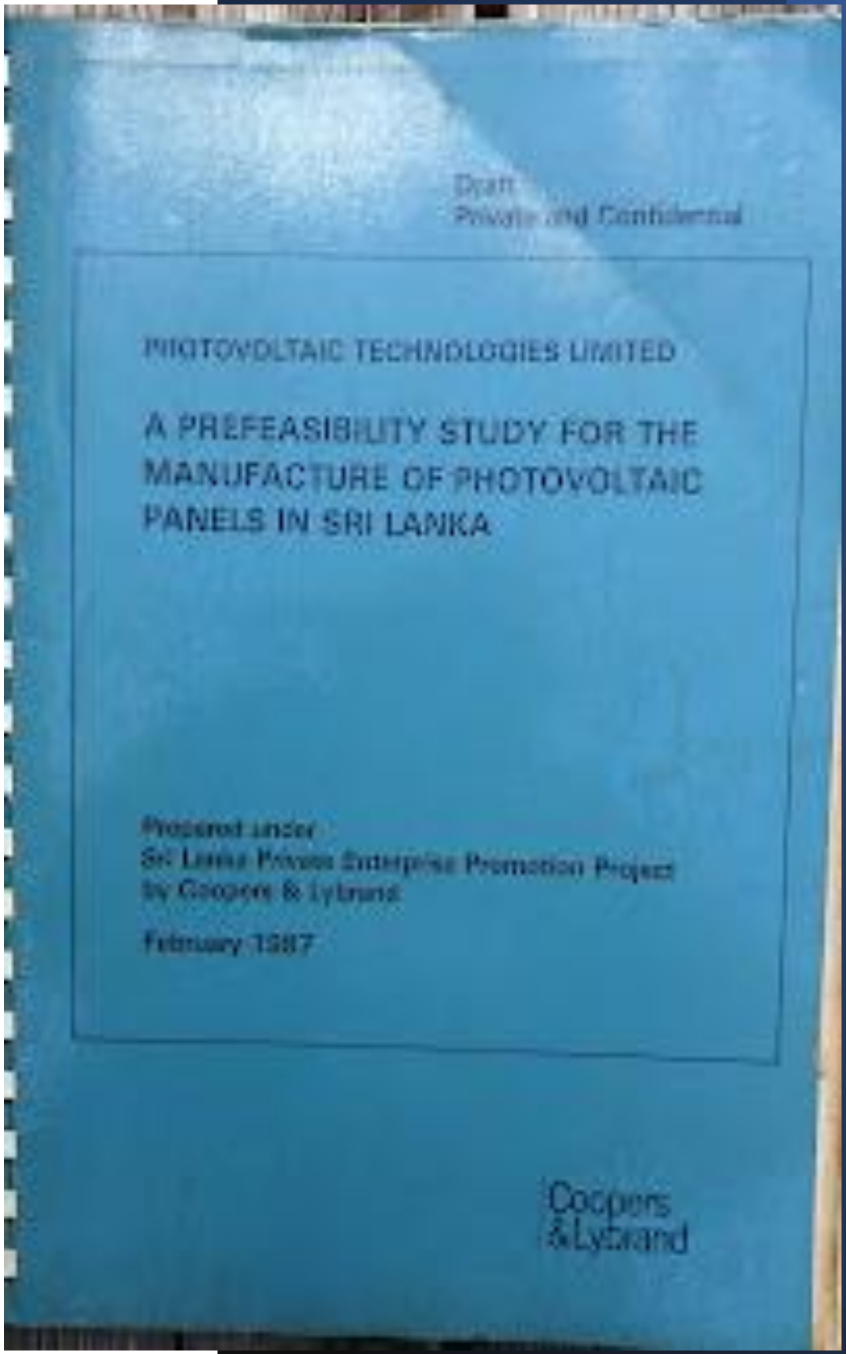
New Business Ventures brings together many diverse projects not directly related to the production and distribution of electrical energy to Ontario consumers.

In its first year of operation the Division focused on investigating market opportunities and identifying business areas. These areas include consulting services to developing countries, technology sales and services, the sale of isotopes and by-products of electricity production, heat energy sales and services, and advanced energy technologies.

From the outset, Hydro has signalled that its intentions are to assist and act in concert with private companies. An agreement with the Consulting Engineers of Ontario sets out the areas of cooperation in the international marketplace.

Birth of a Solar Energy Company





Draft
Private and Confidential

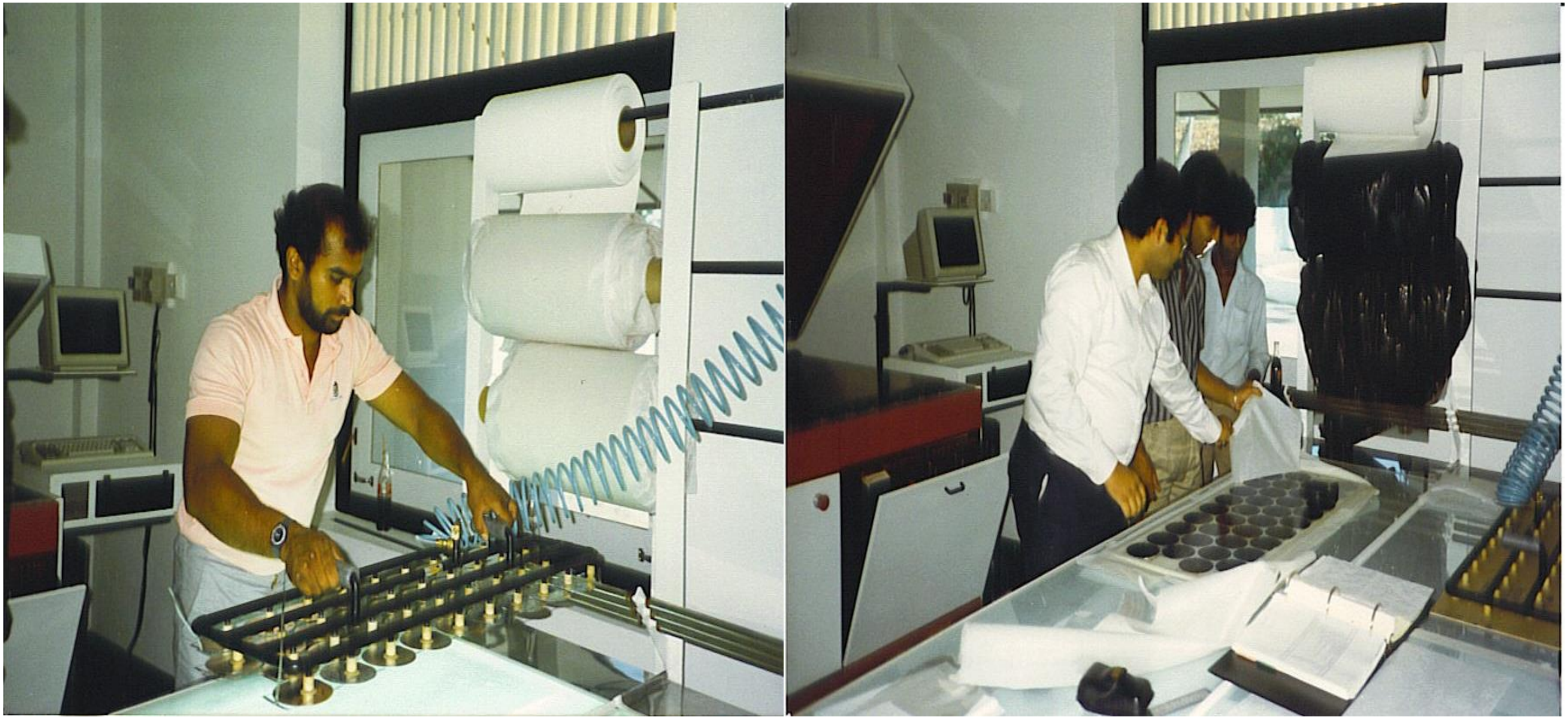
PHOTOVOLTAIC TECHNOLOGIES LIMITED

A PREFEASIBILITY STUDY FOR THE MANUFACTURE OF PHOTOVOLTAIC PANELS IN SRI LANKA

Prepared under
Sri Lanka Private Enterprise Promotion Project
by Coopers & Lybrand

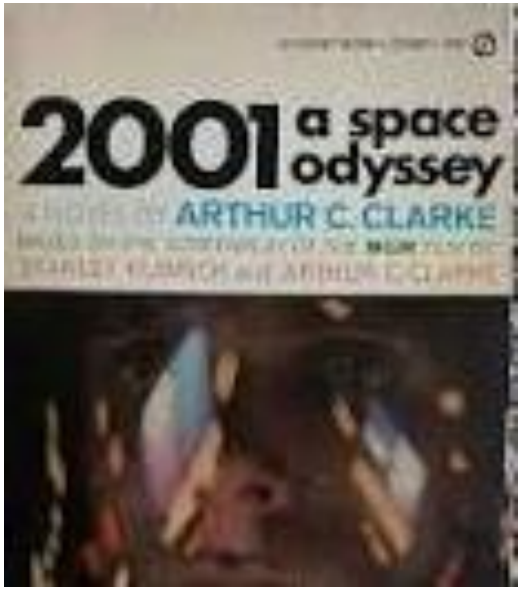
February 1987

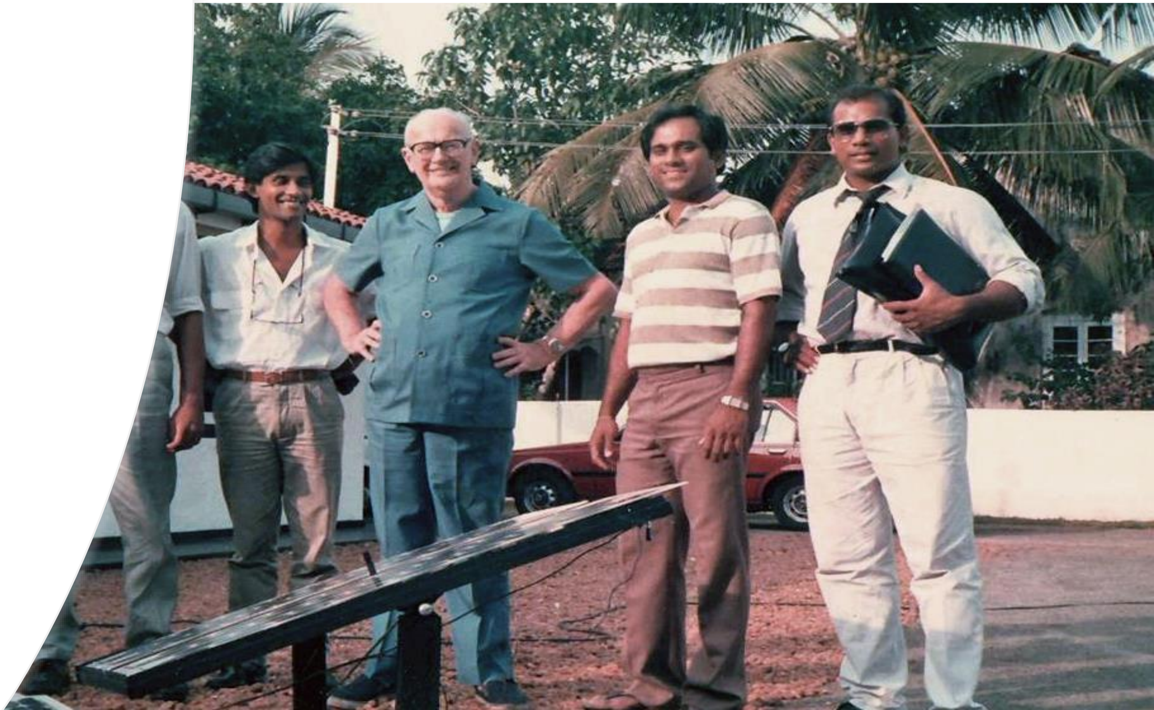
Coopers
&Lybrand



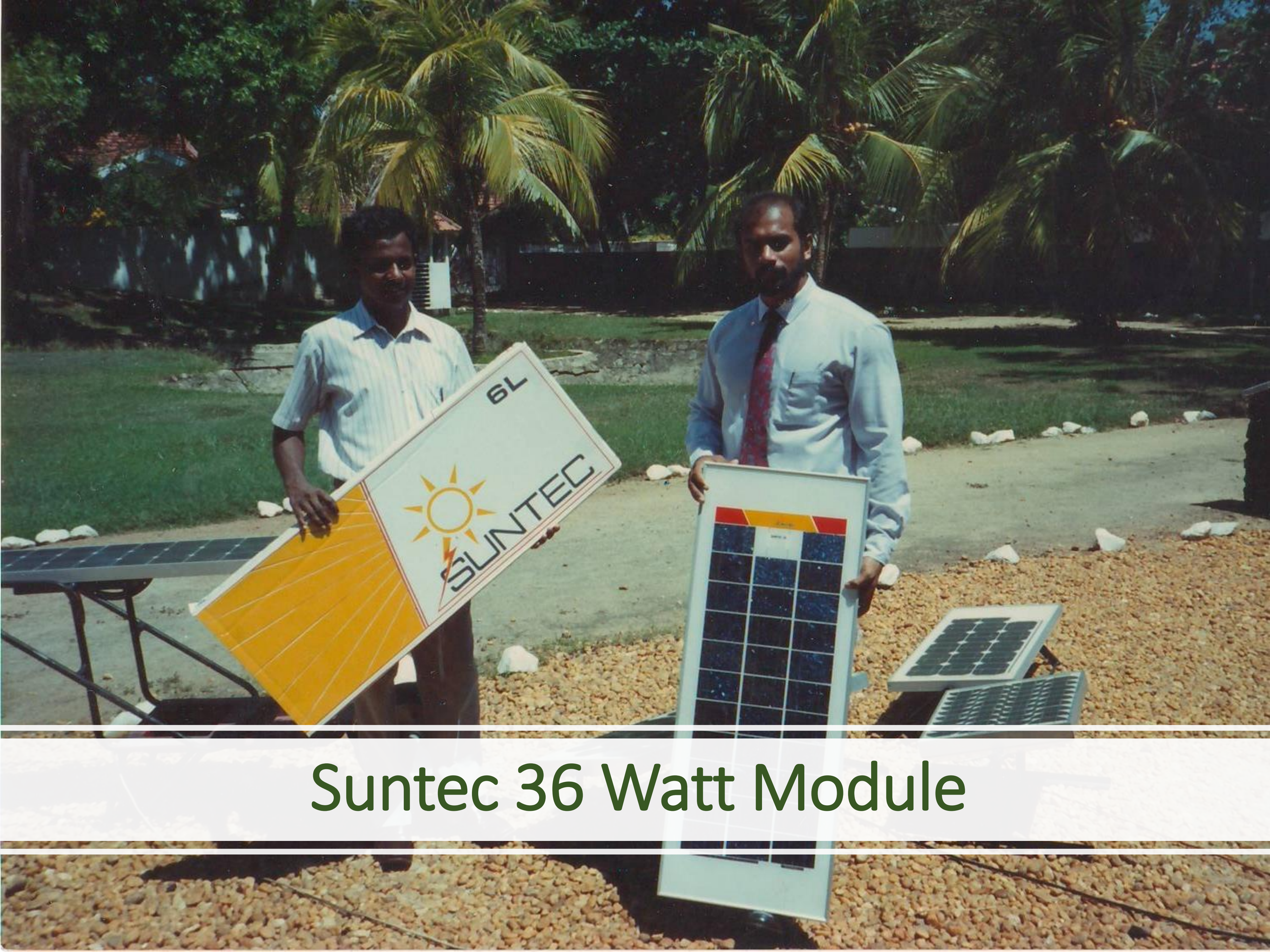
Making the first SUNTEC PV Module in Sri Lanka with Canadian TPK Manufacturing System

With a little help: Sir Arthur C Clarke + others





Our Solar Powered Electric Car – Sinclair C5 with SUNTEC PV Power



Suntec 36 Watt Module

Manufacturing for BP Solar

SUNTEC

Rural Vistas

Lighting up the Village – Benefits of Electricity 4 Ps of Marketing

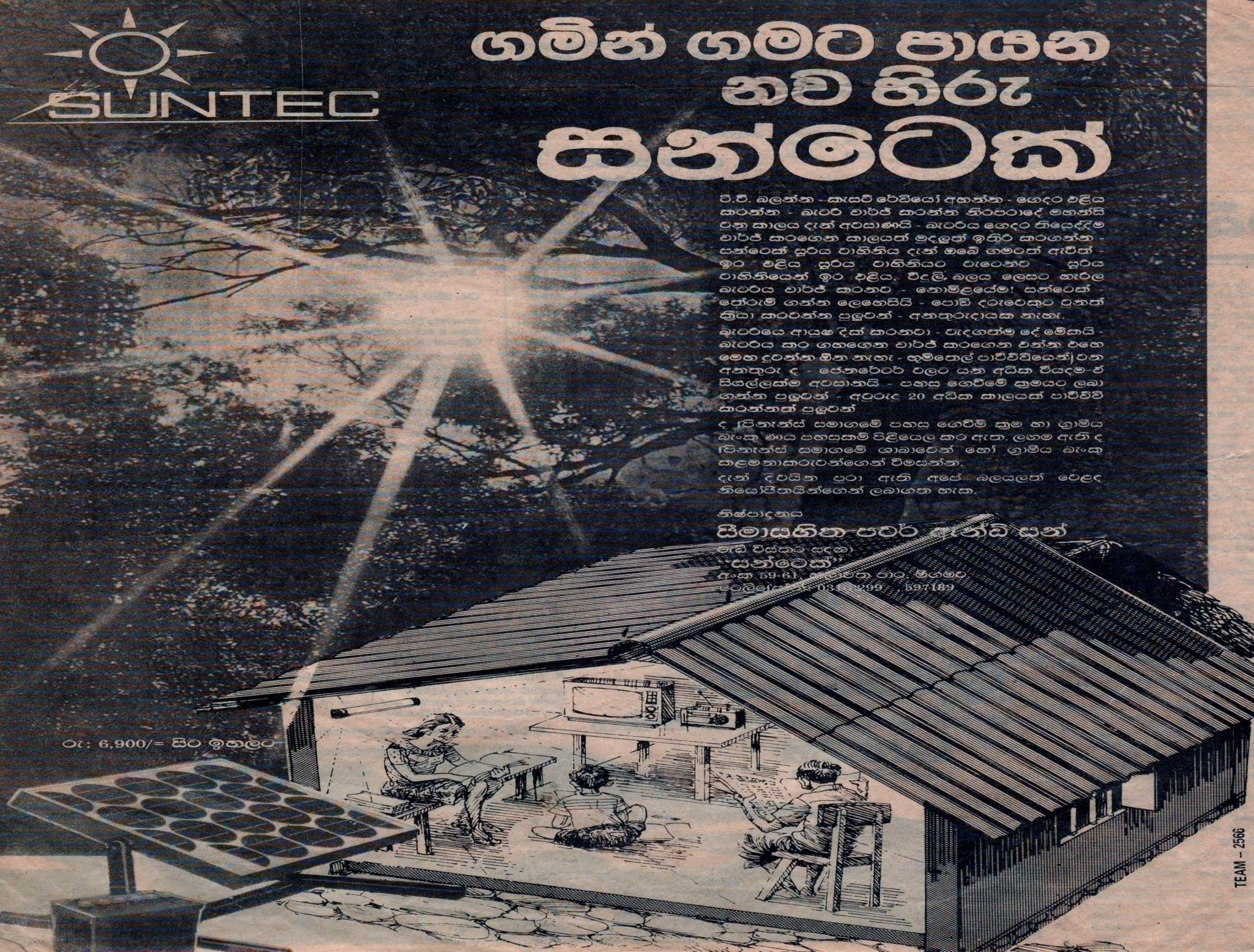
Product

Place

SUNTEC Marketing

Price

Promotion



ගමින් ගමට පායන නව හිරු සන්ටෙක්

ටී.වී. බලන්න - කැසට් රේඩියෝ අහන්න - ගෙදර එළිය කරන්න - බැටරි චාර්ජ් කරන්න නිරපරාදේ මහන්සි වුනු කාලය දැන් අවසාණයි - බැටරිය ගෙදර තියෙද්දීම චාර්ජ් කරගෙන කාලයත් මුදලුත් ඉතිරි කරගන්න - සන්ටෙක් සූර්ය වාහිනිය දැන් ඔබේ ගමටත් ඇවිත් - ඉර එළිය සූර්ය වාහිනියට වැටෙනව - සූර්ය වාහිනියෙන් ඉර එළිය, විදුලි බලය ලෙසට හැරිල බැටරිය චාර්ජ් කරනව - නොමිළයේම! සන්ටෙක් - තේරුම් ගන්න ලෙහෙසියි - පොඩි දරුවෙකුට වුනත් ක්‍රියා කරවන්න පුලුවන් - අනතුරුදායක නැහැ.

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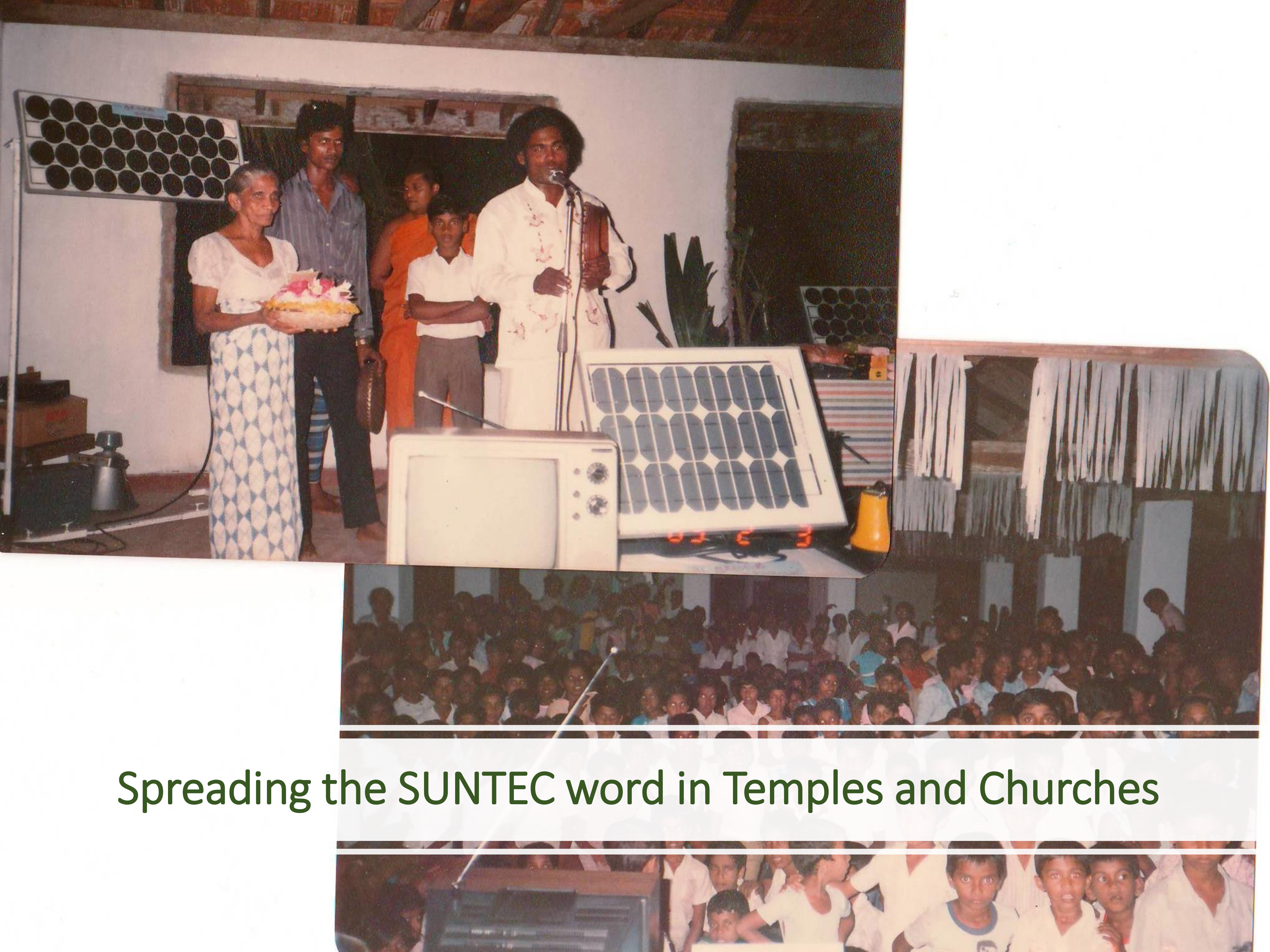
Village Market Promotions



Spreading the SUNTEC word in Temples and Churches

The Rural SUNTEC Dealers

The Typical Rural Home

An Alternative to the Kerosene Lamp

Getting Blindsided with a Smear Campaign

Solar power suitable for lotus eaters ?

It appears that a Solar Power promotional campaign is being conducted in a big way. *The Island*'s Business World 25.12.1988 carries the article "Ponnamperuma points the way for Lankan Lead in Solar Power", which he had delivered at a seminar on Solar Energy organised by SUNTEC. It says that the oil-consuming countries of the world have been livng on capital and not on income. Does this mean that Japan, advanced European and other progressive countri[illegible] pay for their large oi[illegible]mport bills with [illegible] capital and not w[illegible] income earned from using oil energy. How then are they so prosperous?

This theory may apply to Sri Lanka where

For a farming community to function on the proper lines, it should have agro based industries incorporated into the system. Similarly, fishing communities must have facilities to produce ice, fish processing and workshops to maintain and repair their boats and outboard motors. The power supply required to do these jobs cannot be met by photovoltaic cells. So what is the other substantial work these people can do with the little electricity the photovoltaic cells produce? The cell for Sri Lanka to lead the world in solar power is to drag the developing world too to become breeds of lotus eaters — only using power for lighting and listening to the radio and cassette

Solar electricity: too costly for consideration

Your correspondent's enthusiastic write-up on how solar power has "lit up" the lives of Lower Uva residents under the Mahiyangana Infrastructure Development Project (DN 28-12-92) and the equally enthusiastic editorial on the subject which appeared the next day, cannot be allowed to pass without comment.

Direct conversion of solar energy into electricity by means of solar cells is convenient, clean and non-polluting. It is also very expensive. So expensive, in fact, that no developing country should seriously consider solar electricity as anything other than a minute part of its total energy package to be used, if at all, only in a few highly specialised applications. It is most definitely not a viable option for rural electrification, at current cost levels of solar panels, batteries and ancillary equipment.

There is no doubt that electricity can greatly improve the quality of life. Where no mains power is available, even the marginal electrification provided by a small solar system, ie., two to three eight watt fluorescent lamps plus black and white TV for upto four hours a day, will certainly make a very great difference to the life of a rural family. The point at issue is not whether solar electricity is beneficial (it certainly is), but whether the extremely high cost can be justified.

The multinational purveyors of solar equipment and the local solar energy pedlars, who represent them, will naturally wax eloquent on the virtues of solar electricity. They will come out with the most puerile arguments to justify providing rural folk with solar electric lighting and TV even at great cost.

Astonishingly, these ideas are mindlessly echoed by some of our energy planners, who should certainly know better. One of the most ridiculous of these is that the population growth rate can be reduced by providing "alternative forms of entertainment" such

been having his daily bath for thousands of years, long before solar pumps were even thought of).

A small borehole pump capable of pumping up about a thousand gallons per hour and a diesel generator to power it would cost Rs. 50,000 at most. Fuel for the generator for a five hour operation would cost, say, Rs. 25, ie. Rs. 9000 per year. This could be financed by a lump sum of Rs. 60,000 on fixed deposit at 15% per annum. The total investment for the pumping system thus becomes Rs. 110,000, less than one seventh the cost of the solar system, with the added advantage of much greater flexibility and independence from the vagaries of the weather.

Even the fuel cost of Rs. 25 per day could be virtually eliminated by running the generator on biogas/diesel, a procedure which would require only a simple modification to the engine, a biogas producing digester and regular inputs of cowdung and waste vegetable matter (why is appropriate technology in this country confined to research centres and learned papers, and never really used?).

For rural electric lighting and TV, a simple cost effective system would be an extension of the "*Prashakthi*" system developed and popularised by NERD Centre many years ago. All that a solar panel does is charge a battery during the day (at great initial cost, and only if the sun is shining) so that it can be used to power some fluorescent lights with built-in inverters and a small battery-operated black and white TV at night.

The same result is achieved much more cheaply and reliably, if slightly less conveniently, in the "*Prashakthi*" system, where the battery is charged at the nearest battery charging shop and then used for a fortnight or even a month, depending on usage and battery capacity, before being brought for re-charging.

At present the limitation is that there should be a battery charging shop with a mains power supply within reasonable distance of the rural community concerned, if the "*Prashakthi*" arrangement is to work satisfactorily, and a major inconvenience is that the consumer has no supply while his battery is being re-charged. Both these problems can be overcome if the system is properly organised and managed, either by a government agency or by a large private sector organisation.

Once target communities are identified, a network of battery charging centres can be set up, wherever possible at the nearest location served by the grid. In areas very far from the grid, the charging centre could be equipped with a biogas/diesel engine driven battery charging unit.

Next, instead of the present "*Prashakthi*" system where the consumer buys a new battery every three years or so, each charging centre could maintain a stock of batteries and the consumers would pay a rental charge plus a charging fee. The consumer would return his discharged battery and immediately receive a fully charged battery in exchange instead of having to wait for his battery to be charged.

The solar energy pedlars speak of solar/electric vaccine refrigerators (very expensive, but the way) as if that were the only way of keeping vaccines cold without mains electricity. Why does everyone seem to have forgotten the tried and tested (and cheap) "absorption cycle" refrigerators which require only a small kerosene flame to keep them running silently and without fuss?

Even the small amount of kerosene required could be done away with by substituting a small biogas burner for the kerosene lamp. If rural hospitals were provided with refrigerators of this type and small digesters to produce biogas, there would be no need for expensive solar vaccine fridges.

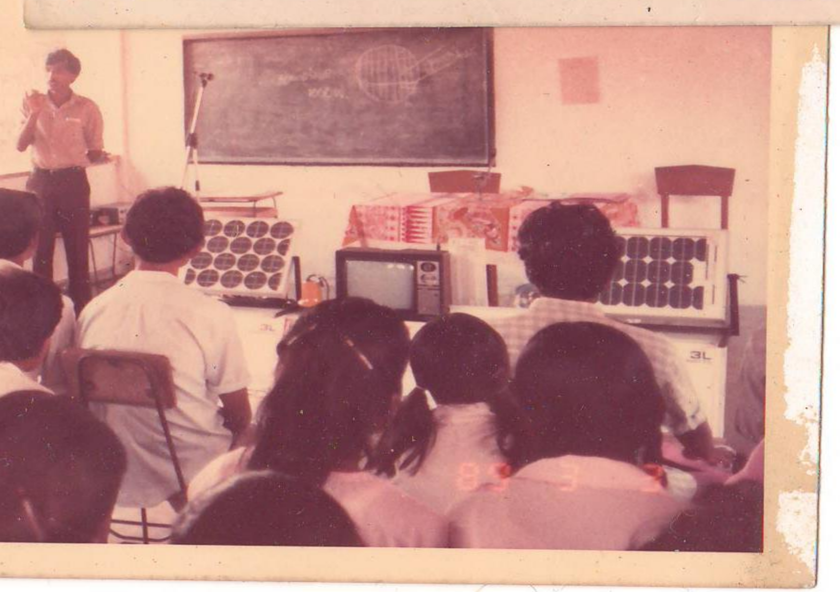
The plain truth is that solar electricity has been a failure all over the world, not because the technology is defective but because costs are too high. This is amply proved by the fact that most of the world's major solar companies have been losing heavily for years and many have closed down.

Those who have survived have done so only because they are subsidiaries of large conglomerates whose other operations are profitable. Your report says that the Mahiyangana Infrastructure Development Solar Project is being funded by an Australian government grant. Fantastic, for the moment.

In a few years time, when solar batteries, pumps, lights etc. (all very expensive) have to be replaced, who is going to fund that? The Sri Lankan taxpayer, no doubt.

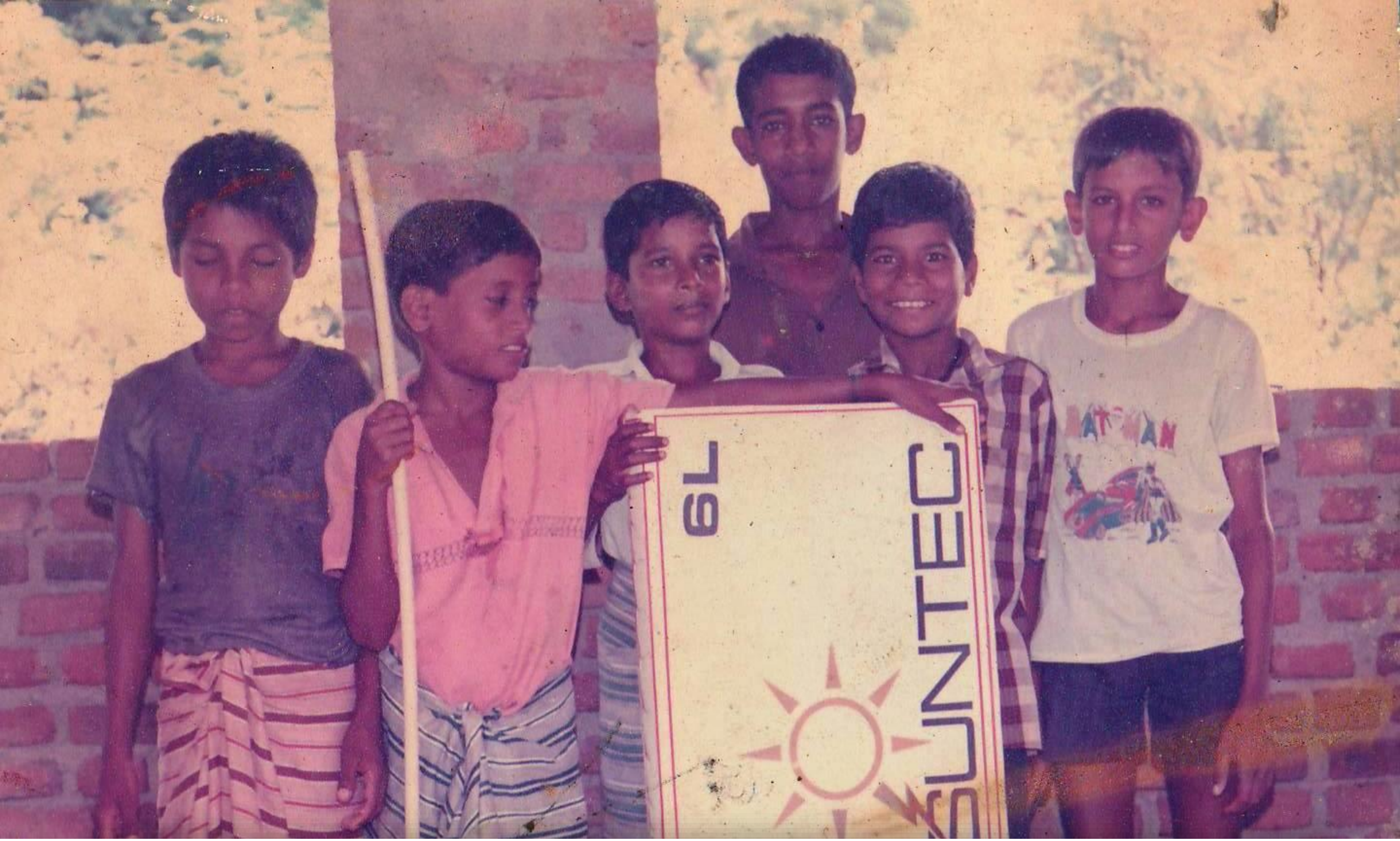
"Son of the Soil"
Colombo.

Training Rural Youth on a Novel Technology



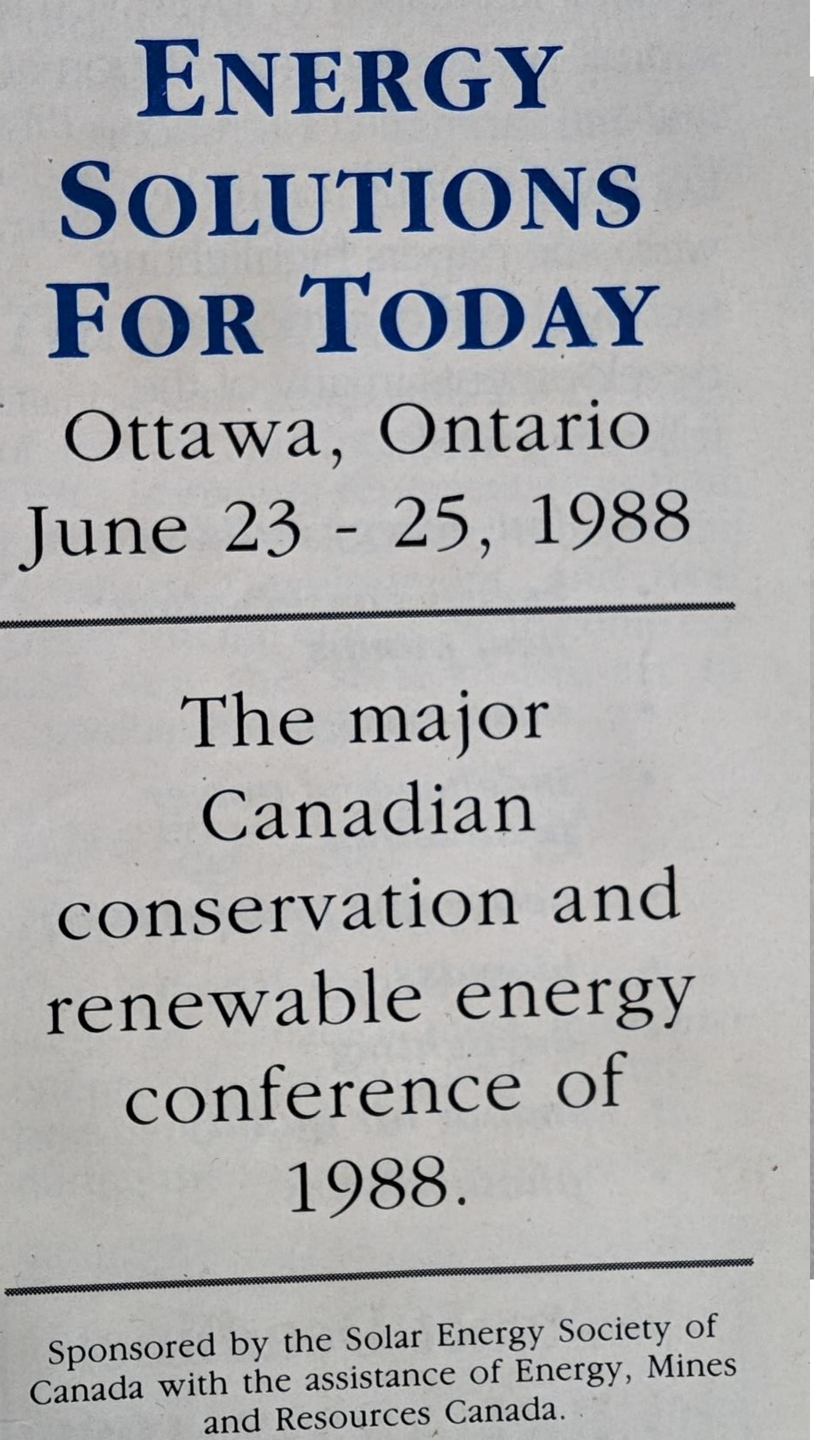
Electricity and Quality of Life

International Support…Solar Electric Light Fund USA – Neville Williams



The Happy Faces


SOLAR POWERED VACCINE REFRIGERATOR
SINGER
SINGER
SUNTEC
SINGER

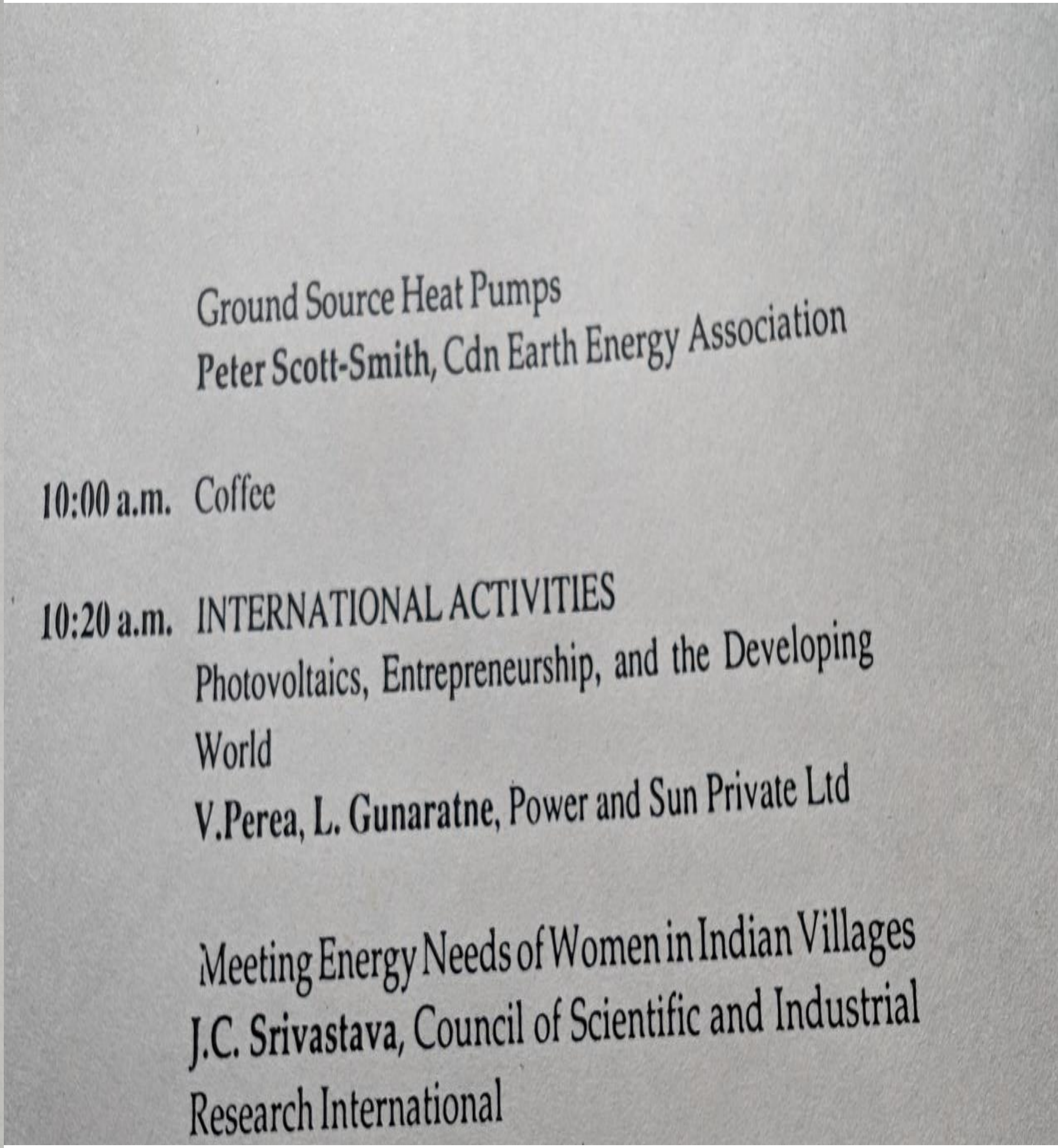


ENERGY SOLUTIONS FOR TODAY

Ottawa, Ontario
June 23 - 25, 1988

The major Canadian conservation and renewable energy conference of 1988.

Sponsored by the Solar Energy Society of Canada with the assistance of Energy, Mines and Resources Canada.

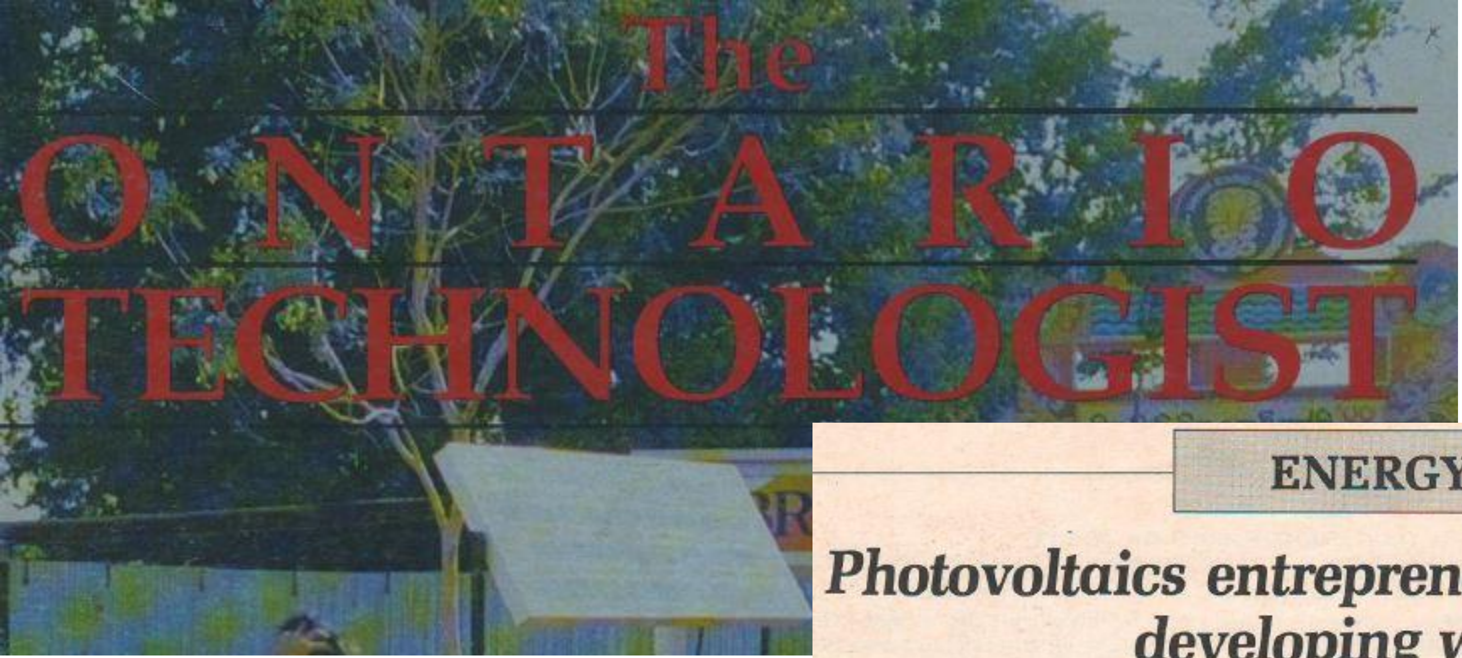


Ground Source Heat Pumps
Peter Scott-Smith, Cdn Earth Energy Association

10:00 a.m. Coffee

10:20 a.m. INTERNATIONAL ACTIVITIES
Photovoltaics, Entrepreneurship, and the Developing World
V.Perea, L. Gunaratne, Power and Sun Private Ltd

Meeting Energy Needs of Women in Indian Villages
J.C. Srivastava, Council of Scientific and Industrial Research International



The ONTARIO TECHNOLOGIST

ENERGY

Photovoltaics entrepreneurship and the developing world: An insight into setting up a solar energy industry in Sri Lanka

By Viren Perera and Lalith Gunaratne, CET
Joint Managing Directors
Power & Sun (Private) Limited
Negombo, Sri Lanka

edgement to their partner, Pradip Jayewardene,
for his valuable contribution

Lalith Gunaratne (second from right) met last August at the Ontario Legislative Building, Toronto, with (from left) the Honourable Robert Wong, Minister of Energy; the Honourable Alvin Curling, Minister of Skills Development; the Honourable Monte Kwinter, Minister of Industry, Trade and Technology; and the Honourable Vince Kerrio, Minister of Natural Resources.

Publicity, Recognition and Academic Publications..

NEVILLE WILLIAMS

Solar Serendipity:

Photovoltaic Rural Electrification in Sri Lanka

The Island of Serendib—formerly Ceylon, now Sri Lanka—has become a leader in the developing world in the number of rural households powered by solar electricity. Over three thousand Sri Lankan families now derive their electric service directly from the sun, using a single roof mounted PV panel. These solar home lighting systems are manufactured locally, using indigenous materials, from batteries to lights. The Kyocera solar cells are imported from Japan and the modules are assembled in Sri Lanka.

Thanks to the unique entrepreneurial efforts by the Sri Lankan firm of Power & Sun, which manufactures Suntec solar modules and electric systems, this country has proved to the world that it doesn't need Western or Northern experts to tell it how to apply solar solutions to rural energy development. With loans from two national development banks, Power & Sun was started 5 years ago by three young Sri Lankans who attended university together in Toronto before returning to their homeland. "The sunshine boys," as they're known around their Colombo Rotary Club, have proved to most non-believers that home solar electric systems can address the needs of the 70 percent of Sri Lankans without access to conventional electricity.

Solar Electric Light Fund

This Sri Lankan family has a 20W solar electric system. The children love doing their schoolwork by electric light.

Charged by the Sun

A 35-watt Suntec system using a 90 amp car battery can provide approximately 9 ampere hours of power nightly, enough to operate 4 DC, 12v fluorescent lights up to 3 hours each (or 6 lights, 2 hours each), a 12v B&W TV set for 3 hours and a radio for 4 hours. Houses are wired neatly with wall mounted switches and hanging light fixtures in each room, and often boast an exterior or porch light. Inexpensive 12v, 10W fluorescent light fixtures are manufactured locally as a government-sponsored cottage industry and bulbs are imported from China and cost 30 cents. The system price, installed, is close to US$600. There is also a less expensive 20W Suntec model.

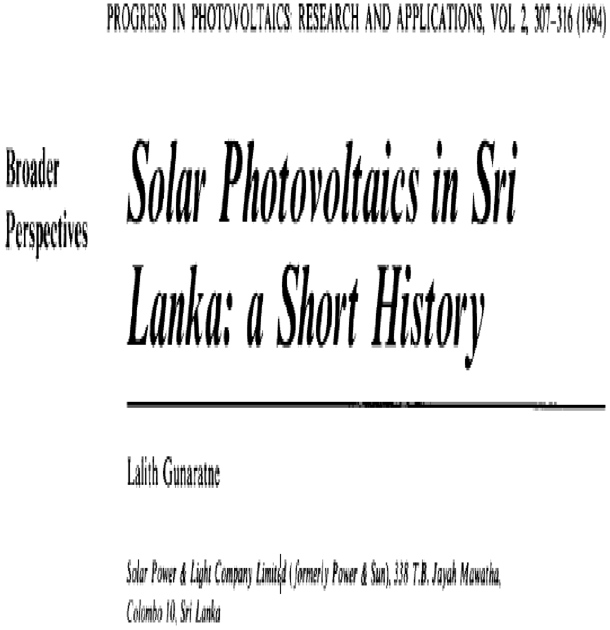
Prices will come down with large-volume production. The factory's capacity is 1500 modules per month, but its current production level is much lower while the company concentrates on market building (which, incidentally, the United Nations has identified as the number one barrier to photovoltaics worldwide—not technology or the economics of solar electricity). Sri Lankan-made, rubber-cased car batteries, with their thick plates, work fine in this application, but need to be replaced every 3 years. Imported, long-life, deep-discharge batteries are too expensive for household use. Battery storage provides up to 5 days autonomy during overcast periods without recharging by the sun. Suntec systems include a voltage charge indicator but not a controller. Trial and error field experience has shown that people best manage their own power consumption and battery current by using inexpensive, locally made charge indicators with little red and green lights.

Right now, an estimated 300,000 Sri Lankans are using car batteries in their

22

SOLAR TODAY

Solar Power & Light Ltd. was recognized for bringing power to the people of rural Sri Lanka. Company principal Lalith Gunartne holds Outstanding Technical Achievement award.



PROGRESS IN PHOTOVOLTAICS: RESEARCH AND APPLICATIONS, VOL 2, 307-316 (1994)

Broader Perspectives

Solar Photovoltaics in Sri Lanka: a Short History

Lalith Gunaratne

Solar Power & Light Company Limited (formerly Power & Sun), 338 T.B. Jayah Mawatha, Colombo 10, Sri Lanka

Shell enters the solar business

In September 1999, Shell Solar Lanka Limited acquired Solar Power and Light Company and the SUNTEC brand name and established in Sri Lanka….

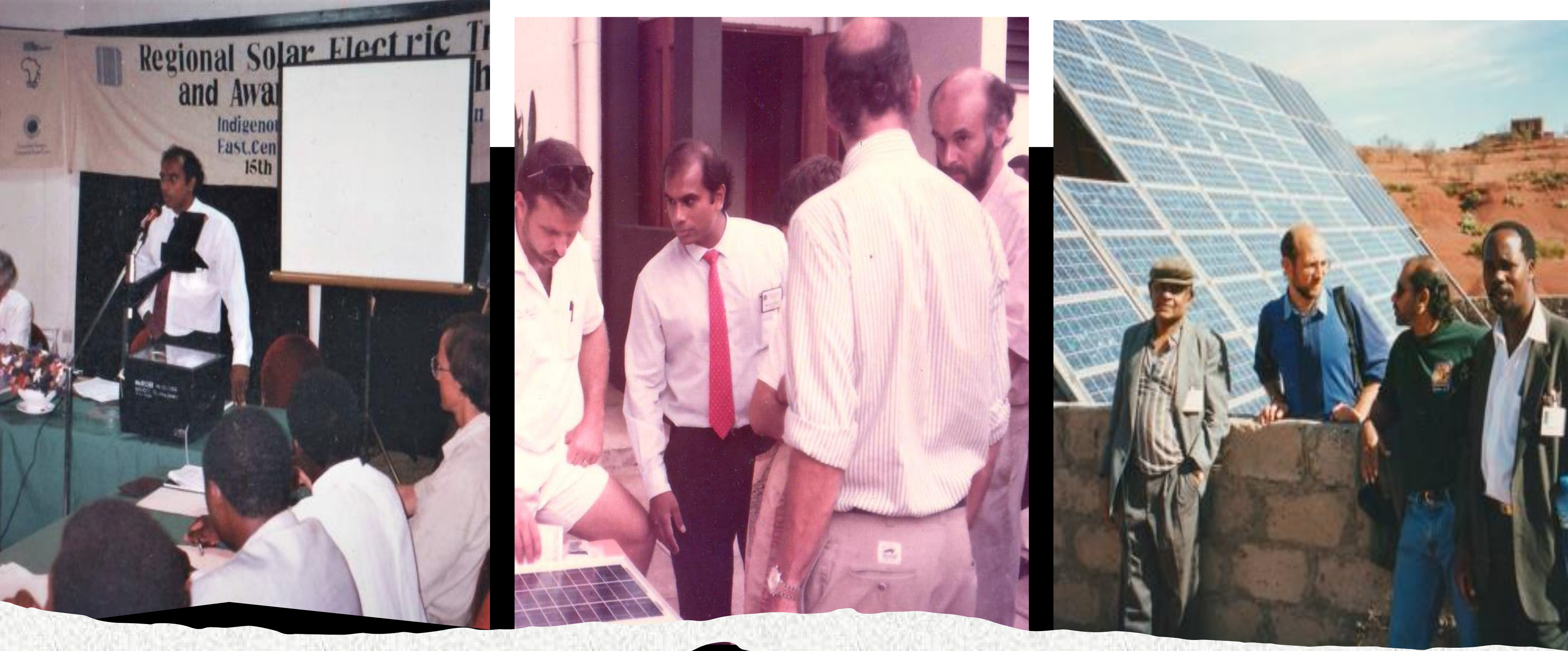
Shell exits the solar business….

- **In 2007 – Shell made a strategic decision to exit the solar business.** They sold their manufacturing to Solar World and their customer service and maintenance arm in Sri Lanka to Environ.

- According to Damian Miller, a former Shell manager who now heads his own solar business, Orb Energy**. "Shell exited the solar industry on a global basis, seemingly without due consideration to how after-sales service and warranty replacements would be provided, thereby damaging the very local solar industries it had earlier helped to create."**

- A Shell spokesman in the Hague countered by saying that "In October 2007, Shell sold Shell Solar Lanka Ltd to Environ Energy Global PTE Ltd. Specifically in order to protect customer interests, the terms of the transaction explicitly covered the management of all past, present and future liabilities, including warranty issues."

http://www.solar-facts-and-advice.com/shell-solar.html



International Consulting on Renewable Energy

7

SUNSHINE AND SERENDIPITY: 1991–2000

Serendipity, as you'll recall from chapter 2, brought me back to Sri Lanka, the teardrop island nation at the tip of India, which I had first visited in 1971. In our late twenties, my first wife and I set off round the world and spent a wonderful month together on the fantasy island of Ceylon, visiting all the tourist sites with a hired driver: the ancient cities of Polonnaruwa, Anuradhapura, Sigiriya; the beaches; the temples; the tea estates. We lived like sahibs at the Queen's Hotel in Kandy, at the government guesthouses set in lush gardens with monkeys in the shade trees, and at the historic Galle Face in Colombo, where we were the only guests. The Galle Face was a place to which I was serendipitously to return exactly twenty years later.

In March 1991, Lalith Gunaratne pulled up in front of the now-refurbished Galle Face Hotel on Galle Road (the coast route to Galle, the Portuguese and Dutch fort city in the south). Built in 1862 in the grand British colonial style, it is one of the oldest hotels in the world in continuous operation. It anchors the Galle Face itself, a huge expanse of open grass south of the old parliament building between the Indian Ocean and Galle Road. Its rooms are large enough to fly small aircraft in, and ocean breezes make it tolerable when the feeble air-conditioning doesn't. Sri Lanka is seldom as hot as Washington, D.C., but its extreme humidity can drive you mad. You can come to terms with it on the long, open veranda beneath a dozen ceiling fans, where white-robed waiters with brass number tags solicitously bring you fresh lime sodas. Several of the waiters I remembered from 1971 were still there in 1991, and one even remembered me. All our solar adventures in Sri Lanka were launched from the Galle Face veranda, including SELCO-Sri Lanka, which I'll get to momentarily.

Lalith jumped out of his red Toyota sedan and came around to greet me on the steps. Built like a wrestler, dark-complected, with a full beard, he looked like someone out of a Sinbad movie. He was stylishly dressed and spoke his Sri Lankan English with a lilting accent tempered by his upbringing in Toronto.

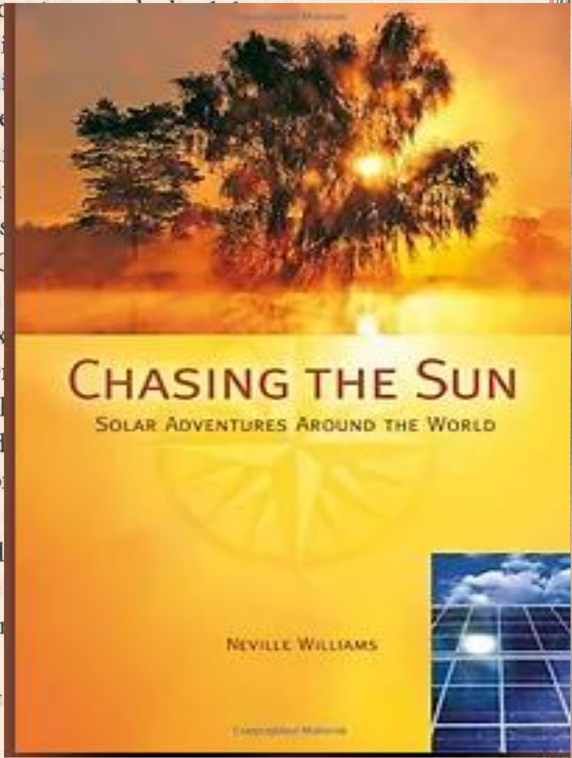
"Welcome to paradise!" he exclaimed. "Do you like old car rallies? Samantha and I want to take you with us to the Mercedes-Benz rally in Victoria Park."

"Sure," I said, surprised. So here I was on my first afternoon back in Ceylon, now renamed Sri Lanka, and I was going to an upscale Sunday-afternoon function with the cream of Colombo society to look at classic Mercedes-Benzes. It turns out there are a lot of them in Sri Lanka! I once had a used Mercedes, so I could appreciate what I was seeing.

Lalith owned a small, pioneering, solar PV company, which he and two of his fellow Canadian Sri Lankans had started five years before, deciding after college tc
left. Lalith had originally studi
Canadian university. I asked hi
replied, "Because I woke up one
that splitting the atom is an u
the building blocks of the uni
formed Suntec with family inves
ment Finance Corporation of C
lives of rural people with solar

Thanks to the miracle of fax
Lalith regarding Suntec's inte
tomer's doorstep." I wrote to I
efforts wherever we could, and
projects; we'd already been pro
Jones Foundation to launch a
counted in chapter 2. We woul
and I decided we might as well

Lalith and his friends had i

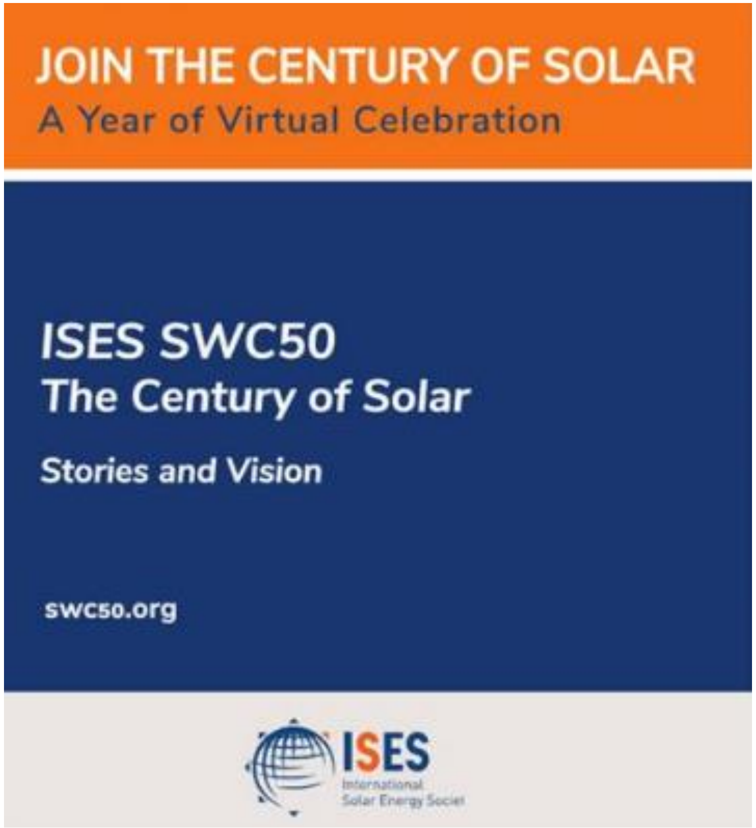


CHASING THE SUN

SOLAR ADVENTURES AROUND THE WORLD

NEVILLE WILLIAMS

International Solar Energy Society Celebrates Pioneers



JOIN THE CENTURY OF SOLAR

A Year of Virtual Celebration

ISES SWC50

The Century of Solar

Stories and Vision

swc50.org

Lalith Gunaratne

Country: Canada

Year joined industry: 1984

Company first worked for: Power & Sun (Pvt) Limited, Sri Lanka - 1986

Technology area: PV

Still active in the industry: Yes

The pioneering solar-PV business was established in Sri Lanka by three partners – Pradip Jayewardene, Viren Perera and Lalith Gunaratne in 1986.The idea born from a sketch of a mobile solar pump by Micheal Mustachi led the trio to establish a business to manufacture and market solar home systems for lighting and TV for rural farmers in Sri Lanka. Futurist Sir Arthur C. Clarke, innovator Dr. Ray Wijewardene and entrepreneur Mr. Prem Sumanasekera mentored the trio. A USAID funded market/feasibility study concluded that a portion of the 84% rural homes without access to grid power could afford to purchase a system. The findings helped raise capital through development banks of Sri Lanka to purchase a PV manufacturing plant from TPK-Solar in Canada. The trio developed an organization led by Ajit Chanmugam and Prasanna Pathirana on technical and Nimal Lakshpatiarachichi for marketing - to manufacture solar PV modules with the balance of system to market, sell, install and maintain the systems around the country through a network of dealers and agents. The original company, Power & Sun (Pvt) Limited promoted the SUNTEC branded systems to rural farmers who would spend between USD 200 and 400 to purchase a system. Micro financing was made available through Sarvodaya SEEDS to expand the market. Neville Williams of the Solar Electric Light Fund in USA discovered the pioneering venture in 1989 and promoted the business model globally which attracted the World Bank to study it. The World Bank team led by Loretta Schaeffer and Anil Cabraal worked with the trio to establish a USD 100 million fund for solar and other decentralized renewable energy technologies in 1993 which has seen over 120,000 solar homes systems installed. The venture - reorganised as Solar Power & Light Company was sold to Shell Renewables International in 1999.

2011

Canada Bound….

Green energy failure

– *Appeared in the Financial Post*

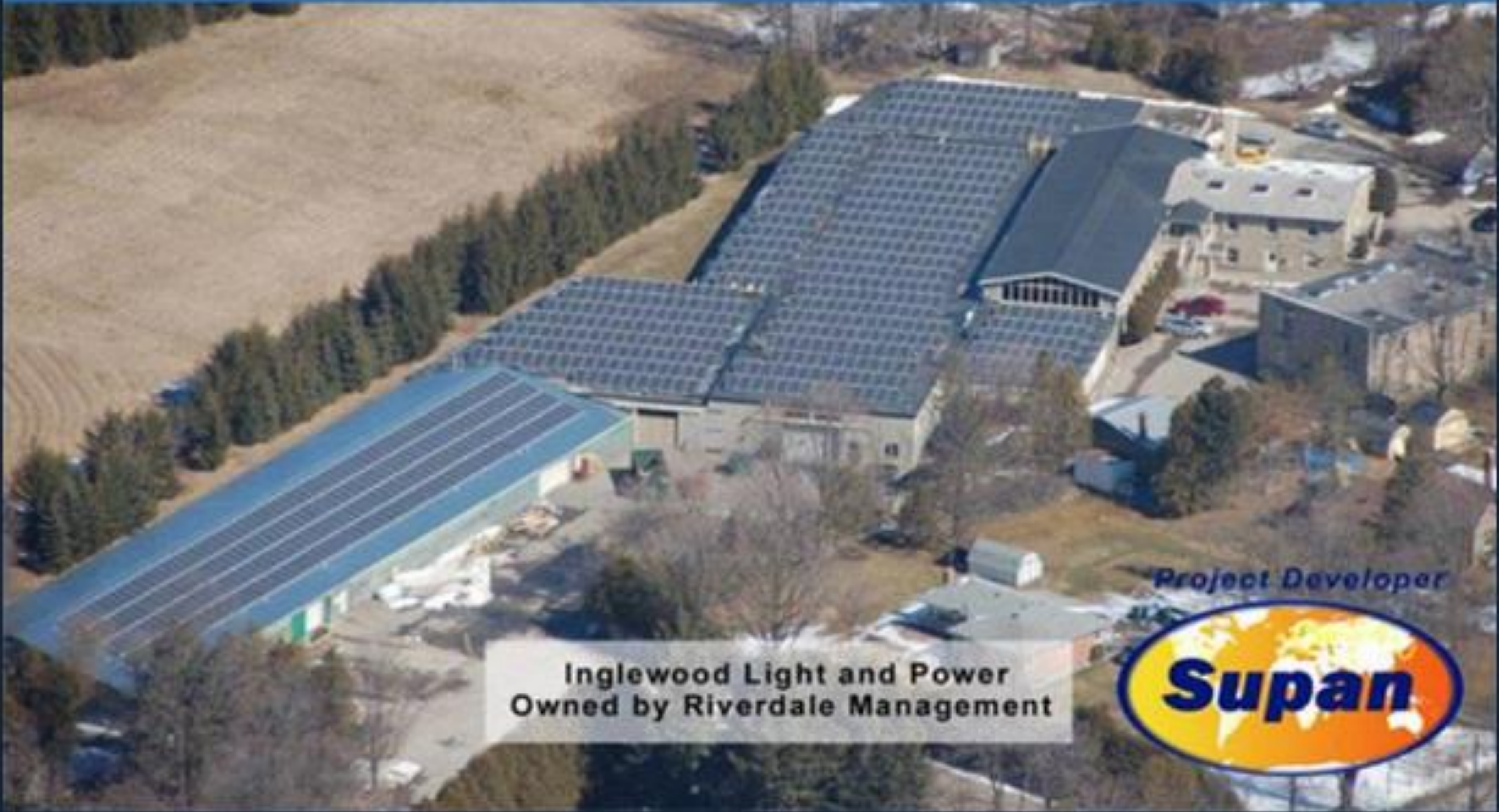
The pledge by Ontario PC leader Tim Hudak to roll back key provisions of the Ontario Green Energy Act is a courageous move and deserves to be applauded. It will likely spark intense debates as we head into the upcoming election. It is hard to say whether public opinion will be on his side, but the facts certainly are.

Moving to Ottawa and Investing in Supan Group…..

Ontario FIT program projects on a platter gets caught up in Provincial Politics…

CanSIA

2012 Game Changer Awards
Solar PV Project of the Year



Inglewood Light and Power
Owned by Riverdale Management

Project Developer

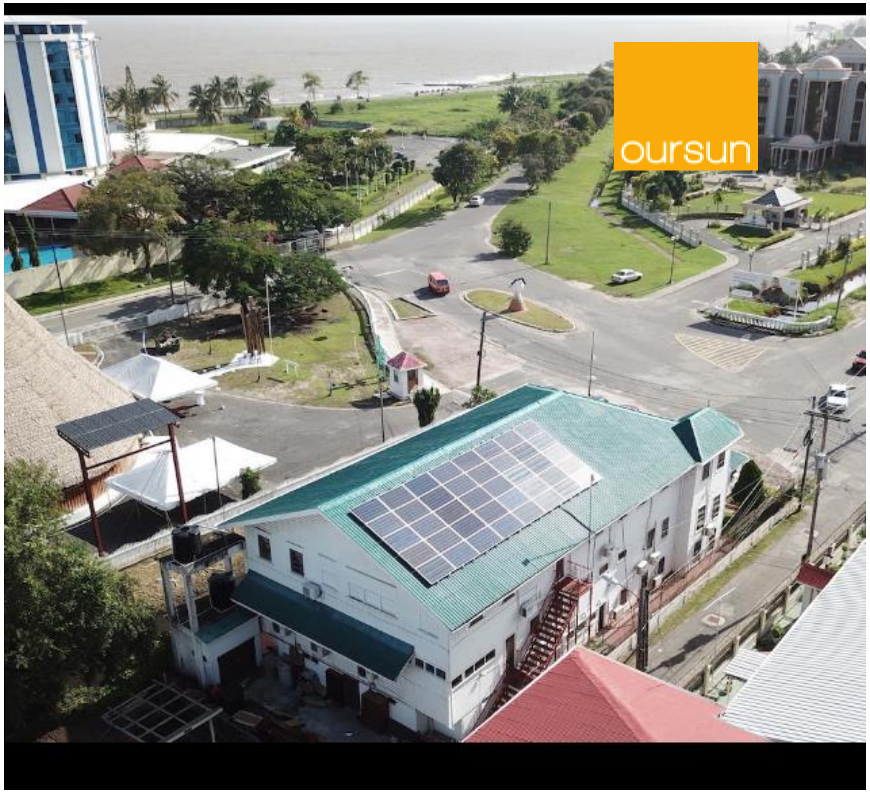
Supan

oursun

clean energy
services and solutions

oursun Canada

A joint company of
The meeco Group and Supan



oursun Guyana

45 kW system on President’s House – Georgetown and 57 Government Buildings with 740 kW of Grid Connected Power + 400 kW rural hybrid sytem

Stepping back to Sri Lanka …. non-profit initiative…and the World Bank finances renewables

1991

➲ The Energy Forum

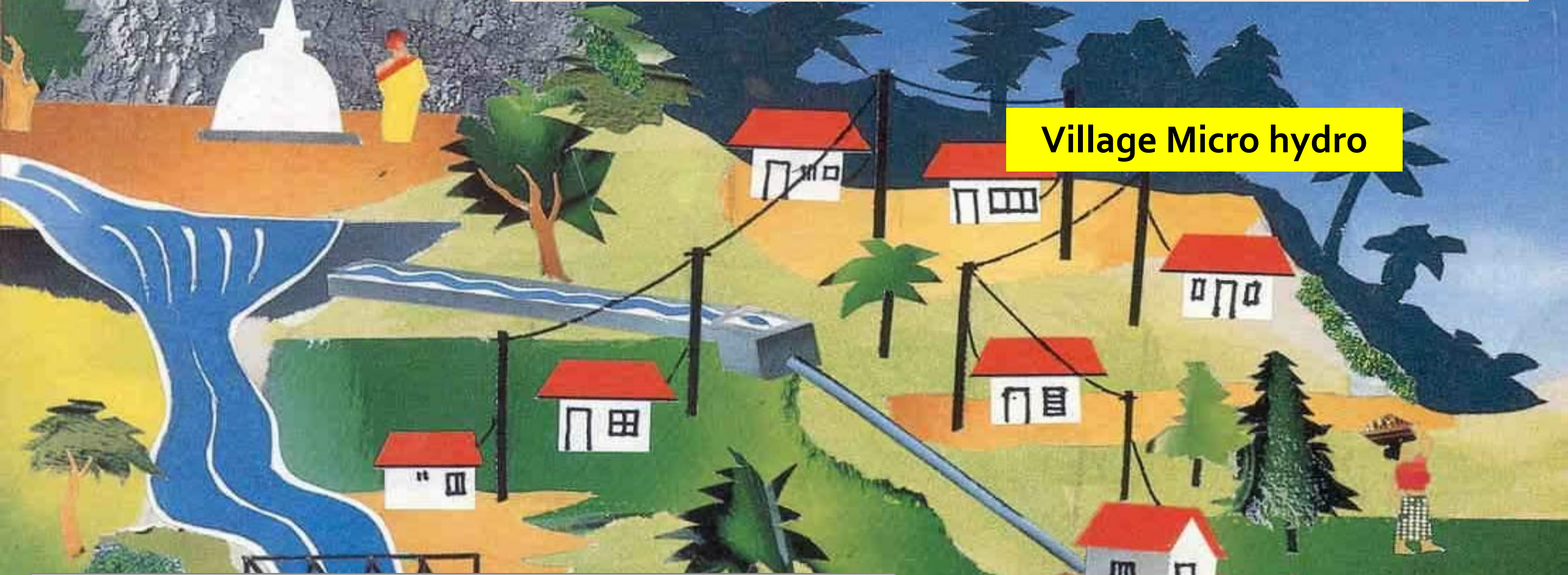
The Energy Forum was established by ITDG in 1991 and became an independent organisation in 1999.

The Energy Forum at the initial stage played a role in supporting the establishment of the ESD Project in 1997.

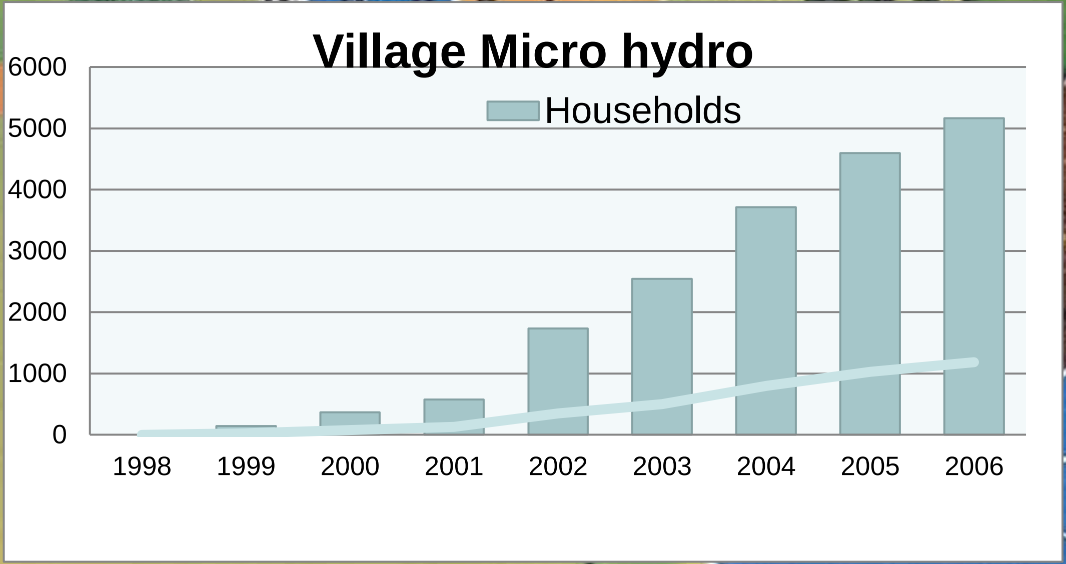
The Energy Forum was a partner of HIVOS until 2003, and created partnerships with farming communities, Business communities, Researchers, NGO activists, Journalists, Provincial Council officials, and Government Officials.


MICRO-HYDRO POWER
A guide for development workers
ITDG

➘Focus 1: Supplying Energy to Off-Grid Communities



Village Micro hydro



Federation of Electricity Consumer Societies

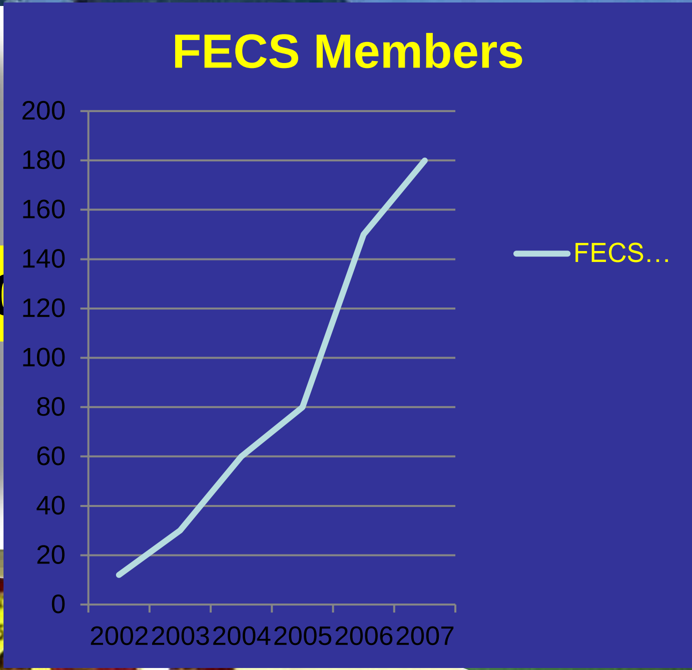
- Conducted capacity programs for 700 ECS members representing 180 ECSs

- Introduced 36 income generating activities to 20 schemes

- Trained 97 ECSs on constructing concrete poles

- Conducted a study for establishing national micro-hydro standards in Sri Lanka, India and **Regional Harmonization of Micro Hydro Standards**

Establishment of the Federation of Electricity Consumer Societies



Dendro Power

Focus 1: Supplying Energy to Off-Grid Communities

Galoruwa-
Kolonna - 9 kW
24 households

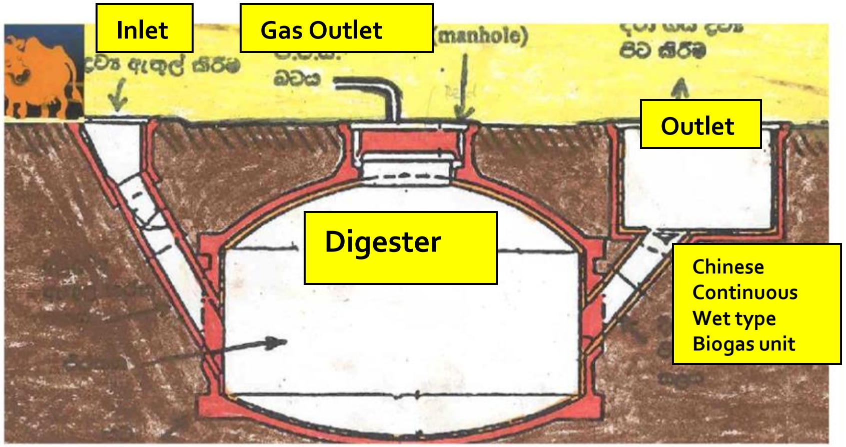
Batugammana – Balangoda
12kW; 48 households

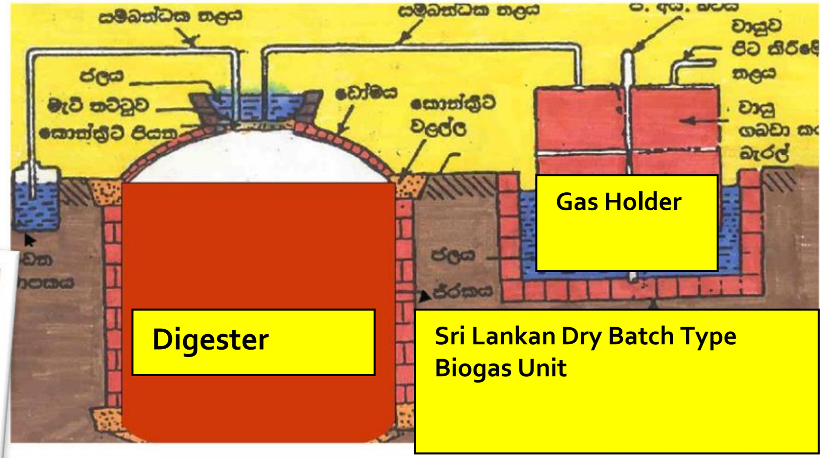
Vatamada – Hambegamuwa – 12 kW 28 households

Focus 1: Supplying Energy to Off-Grid Communities

Bio gas

Power





THE WORLD BANK
IBRD • IDA

Funds the first global Renewable Energy Program in Sri Lanka…USD 100 million +

- World Bank signed an agreement with the Government of Sri Lanka to initiate an Energy Services Delivery (ESD) Project for decentralized, renewable energy production for electricity generation to expand markets for solar-home systems and village-level, micro-hydro schemes.
- **One of the major reasons for the success of the Energy Service Delivery is that project design was flexible enough to allow different approaches and changes as and when required.**

Back to Canada - 1985

Hydro Power Adventures in Sri Lanka and Canada….

GALT GREEN ENERGY

Small Hydro Adventures

Galt Green Energy was an Ontario-based hydro turbine engineering company focusing on small and micro hydro developments.

The Eco-Siphon system produces electricity through the natural flow of water in rivers and canals with two to six meter drop.

It reduces development cost of civil works by 50 to 80%.

The differentiator is a siphon-based system where it sits at the top of a waterfall instead of at the bottom, eliminating high construction costs.

The turbine is a fish-friendly system reducing the impact on ecosystems.

GGE Plant in Bradford, ON 1985

GALT GREEN ENERGY

El Teb Tea Estate
GGE System
Sri Lanka - 1987

GALT GREEN ENERGY

GGE becomes Alfa Star Hydro

GALT GREEN ENERGY

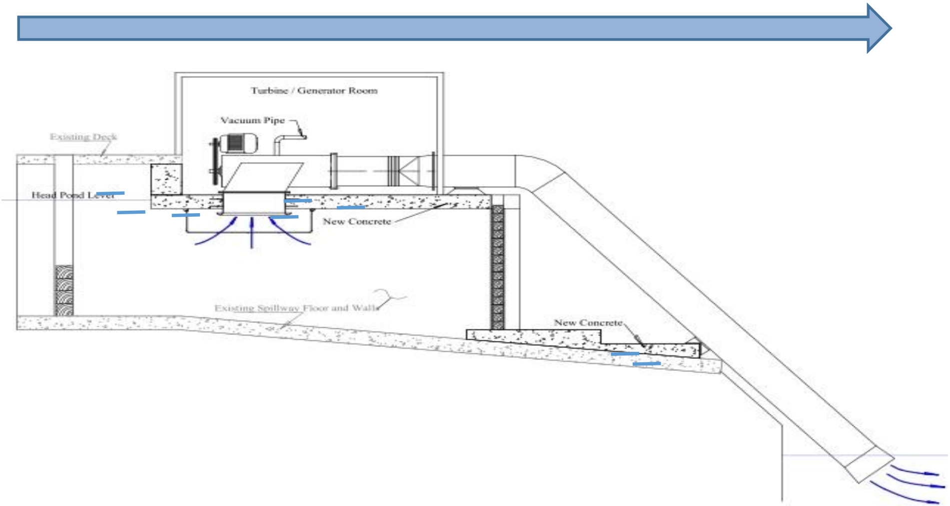
ALFASTAR
HYDRO

Initial Market Segment

- Alfa Star will focus on selling its technology for installation within canals and rivers.
- Canals include irrigation, existing dam structures and water treatment plants generally have structures suitable for low-head hydropower development.
  - Reliable and controlled water supply
  - Head level below 7 meters
  - Minimal civil work requirements
- A number of canals exist around the world, especially in surrounding ASEAN countries and East Asia
- Over 10,000 dams with low head hydro potential exist within Canada (1)

Canal Setting

Downstream – Side View of Power Station



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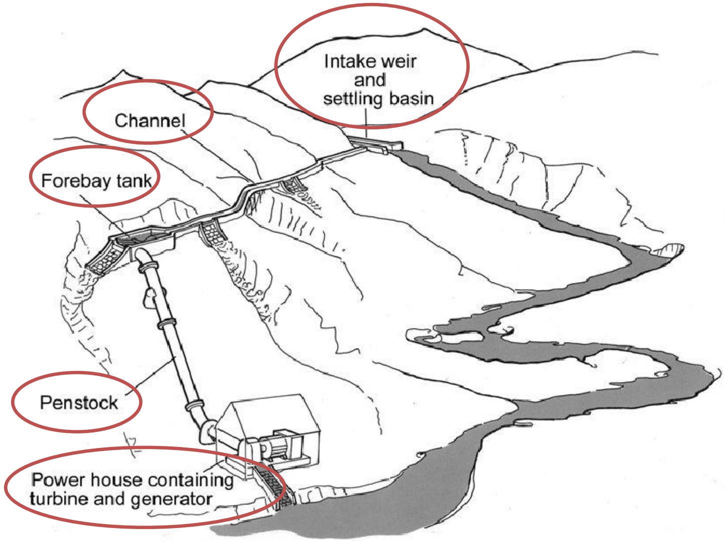
1) *Naturel Resources Canada, Hydraulic Energy Group, Renewable Energy Technologies, 2008*

Conventional Solutions vs. EcoSiphon Solution

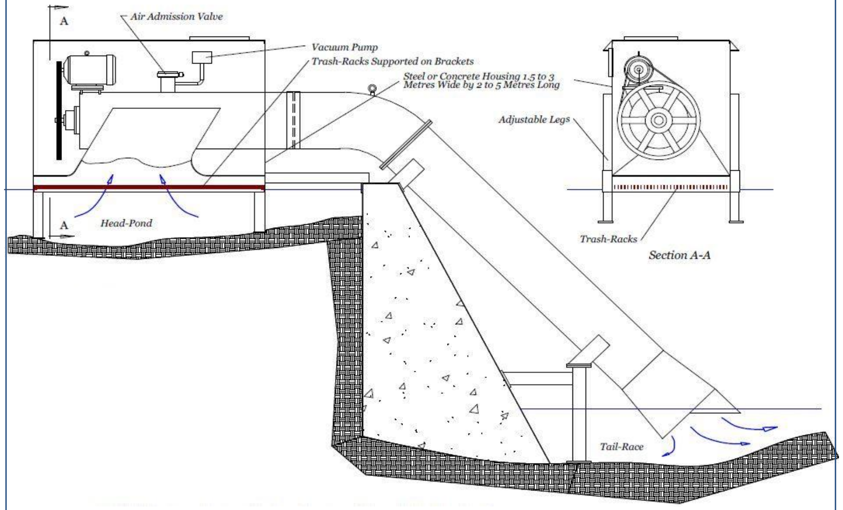
ALFASTAR HYDRO

Large Environmental Footprint



- Water is typically diverted from a water source through a pipe *(penstock)*, which is generally constructed below water.
- Capital spent on civil work, operations & maintenance as well as the impact to aquatic ecosystems is generally high
- Land acquisition challenges

Small Environmental Footprint



- System conveys water upwards from a water source which then passes through the turbine / generating room above water.
- No water diversion from the river or penstock
- Capital spent on civil work, O&M as well as the impact to aquatic ecosystems is significantly reduced
- Reduces land acquisition challenges

Challenges with Low-Head Hydro Power

Limitations with Current Solutions

- Significant civil work and construction costs
  - Costly annual O&M costs and;
  - Large environmental footprint
- Land acquisition challenges
- Lengthy construction periods
- Large total lifetime project costs
- Lower efficiency output

High Project Risk and Lifetime Costs

EcoSiphon Solution

- Reduces civil work and construction costs
  - Lower annual O&M costs and;
  - Small environmental footprint
- Zero land acquisition challenges,
- Reduces construction timeline
- Innovative turbine design
  - High efficiency output
  - Fish friendly attribute

✓ Reduces Project Risk & Lifetime Costs

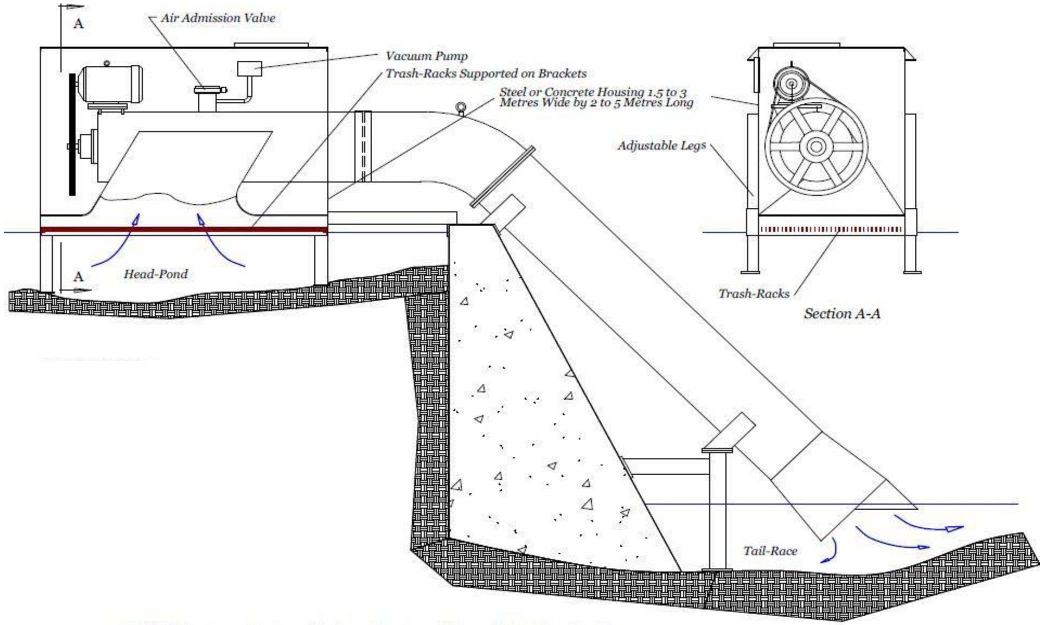
EcoSiphon vs Other Siphon Systems

Higher Output Efficiency

- The general turbine output efficiency of the EcoSiphon system is ~90%.
  - Highly competitive compared to other siphon systems which are faced with two problems that negatively impact efficiency:

    I. The presence of air dragged into the penstock because of the inlet velocity being too high due to constrictions at the water intake.

    II. An inability to align the rotor blade and water flow for optimum water energy conversion



Air Pockets And Poor Rotor Alignment Are Common Problems With Conventional Siphon Technologies

Proven System

Canal setting. Ontario, Canada

Emerson Dam Hydro Project - Haliburton

Construction started in November 2016 and commissioned in May 2019 - the 40kW unit was manufactured by Alfa Star Hydro and the work was done by Ted Boyes Construction.

The unit will produce 200,000 KW of power annually.

Emerson Dam Small Hydro Project - Timeline

1987- Cuming-Cockburn & Associates	Pre-Feasibility Study
2001- The River and The Town	Interconnectedness and Environmental
2003- Prefeasibility Hydropower	Trent U- Sam Yeaman
2004-Community Response to Drag	River Hydro Development
2006-Possible Funding Incentives	Trent U- Ivan Ho
2008 Dam Safety Review-	AECOM
2010-Geotechnical and Foundation Assessment	Geo-Logic Inc.

2012- Genivar- Refurbishment Engineering	under the Lakes and Rivers Improvement Act
2013- Haliburton Solar and Wind Consultation and Project Management Services	Started the project for generation
2014- BluMetric Class EA Assessment-	
2014-Connection Impact Assessment	Hydro One
2014- Earthworks	Archaeological Services Assessment
2014- Biological Assessment Natural Resource Solutions Inc.	Natural Resource Solutions Inc.

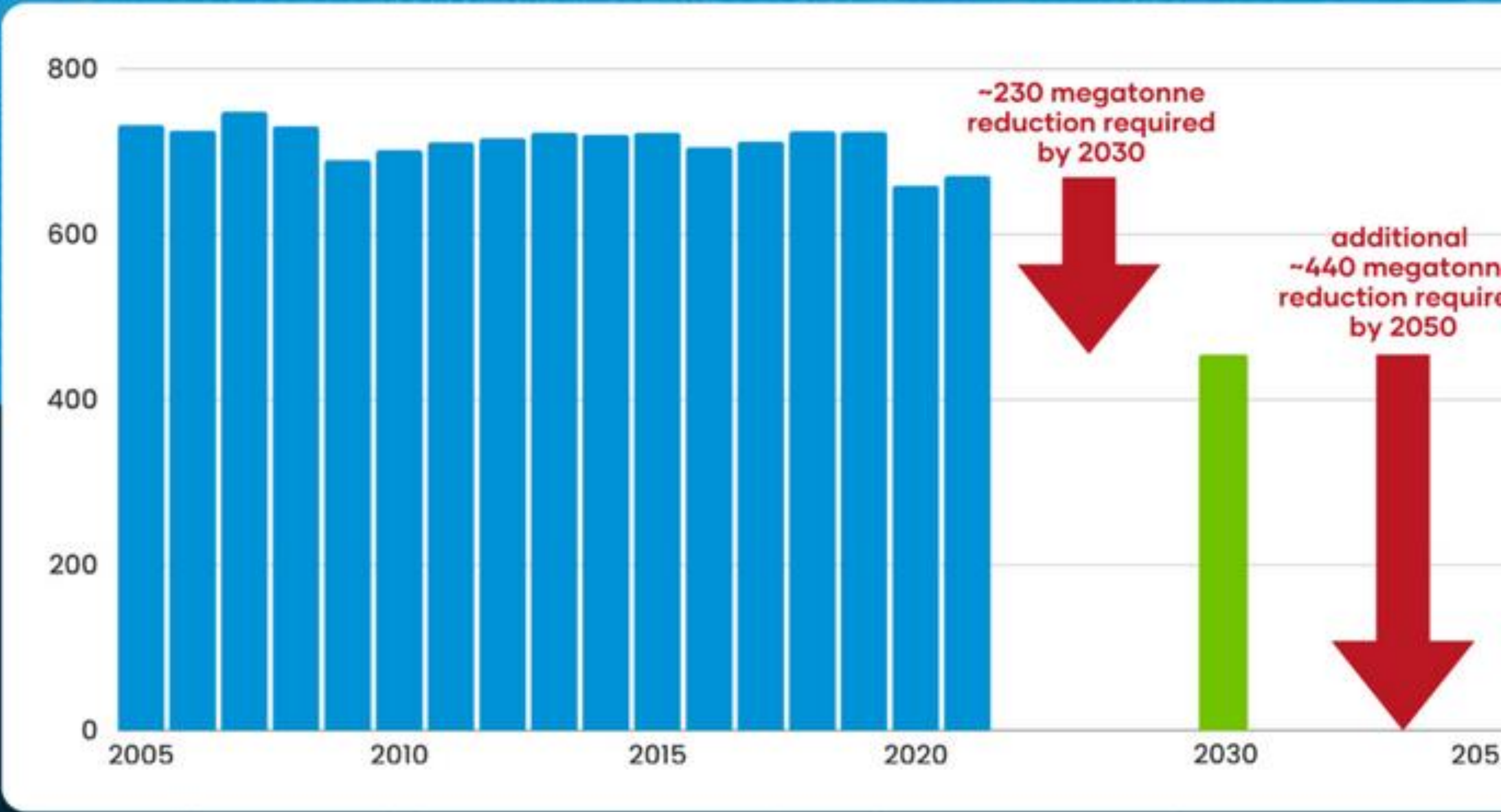
2014- Heritage Impact Assessment	
2014- Aboriginal Consultation	
2015- Terrestrial Vibration Assessment	
2015- Engineering for uplift forces during a 100 year flood.	
2016- Engineering Design Report For Work Permit Application	WSP
2016- Distribution Connection Agreement	Hydro One
2016- Self Declaration Letter	Hydro One

2016- Confirmation of Verification Evidence Report Agreement	Hydro One
2017- Electrical Safety Agreement	Hydro One
2019- NRSI Water Velocity Testing and Analysis	
2019 May- Final Approvals Completed	Commissioned on 18th May, 2019

https://www.ontarioriversalliance.ca/emmerson-dam-micro-hydro-project-drag-river/

Canada’s Greenhouse Gas Emissions

(megatonnes of carbon dioxide equivalent)



~230 megatonne reduction required by 2030

additional ~440 megatonn reduction requir by 2050

Source : https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.

WATERPOWER CANADA
HYDROÉLECTRICITÉ CANADA

WATERPOWER
CANADA

Waterpower Canada endorses ending new baseload gas-fired generation after 2035, as proposed by the draft Clean Electricity Regulation.

Supplying more of our energy needs through electricity will require significantly more low emitting supplies. While much of the energy can come from variable renewables like wind and solar power, we will require large additions of firm resources that are available on demand.

These firm power sources can be counted on to ensure grid reliability when variable renewables are not available.

Hydropower is an ideal solution because it is both firm and renewable, and Canada has tens of thousands of megawatts of hydropower potential.

First Nations and Hydro Power

- The most abundant of Canada’s renewable power sources
- Many viable hydro sites are located in aboriginal lands with land and water rights either with government or the people
- Hydro power is cost competitive
- Utilities and power authorities are familiar with hydro power

Source: Aboriginal Power (Chris Handerson)

Pic Mobert - Pioneers in Hydro Power

Pic Mobert Mobert Hydro Inc. (PMHI), a partnership which comprises the **Gitchi Animki Energy LP** (Pic Mobert First Nation (Pic Mobert)) and White River Hydro LP (Regional Power Inc. (Regional Power)) currently operates two hydroelectric power generating facilities on the White River in northwestern Ontario which generate 18.9 MW of energy.

Netmizaaggamig Nishnaabeg (Pic Mobert First Nation) is a proud Ojibwe community with two land bases, Pic Mobert South and Pic Mobert North, which lie off Highway 17 approximately 55 km east of Marathon, Ontario, along the beautiful eastern shores of White Lake.

IESO Small Hydro Program Launched

Small hydroelectric facilities can now apply to the Small Hydro Program, which was launched to re-contract facilities with capacities up to, and including, 10 megawatts. Facilities that are eligible for the program include those that have an existing contract with the IESO that expires before 2043, those that are uncontracted and those that have an existing contract with the Ontario Electricity Financial Corporation.

The Small Hydro Program is one component of the IESO’s Resource Adequacy Framework and serves as a mechanism to sustain investment in assets, resources and businesses that will provide value for ratepayers. There is no deadline to apply. All contracts under the Small Hydro Program run through to April 30, 2043.

https://ieso.ca/en/Sector-Participants/Resource-Acquisition-and-Contracts/Contracts

Recommendations to the Government

Federal and Provincial governments need to develop clear plans and strategies to drive the electrification of the economy including incentives, codes, and standards for end use equipment.

Environmental assessment and permitting processes and policies need to be streamlined and explicitly recognize the overarching importance of renewable energy projects. The objective should be to reduce the average time for project approval in half within 18 months.

Waterpower provides more than 60% of Canada’s electricity and is the fourth largest generator in the world, ensuring our electricity grid is one of the cleanest globally.

The Happy Faces say Thank you…

Lalith Ananda Gunaratne

Lalith@mindfulsage.net