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SIRIM Link

Driving innovation through technology and quality

RENEWED ENERGY

SIRIM leads the country's renewed commitment towards finding cleaner, renewable energy.

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The Malaysian sun may soon be used in remote water treatment systems

JATROPHA WONDER

The rise of the lowly jatropha as a source of renewable energy

WASTED BIOMETHANE

Harnessing the palm oil industry's kilotonne methane emissions

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Renewed Commitment

HELLO READERS, IT IS GOOD to be back after such a long spell of silence. Tough economic times are no excuse for not communicating. In fact, we should be communicating more to renew our spirits, energy and committment for the well-being of society.

In this issue, SIRIMLink focuses on a particularly pertinent issue that affects society's well-being: Renewable Energy. Renewable energy has been around for decades in one form or another. However, it has always been more a novelty than a necessity.

That is about to change.

The burning of fossil fuels produces over 20 billion tonnes of carbon dioxide per year, but natural processes are estimated to only be able to absorb about half of that amount. Carbon dioxide, as everyone knows, is one of the greenhouse gases behind global warming. Furthermore, the world's conventional fossil-fuel energy resources are dwindling. Thus, the worldwide scramble to harness energy from naturally replenishable resources.

Because of Malaysia's unique geography and economy, it is well-positioned to take advantage of the many renewable energy technologies. Malaysia has tonnes of biomass waste generated by its agricultural sector that can be converted into biomethane, bioethanol and feedstock. We have long shorelines, long hours of sunlight, and steady winds, all of which have renewable energy potential.

SIRIM is honoured that the Ministry of Science, Technology and Innovation (MOSTI) has given SIRIM the mandate to lead the renewable energy taskforce in its quest to find renewable energy resources in Malaysia. This issue of SIRIMLink is published in conjunction with the National Renewable Energy Summit 2009 in Kuching, Sarawak and offers an overview of SIRIM's current work in this area.

We hope you enjoy the issue.

Nor Rashid Ismail
Vice President
Corporate Division

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Indonesian companies to collaborate with SIRIM in renewable energy research

MoUs with Institut Teknologi Bandung, Alpen Steel and Cihanjuang Inti Teknik to promote cooperation in renewable energy technology.

SIRIM HAS VENTURED INTO Indonesia to explore and promote cooperation in the areas of technology related to renewable energy with three local companies. The collaborations were sealed through three Memorandums of Understanding signed between SIRIM, Institut Teknologi Bandung, Alpen Steel and Cihanjuang Inti Teknik which will focus on the transfer of technology and technical know-how in relation to renewable energy and power generation from wind, hydro and solar sources.

Ir. Hj. Yahaya Ahmad, President and Chief Executive of SIRIM receiving a token from Prof. Dr. Ir. Djoko Santoso of ITB. Looking on is YB Tn. Hj. Fadillah Yusof.

Under the MoU, the parties mutually agree to cooperate in the field of renewable energy in terms of exchanging technical and management information, technical know-how, assistance, training and industrial attachments, joint research and development and the transfer of technology. The collaboration also includes the up-scaling of projects, commercialisation and the sales and service of generator turbines.

Institut Teknologi Bandung (ITB) is an institution of higher learning dedicated to strategic alliances between governments, industry and reputable regional and international universities. Alpen Steel is involved in the manufacture of solar panels as well as the fabrication of specialised turbines for generating energy from both wind and hydro power sources. Cihanjuang Inti Teknik is also in the business of fabricating hydro generator turbines.

The collaborations were sealed with SIRIM Berhad being represented by its President and Chief Executive, Ir. Hj. Yahaya Ahmad while ITB was represented by its Rector, Prof. Dr. Ir. Djoko Santoso. Alpen Steel was represented by its Main Director, Paul Sutanto while Cihanjuang Inti Teknik was represented by its owner, Eddy Permadi. The signing of the MoUs was also witnessed by YB Tn. Hj. Fadillah Yusof, Deputy Minister of Science, Technology and Innovation of Malaysia.

At the ceremony, YB Tn. Hj. Fadillah said the MoUs will be beneficial to both countries in exploring more alternatives for renewable energy as they shared similar geographic characteristics.

"As such, both countries will not only benefit from the findings but also help to boost productivity while saving energy," he added.

SIRIM strikes collaboration in agriculture machinery

Collaboration with Guangdong Agricultural Machinery Research Institute (GAMRI) and MCAM (Malaysia) Sdn. Bhd. to benefit Malaysian agricultural sector.

A COLLABORATIVE PARTNERSHIP has been initiated by SIRIM between Guangdong Agricultural Machinery Research Institute (GAMRI) from China and MCAM (Malaysia) Sdn. Bhd. that aims to boost the Malaysian agricultural sector's technological edge.

President and Chief Executive of SIRIM Berhad Ir. Hj. Yahaya Ahmad signed the collaboration at a ceremony at SIRIM headquarters along with Lin Yang Nan, Director of GAMRI and Victor Teo Vei Kim, Managing Director of MCAM.

The MoU was witnessed by YBhg. Prof. Datin Paduka Dr. Khadijah Mohd Yusoff, Deputy Secretary General (Science Services) of the Ministry of Science, Technology and Innovation.

Lin Yang Nan, Director of GAMRI with Victor Teo, Managing Director of MCAM. In the background are Ir. Hj. Yahaya, President and Chief Executive of SIRIM and Prof. Datin. Paduka Dr Khadijah Mohd. Yusof.

Guangdong Agricultural Machinery Research Institute (GAMRI) has a reputation for producing quality agricultural machinery and equipment for use around the world. Based in Guangdong, China, the company possesses vast experience in the design, engineering and manufacturing of specific machinery and equipment such as combine harvesters, granulators, grading and packing machines, pulverisers, irrigation facilities, sieves, hoggeries and others.

MCAM on the other hand, is a newly formed joint venture between China and Malaysia to commercialise agriculture machineries jointly developed between the two partners. The first commercialised product is MCAT, a palm oil fresh fruit bunch transporter.

Under the MoU, SIRIM will identify research projects for joint research in accordance to Malaysia's needs, while GAMRI will provide research and development support to SIRIM and MCAM shall be responsible for commercialisation of the research.

SIRIM focuses on five main areas in its efforts to strengthen local technological expertise and to support in the manufacturing value chain: machinery and equipment; control and instrumentation; process and product design; production process and materials; and parts and components.

The goal of SIRIM Berhad is to ensure that the Malaysian manufacturing industry is technologically salient, resilient and cost efficient as the country moves rapidly forward towards an economy increasingly built upon knowledge, innovation and intellectual property.

Three gold medals for SIRIM at Invention, Innovation & Technology Exhibition 2009

All six entries by SIRIM researchers receive an award at prestigious competition

Researchers from SIRIM Berhad walked away with six awards at the Invention, Innovation & Technology Exhibition 2009 on 18 May 2009. The haul included three gold medals, two silvers and one bronze.

Gold medal winners, from left: Hamidah Sidek, Goh Peng San and Dr. Surani Buniran.

The first gold medal winner was a volumetric scanning and weighing machine that promises to shorten the freight charges calculation process from two minutes to two seconds. By using ultrasonic and laser sensors instead of a manual scale and measuring tape, freight charges are computed, displayed and recorded for report or billing as each of the boxes pass through the machine in an integrated and automated manner.

Another gold medal winner was the project "Fermented Marine-based Materials for Cosmeceutical Application" led by Hamidah Sidek, which explores cosmetic formulations based on Budu, a traditional food seasoning made from anchovies and salt. Studies show evidence of valuable cosmetological properties in Budu. It is antioxidising, has anti-melanogenesis properties, enhances cell proliferation, promotes collagen synthesis and has UV protection properties.

The project "Nanopores Activated Carbon Rice Husk: Production and Application in Supercapacitors" led by Dr. Surani Buniran won the other gold medal. It examines the possibility of using rice husk in supercapacitors for use in electronic devices, computer back-up systems, high power lasers and hybrid electric vehicles. By choosing rice husk as the carbon source, the problems associated with open burning of rice husk can also be addressed. Dr. Surani's project also won the Best Invention Award from KASS International Sdn Bhd.

Dr. Chen Sau Soon led the team that won a bronze medal for "BUOGAS IV".

The other winning projects by SIRIM at ITEX 2009 were the projects "Development of High Precision Miniature Alumina Crucible Using CIM Process", led by Dr. Teng Wang Dung, and "Innovative Fabrication Method of Photonic Integrated Circuit", led by Dr. M. Zahid A. Malek. Both bagged silver medals at the ceremony.

"BUOGAS IV", led by Dr. Chen Sau Soon, won a bronze medal. Her latest project is on solar photocatalytic reactors, featured on page 10.

SIRIM joins forces with Indonesian counterparts in transfer of technology

Landmark agreements between SIRIM and Badan Pengkajian dan Penerapan Teknologi (BPPT) and Universitas Al-Azhar

SIRIM HAS STRETCHED OUT ITS expertise and know-how in Indonesia with the signing of two Memorandums of Understanding with Badan Pengkajian dan Penerapan Teknologi (BPPT) and Universitas Al-Azhar.

It is a milestone for both countries in the development of research and technology facilities, in which the MoUs cover the exchange of technical and management information between all three parties with the provision of technical know-how and assistance in the areas of Physical, Chemical, Measurement and Microbiology.

Badan Pengkajian dan Penerapan Teknologi (BPPT) is an agency for the assessment and application of technology of the Government of Republic of Indonesia dedicated to develop entrepreneurs, commercialise Research and Development and also develop and spawn companies for wealth generation and sustainable job creation.

Universitas Al-Azhar (UAI) meanwhile, is an institution of higher learning established by the Government of Republic of Indonesia as a non-profit organisation in the form of a partnership between governments, industry and highly reputable regional and international institutes of higher learning.

The collaboration was sealed at BPPT Office in Jakarta, with SIRIM Berhad being represented by its President and Chief Executive, YBhg. Ir. Hj. Yahaya Ahmad while BPPT was represented by its Chairman, Dr. Marzan A. Iskandar and UAI was represented by its Rector, Prof. Dr. Ir. Zuhal.

The signing ceremony was witnessed by YB Tn. Hj. Fadillah Yusof, Deputy Minister of Science, Technology and Innovation of Malaysia and the Honourable Dr. Teguh Rahardjo, Deputy Minister of Negara Riset and Technology of Indonesia.

Under the MoUs, the said parties will provide technical know-how and assistance, training and industrial attachments and also exchange of technical, organisational and management information on existing and planned training activities.

Ir. Hj. Yahaya Ahmad, President and Chief Executive of SIRIM sealing the agreement with Dr. Marzan A. Iskandar, Chairman of Badan Pengkajian and Penerapan Teknologi, Indonesia.

In addition, the Memorandums of Understanding also include design and establishment of laboratory testing infrastructure in the areas of Metallurgy, Construction, Plastics Technology, Industrial Products, Coating Materials, Packaging, Vibration, Biomedical Instrument Calibration, Noise, Electromagnetic, Clinical, Residues/ Pesticides and Advanced Materials.

The Deputy Minister in his speech at the signing ceremony said that SIRIM Berhad is diligently striving to put Malaysia on the global map of innovative countries with efforts to strike new partnership in the field of science and technology.

"At the same time, SIRIM too has to continue to strive and build its international stature through more collaboration alliance and association with global players in research and technology," he said.

He said the ministry also aimed to increase the national capability and capacity for research and development while positioning Malaysia as a technology provider in key strategic knowledge industries both locally and internationally.

Engineers at SIRIM to benefit from venture with Korean automotive expert

Collaboration will enable SIRIM engineers to adopt more hands-on approach to R&D

SIRIM ANNOUNCED A BUSINESS collaboration with ACT Technology (Asia) Sdn. Bhd. which will pave the way for a joint development of research and testing services for automotive and component manufacturers in Malaysia and South East Asia.

The collaboration was sealed in a signing of Memorandum of Understanding ceremony held at SIRIM's headquarters on 24 April 2009. SIRIM Berhad was represented by its President and Chief Executive, Ir. Hj. Yahaya Ahmad and ACT Technology (Asia) Sdn. Bhd., by its Chief Executive Officer, Tae Ig Park.

SIRIM through its newly set up Automotive Component Centre, aims to provide design engineering and homologation testing services for automotive parts and components.

Meanwhile, ACT Technology (Asia) Sdn. Bhd. is the Malaysian branch of the South Korean-based ACT Co. Ltd. Since its establishment in 2001, ACT Co. Ltd. has since delivered numerous engineering services to major automakers, automotive part manufacturers and general manufacturing industries around the Asian region.

Under the MoU, both parties will collaborate in automotive research and component design and testing. The MoU will also provide exposure to SIRIM's engineers on the latest technology on vehicle and component testing, which includes Noise, Vibration and Harshness (NVH), endurance and durability, and other related testing.

SIRIM Berhad President and Chief Executive, Ir. Hj. Yahaya Ahmad said in order to position itself in this industry, SIRIM needs to establish strategic partnerships with renowned automotive R&D and homologation testing centres as well as develop adequate talent pool in this field.

"The Memorandum of Understanding will enable SIRIM engineers to be 'hands-on' engineers who not only perform the testing but also design and analyse each test they conduct. This will be a very unique capability which the automotive industry requires and which will be appreciated," said Yahaya.

Ir. Hj. Yahaya Ahmad, President and Chief Executive of SIRIM exchanging documents with CEO of ACT Technology, Tae Ig Park.

National Renewable Energy Summit 2009 at Kuching, Sarawak.

Bringing Great Ideas Together

SIRIM IS ORGANISING A TWO day summit entitled "National Renewable Energy Summit 2009 – Tapping Opportunities", an event that focuses on the potentials of renewable energy (RE), its prospects as well as directions for the development of the sector in Malaysia.

Also known as 'RENEW Summit 2009', the event will be held on the 18 and 19 August 2009 in Kuching, Sarawak. Sarawak is being chosen to host the summit as it is home to SCORE (Sarawak Corridor of Renewable Energy).

RE is energy that is generated from naturally renewable resources such as sunlight, wind, rain, wave and geothermal heat. In 2006, about 18% of global final energy consumption came from renewable energy, with 13% coming from traditional biomass, such as wood-burning. Hydroelectricity was the next largest renewable source, providing 3% of global energy consumption and 15% of global electricity generation. RE is a key area in SIRIM's objective to discover and develop new technologies that enable industries to move up the value chain.

President and Chief Executive of SIRIM Berhad Ir. Hj. Yahaya Ahmad said SIRIM hoped that the RENEW Summit will be an avenue that will provide exposure and potentials of renewable energy. "SIRIM also hopes that the conference will be able to outline the direction and prospects of RE; exchange technical information, knowledge and ideas on RE; and provide new and alternative sources of RE for the benefit of the country," he said.

SIRIM's contribution in Renewable Energy is wide-ranging, covering research in several sectors that includes bio-mass energy, bio-fuels, wind and tidal energy and bio-gases. Last year, SIRIM was appointed to lead the government's task force on RE. SIRIM has successfully brought together stakeholders from the public and private sectors to identify key research areas that will support the growth of RE in the country.

Ir. Hj. Yahaya Ahmad with YB Tn. Hj. Fadillah Yusof at the soft-launch ceremony.

"SIRIM's active involvement in RE includes research on the jatropha seed for bio-fuel in Sarawak, wind energy potential in Sabah, the production of bio-ethanol from empty palm fruit bunches as well as the production of biogas from palm oil mill effluent," said Ir. Hj. Yahaya.

RENEW Summit 2009, supported by the Ministry of Science, Technology and Innovation (MOSTI), will bring together some 300 participants from around the world including Brazil, Thailand, Indonesia and Malaysia. It will be a forum where participants can exchange ideas, technical information and knowledge to explore the potential of renewable energy, outline its direction and prospects, as well as highlight new sources of renewable energy.

The Summit offers a platform for business officials, academics, and professionals who will be exposed to paper presentations on topics such as Green Energy Initiatives, Climate Change, Biofuel, Biomass, Waste to Wealth and many others.

The seminar will be carried out simultaneously with an exhibition to connect professionals with exhibitors. It is expected to draw crowds from both the local and regional business community.

RENEWING THE WORLD'S ENERGY

SIRIM has been given the daunting honour of heading MOSTI's renewable energy taskforce with several programmes already underway and beginning to show promising potential.

AS NOVEL AS IT MAY SOUND TO Malaysian ears, renewable energy has actually been around for centuries in one form or another. Many countries without Malaysia's natural resources have long ago adopted renewable energy programmes – wind turbines in Spain, geothermal generators in Iceland, solar panels in Guatemala, tidal energy turbines in Norway. In fact, Malaysia might well be regarded as a laggard when it comes to renewable energy technology.

Not for long. With the establishment of the national renewable energy taskforce by the Ministry of Science, Technology and Innovation (MOSTI), it is hoped that Malaysia will soon have its own viable renewable energy research and technology programmes in place to take advantage of the country's rich natural resources and reduce its carbon emissions.

"The mandate of the taskforce is to identify the players in the country that can help develop these technologies so that they can be further enhanced," says Dr Zainal Abidin Mohd Yusof, Vice President, Research and Technology Division at SIRIM Berhad, which is heading the taskforce. "We are interested in two things: first, developing renewable energy technologies from our current natural resources; and second, developing a sustainable renewable energy programme."

Admittedly, the initiative does seem a little late in coming. This is mainly because as a country, we are in no danger of running out of energy anytime soon – we have an abundance of petroleum, natural gas and hydroelectric power. However, as our natural resources deplete, we may become a net importer of energy as soon as 2015. The time has come to look at alternatives.

Renewed interest

The reason why renewable energy is particularly interesting to Malaysia is because of the country's rich resources. Take solar energy, for example: being in the tropics, we get between six to eight hours of good sunlight every day, all year round. Malaysia is also surrounded by a lot of water, which may indicate some potential for wave and tidal energy programmes. We also have a strong agricultural sector that generates tonnes of waste that can potentially be converted into energy.

As such, SIRIM has quite a few renewable energy programmes currently underway – solar photocatalytics for treating water in Cameron Highlands, methane gas from palm oil sludge in Pulau Carey, ethanol from jathropha farms in Sarawak, wind and tidal energy farms in Sabah.

Dr. Zainal Abidin Mohd Yusof, Vice President, Research and Technology Division, SIRIM Berhad

Agricultural power

Perhaps unsurprisingly, Malaysia's best hope for sustainable renewable energy is expected to come from its agricultural sector and the kilotonnes of organic waste it generates.

"In some parts of the world, governments are actually exploring the possibility of planting grass as a source of biomass," says Dr Zainal. "Luckily, we don't have to resort to such measures, because we already have an almost unlimited supply of untapped waste from our enormous oil palm plantations and those of Indonesia."

The question that comes up next, of course, is whether or not this foray into biomass-based energy is going to affect the food chain. The 'food or fuel' debate heated up recently when Malaysia increased production of biodiesel from palm oil, with some quarters expressing con't

concern over whether the move would push up prices of vegetable oil-based food products. However, Dr Zainal is quick to point out that biomass energy research is focused on the waste of palm oil production, and not the palm oil itself.

"We are looking at the other components of palm oil production – the empty fruit bunches, the fronds, the fruit fibres, the leaves and even the trunks," says Dr Zainal. "These are a source of cellulose, which can be converted into glucose and subsequently, ethanol."

Ethanol itself has been used as a source of energy for years, harvested from crops like sugar cane, corn and potato – Henry Ford's first Model T was actually designed to run on the stuff. However, as more and more oil fields were discovered and petroleum became cheaper to produce, it was gasoline that ultimately emerged as the dominant transportation fuel. Research into ethanol has therefore lagged. Scientists have a lot of catching up to do.

Besides ethanol, SIRIM researchers are also exploring ways of converting palm oil sludge into methane: a gas that is similar to petroleum-based natural gas and can be used within the transportation sector. Right now, palm oil sludge largely sits decomposing in a lagoon somewhere, emitting huge amounts of methane into the atmosphere. The challenge is to find an economically viable way of trapping that gas and compressing it for use in methane-based vehicles.

"The benefit of such a system will be two-fold to palm oil plantation operators," explains Dr Zainal. "If they can demonstrate that it works, they will not only gain from the sale of methane gas but also from the trading of carbon credits, because the process of converting biomass to energy is essentially carbon neutral."

Here comes the sun

Although biomass processes hold the greatest promise for long-term renewable energy in Malaysia, the technology that is closest to being commercialised is undoubtedly solar technology. It has been extensively researched, with the latest solar cell reportedly being able to convert 40.8 percent of the light that hits it into electricity.

In fact, the only barrier to the widespread adoption of solar power is cost.

"Right now, solar energy is still more expensive than conventional energy, largely due to the high cost of photovoltaic solar cells," says Dr Zainal. "However, as energy tariffs rise around the world, that viability gap is expected to become narrower. Increased adoption rates will also push down the prices of solar cells. Some studies suggest that solar energy will be as viable as other energy sources by the year 2013 for Malaysia."

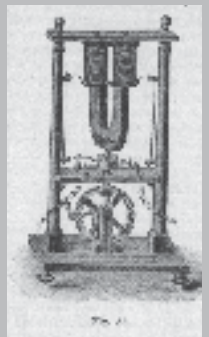
Besides photovoltaic solar energy, SIRIM researchers are also exploring conventional solar thermal energy: using the sun's heat in agricultural or industrial drying and for

1800
Alessandro Volta (Italy) invents the first electric battery.

1879
Thomas Edison invents the incandescent light bulb. Three years later, he opens the Pearl Street Power Station in New York City, one of the world's first central electric power plants.

1883
Charles Fritts builds the first genuine solar cell. Its efficiency rate was between 1 – 2 percent.

1800 1900



1832
Hippolyte Pixii builds the first dynamo, upon which all turbine generators have been modeled since.

1890s
The mass production of automobiles leads to an unprecedented demand for oil. By 1950, oil would became the world's most used energy source.

heating water in hospitals. Another area of research is in photocatalysts: using solar radiation to trigger specific chemical reactions in water detoxification applications.

Public beneficiaries

Everyone stands to benefit from renewable energy, but it is going to be tricky moving forward. With so many renewable energy technologies available, anyone would be forgiven for being confused at the available options. However, as a knowledgeable and neutral partner, SIRIM can help the public and private sector navigate this muddle of technologies.

Photo credit: dave_7, on Flikr

The Model T Ford was originally designed to run on ethanol.

"All renewable energy technologies have strengths and weaknesses, but technology providers will of course only sell the benefits of their own concepts," says Dr Zainal. "SIRIM has an objective viewpoint on the pros and cons of all these technologies, and we can help decide what's best for whom."

The ultimate beneficiaries of MOSTI's renewable energy programme will be society itself. Rural areas which are too remote to be connected to the national power grid may soon enjoy electricity from mini and micro-hydroelectric generators and wind farms. Biomass energy processes will reduce both carbon and methane emissions from agricultural waste. One of SIRIM's commendable efforts is the design and installation of a mini-hydro generator system for the Kampung Limbang Laut community in Tambunan, Sabah, while another project is in the pipeline in Batang Ai, Sarawak.

"My vision is that one day Malaysia will be a renewable energy superpower," says Dr Zainal. "If we can perfect the technology and processes for turning our kilotonnes of palm oil waste into renewable energy, we may well become a leading exporter of renewable energy products."

1954
The Obninsk Nuclear Power Plant in the USSR becomes the world's first nuclear power plant to generate electricity for a power grid, producing 5MW.

1958
Bell Labs develops the first silicon-based photovoltaic solar cell. With an efficiency of 6%, it was the first solar cell capable of generating enough power to run everyday electrical equipment.

1961
Coal becomes the major fuel used by electric utilities in the United States.

1987
Hans Tholstrup and Larry Perkins complete a 3010km Solar Trek in Australia in a solar-powered car. The General Motors Sunraycer had an average speed of 67 km/h.

2000

2003
The U.S. sponsors a USD1 billion, 10-year demonstration project to create the world's first coal-based, zero-emissions electricity and hydrogen power plant.

2008
Scientists at the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) set a world record in solar cell efficiency with a photovoltaic device that converts 40.8 percent of the light that hits it into electricity. In the same year, world crude oil prices break USD100 per barrel for the first time.

2009
The Honda FCX Clarity is named the 2009 World Green Car. The hydrogen fuel cell automobile has an electric range of 450 km and a top speed of 160 km/h.

JATROPHA WONDER

Once regarded as little more than a living fence, the humble jatropha is now hailed as an economical and environmentally safe source for renewable energy.

OF THE DOZEN OR SO PLANTS currently being researched for their potential in bioenergy, perhaps the most widely pursued around the world is jatropha: an ugly, inedible poisonous plant that was once regarded with disdain but is now considered a star among crops.

The excitement surrounding jatropha is understandable. With current technology, it is estimated that one hectare of mature jatropha can yield between 1.5 to 2 tonnes of biodiesel per year. This is lower than the yield of oil palm (between three to four tonnes per hectare per year), but much better than other biodiesel sources such as rapeseed, coconut oil or corn. However, at current crude palm oil prices, oil palm farmers make more money selling cooking oil than biodiesel, whereas jatropha has no other use apart from being a source for biodiesel. Increasingly, it is beginning to look like jatropha will be the world's best bet in its pursuit for alternative fuels.

Sometimes referred to as "green oil", jatropha really is quite a magnificent shrub as far as poisonous plants go.

anywhere, and on almost any terrain – gravelly, sandy or stony – and thrives on a mere 250 mm of rain a year. You don't need pesticides to grow jatropha because the plant already has innate pesticidal and fungicidal properties. Also, because it has a life expectancy of approximately forty years, very little ploughing and planting is needed to cultivate jatropha crops.

With its millions of hectares of uncultivated land, India is largely recognised to be the world's leading producer and advocate of jatropha as a biofuel – the railway line between Mumbai and Delhi is lined with jatropha, and the train itself runs on 15-20% biodiesel. However, SIRIM's interest in jatropha is focused around the other potential applications for the plant. Led by Dr Baharum Baharum Ismail, Senior Principal Engineer in the Energy and Process Engineering Programme, the jatropha Project team is working closely with jatropha farmers in Sarawak to explore three other possible applications for jatropha in order to maximise its viability.

"The technology for producing biodiesel from the seeds of a jatropha fruit is already well-established, although it does need some fine-tuning," says Dr Baharum. "The challenge is in finding practical applications for the remaining 80% of biomass. Right now, we're exploring three other potential ideas, including converting it into biofertiliser for the agricultural sector, crushing it into biopellets (biocharcoal) to be used as fuel to generate electricity and even convert it into bio animal feed."

" Despite its appeal as a low-maintenance crop, jatropha farming is not as easy as it looks."

Twelve kilograms of the yellow, golf ball-sized jatropha fruit will yield approximately four kilograms of seeds, which in turn will yield about one kilogram of biodiesel (see Figure 1, next page). After the oil is pressed from the seeds of the jatropha fruit, the leftover pressed cake (also known as a seedcake) and fruits can be composted and used as a high-grade, nitrogen-rich organic fertiliser. The same pressed cake can also be palletised and sold as biocharcoal in Europe.

"We are also looking at ways to mechanise the way jatropha fruits are harvested," Dr Baharum continues. "The less we have to rely on foreign labour in our plantations, the better."

Dr Baharum's team is even looking into ways to automate the way jatropha seeds are sorted and graded. He welcomes ideas from the public, and invites Malaysian inventors to come forward to discuss designs.

"If we want to improve the productivity of the jatropha industry, we have to be able to differentiate between high-quality seeds and low-quality seeds," he explains. "We have heard of some machines in China that are capable of doing it, but we have not actually seen them at work yet. We hope to be able to build upon their design and modify our own machines accordingly."

Teething issues

Despite its appeal, it is not easy to become a jatropha farmer. While jatropha starts yielding 9–12 months from being planted, the effective yield is only obtained after three years or so. Many farmers simply cannot wait that long – after one or two years, they grow disheartened and go back to planting other crops. The problem is compounded by a burgeoning seeds-and-saplings industry populated by opportunistic traders who overpromise high-yield, high quality plants and sell seeds to farmers at grossly inflated prices. Farmers must differentiate between farming jatropha for seeds and seedlings or for seeds and oil, because that is why there is such a difference the price of the commodity.

"Three important factors play a role in determining an agricultural enterprise's success," Dr Baharum says, leaning forward to sketch a diagram. "First, you have to ensure you have the best seeds or saplings in the world. Second, you need to have good, recognised agricultural practices that have been proven to deliver results. And third, you require good processing equipment."

Unlike palm oil or rubber plantations, jatropha plantations in Malaysia do not have the benefit of years of experience, billion-dollar research efforts and well-developed agricultural best practices. Many smaller farmers do not have good agricultural practices and may even con't

Dr Baharum, Senior Principal Engineer, SIRIM Energy and Process Engineering Programme

use the wrong fertiliser for their jatropha crops. When they don't get the results they expect, the plant is blamed instead of the methods used.

Still, Dr Baharum estimates that there are between five to ten thousand hectares of jatropha plantations scattered across the country. However, we are quite far behind India, China, Indonesia or even Thailand in terms of jatropha research, something which Dr Baharum attributes to our affinity for our perennial favourite crop, oil palm.

"If I were a plantation owner, would I put my money into a promising but still under-developed crop like jatropha, or would I go with the well-established and profitable oil palm?" Dr Baharum asks. "The choice is easy."

Dr Baharum also cites examples of private companies that conduct all their research and development work in Malaysia, but when they are ready to set up commercial-scale plantations, they opt to do so in Cambodia or Indonesia. The reason, he says, was simple: money.

"The Malaysian market for biodiesel is not attractive enough to private investors," Dr Baharum explains. "In most parts of the world, one litre of diesel costs USD1.00 (RM3.50), nearly double the price in Malaysia. Biodiesel producers therefore stand to make a lot more money growing and processing jatropha biodiesel crops elsewhere."

Dr Baharum's jatropha Project is still in its early days. The plants are only about two years old and do not yield enough fruit yet for any proper lab work to be carried out. The work, as he puts it, is in the phase of 'optimisation': ensuring that the jatropha crops under their purview are properly cultivated so that they will have strong yields for many years into the future. He expects the yield to be good enough for biodiesel processing by 2010 or so, depending on the weather.

"We have production facilities which are ready to convert the jatropha seed oil into biodiesel, and we have the crushing and palleting machines ready to deal with the waste," Dr Baharum says. "All we need now is a good pressing machine to squeeze the crude oil out of the jatropha seed's kernel. We are evaluating several machines from India, Indonesia and Thailand."

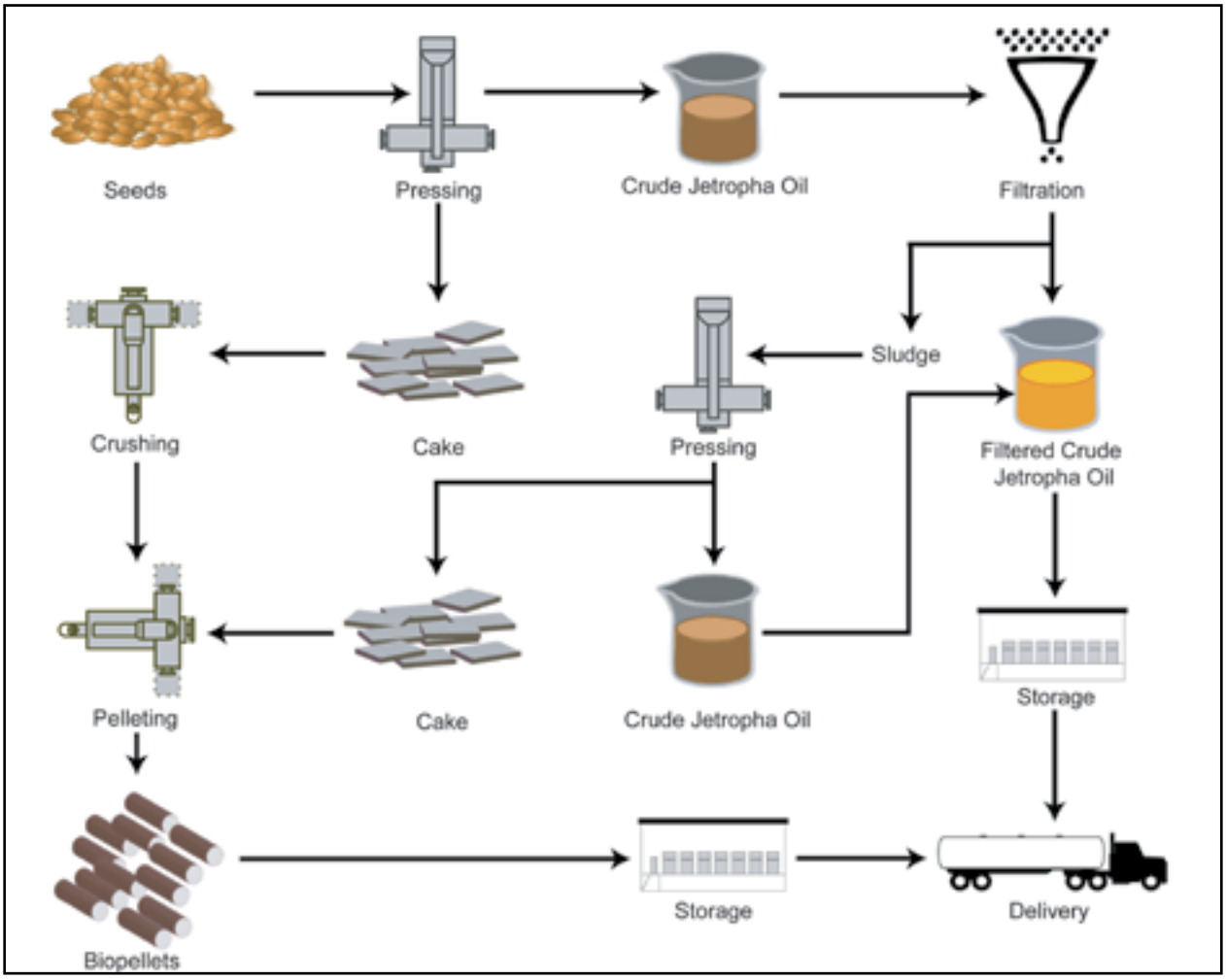
Ultimately, however, Dr Baharum is adamant that the machines used to serve the jatropha industry should be made locally, by local companies. He points to the palm oil industry's heavy reliance on foreign-made machinery during its early days, and says that the jatropha industry should not make the same mistake.

"Machine sales and service is another big business that should go to Malaysians instead of foreigners," Dr Baharum says. "We must ensure that our locally-developed technology is up to the task."

Useful by-products

As mentioned earlier, however, Dr Baharum's real interest in jatropha is not in its potential as source of biodiesel, but in what else the plant can do. As things stand, jatropha biodiesel is still too expensive to be commercialised in a big way.

"If the only thing you get from a jatropha plant is oil, it is hardly a viable business enterprise," says Dr Baharum. "We have to find ways of commercially exploiting the rest of the plant in order to balance production costs."



The integrated jatropha seeds processing flow. In the first pressing, seeds are first crushed for oil, with the remaining solid waste turned into cakes. The second press squeezes out any oil remaining from the sludge, before another batch of finer cakes are made.

Dr Baharum intends to crush and palletise much of the by-product of the biodiesel process for export to Europe, where there is a ready market for biopellet fuels for use in boilers. jatropha seed shells, for example, have a calorific value (CV) as high as that of regular charcoal.

There are also useful by-products to be found within the agricultural process itself, according to Dr Baharum ."The leaves, branches and trunks that are snipped off jatropha crops during pruning are rich in fertiliser nutrients," he says. "If we recover and treat these parts of the plant properly, we will also have a good source of organic fertiliser that we can use on the plantation, thereby making the crop more economical."

Dr Baharum also believes that work should begin on exploring the medicinal and nutritional potential of jatropha, an area of research that is largely ignored locally. For the immediate future, however, all he wants is to give the private sector some answers with regards to the proper processing of jatropha.

"There are successes, and there are failures, and we have to document these stories for the benefit of other researchers if we want to become serious contenders in the jatropha industry," says Dr Baharum. "We are already late. The time to move is now."

Dr Baharum also asks that the private sector be more patient with jatropha research."Do the right calculations, validate your information and together we can make something of this industry," Dr Baharum says. "With the right technology, jatropha may one day be the country's third national crop."

Dr Baharum welcomes co-jatropha researchers to communicate and collaborate with him so as to avoid duplicating research efforts. He may be contacted at SIRIM Berhad.

SOLAR CATALYST

The scorching Malaysian sun we dislike so much may soon be used to treat contaminated water.

LIVING UNDER MALAYSIA'S SUN, WE generally regard our weather as awful. Our sun provokes bad tempers and causes sweaty clothes; it precludes midday picnics and afternoon strolls. When it's out, it's scorching; and when it's not, it's raining.

Soon, however, we might come to regard our sun on more friendly terms. Dr Chen Sau Soon, Senior General Manager at SIRIM's Environment and Bioprocess Technology Centre (EBTC), is hard at work finding ways of exploiting Malaysia's sunshine; specifically, she and her team of co-researchers are exploring photocatalysis: using the sun's ultraviolet rays to induce chemical reactions.

"Being in a sun-rich region, we are not really maximising our sunlight for all its worth," says Dr Chen. "Power generation is just one aspect of solar research. What we're doing now is exploring an environmentally-sound way of using natural sunlight to treat polluted water."

Photocatalysis is not really about generating energy. It's about conserving energy while decontaminating water that would not have been easily treated by conventional systems.

"Like any treatment systems that degrade organic pollutants to carbon dioxide, the photocatalytic system will do the same," explains Dr. Chen. "The difference however, is this system taps on the abundantly available solar energy to initiate a reaction that breaks down pollutants in the same way that electric-powered ultraviolet lamps perform the same function.

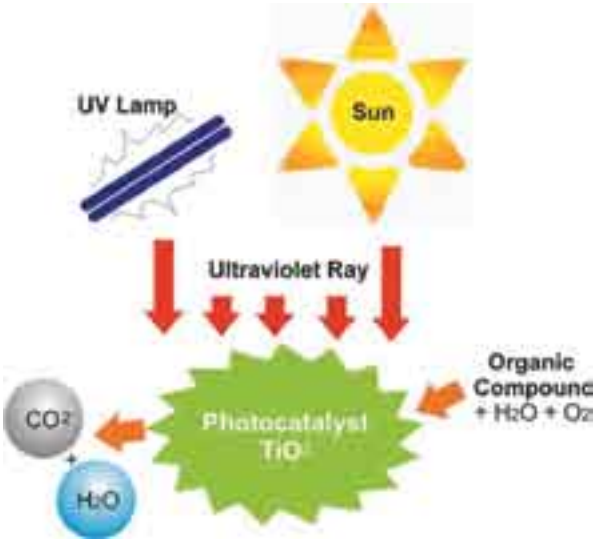
There are many different types of photocatalysts out there, but the one used by the team of researchers at EBTC is titanium dioxide: the same stuff found in talcum powder. However, while a speck of talcum powder might measure one or two microns across, the material used in this research is a hundred times smaller and comes coated around translucent beads measuring about 5mm across. At that nano-scale, titanium dioxide becomes highly reactive and is able to not only clean up contaminated water, but photocatalysis is also used in air purification cum sterilisation system, anti-fogging products and self-cleaning glass.

"Some new refrigerators on the market promise that your vegetables will remain fresh for much longer," Dr Chen enthuses. "This is because the coating used contains photocatalysts that has been shown to be an effective scavenger of a chemical (ethylene) that is associated with fruit ripening and vegetable staleness. Another emerging application is to use the photocatalytic paint on road kerbs and riverbanks – when the sun hits the paint, it releases radicals that will decompose pollutants like nitrous oxide and sulphur dioxide."

Pilot underway

Dr Chen has just received MOSTI's TechnoFund to build a pilot-scale photocatalytic water treatment system in Cameron Highlands. The system will be about 30 times larger than the one at SIRIM's laboratory and will be tested at a farm.

"We're setting it in a vegetable farm where the potential of pesticide contamination in the groundwater exists," explains Dr Chen. "We also chose Cameron Highlands because it is an agricultural area, and we have measured high ultra-violet irradiance levels, which is favourable to the process of photocatalysis."



The photocatalytic

Dr Chen Sau Soon, Senior General Manager, SIRIM Environment and Bioprocess Technology Centre

"Pesticide contaminants are often riskier than visible contaminants," Dr Chen warns. "Although the contamination level might seem low, it can sometimes be sufficiently toxic to cause long-term health problems."

Dr Chen envisions her system as consisting of two-phases: first, suspended matter is removed from the water with a simple sand filter; and then, the water is channelled through the photocatalytic reactor containing the titanium dioxide-coated translucent beads. The catch, however, is that the whole photocatalytic system must be exposed to ultra-violet light to work.

"One of the limitations of solar radiation is that it can only be harnessed during the day," says Dr Chen. "However, that would be unacceptable for an effective and robust water treatment system; because it would mean that it will not work at night. As such, we intend to use ultraviolet lamps to ensure the photocatalytic reaction will continue even when the sun goes down."

The idea is to create a closed, self-sustaining system for water purification. In extremely remote areas where grid power supply is not available, the system will use natural sunlight for the photocatalysis process, while accompanying solar photovoltaic cells soak up the sun's energy, converts it into electricity to operate the pumps and ultraviolet lamps, thus ensuring the photocatalysis is continuous.

However, Dr Chen emphasises that the photocatalytic system is not intended to replace conventional treatment technology for the typical industrial wastewater or even raw water supplies. The basis of photocatalytic treatment in the sun-rich region of the tropics taps on the abundant solar irradiance that this country is richly endowed with.

WASTED WASTE

Ever wondered what the energy potential might be of all the waste generated by the agricultural sector? Here's a tip: it's a lot.

AS AZHAR ABDUL RAOF LEANS back in his chair, one cannot help but smile at his confidence. A Senior Executive in SIRIM's Energy and Process Engineering Programme, Azhar is busy finding ways to harness and commercialise the biomethane potential of Malaysia's palm oil industry.

Methane is quite useful as the principal ingredient of natural gas: the fuel used in NGV vehicles and gas cylinders for cooking stoves. At room temperature and standard pressure, it is a colourless, odourless gas. However, it is also a potent greenhouse gas with a high global warming potential, and can trap about twenty times more heat than carbon dioxide. A study published in December 2004 by the Malaysia Energy Centre suggests that Malaysia's palm oil industry releases about 500,000 tonnes of methane a year, which is equivalent to 10.3 million tonnes of carbon dioxide.

"Right now, effluent from palm oil processing just sits around in anaerobic ponds, releasing methane into the atmosphere," says Azhar. "We have over 400 palm oil mills in the country, plus municipal and sewage waste, and all of that has biogas potential. Conservatively, I estimate that we are releasing about 1.5 billion cubic metres of methane into the atmosphere annually, which is enough to power about 16 percent of the transport sector's vehicles."

Biogas itself is about 65% methane and 35% carbon dioxide plus residual nitrogen, hydrogen, hydrogen sulphide and oxygen. Current work is focused around purifying the biogas so that it can be used in generating electricity or as a biofuel for NGV vehicles.

SIRIM is working with a couple of partners on the project – a Japanese university is helping to develop the

technology required for producing biogas, while Sime Darby is providing the site, raw material and support in operating the pilot plant required for Azhar's research.

Moving on with biogas

Azhar Abdul Raof, Energy and Process Engineering Programme, SIRIM

One might ask why the palm oil industry is not falling over itself trying to find ways to use all its methane, and the answer is this: most palm oil mills have an excess energy supply already and hence do not really need to. Furthermore, methane must generally be used *in situ*, because getting methane into cities would be a logistical nightmare (it has a boiling point of -161°C and is very difficult to transport). Unfortunately, most palm oil mills are located in very remote areas far away from major economic centres.

"We intend to get palm oil mill operators to convert their current vehicles into natural gas vehicles," explains Azhar. "These vehicles include the diesel lorries that are used for transporting palm fruit bunches from the plantation to the mill as well as the forklifts and other cars used around the plants."

There is, however, a general fear among users that NGV is a less powerful fuel when compared to petrol or diesel. Azhar scoffs this claim, and assures us that one litre of compressed methane offers more or less the same energy content as one litre of petrol. The other often-quoted objection to NGV vehicles is the lack of refueling stations, but since a palm oil plantation's vehicles rarely travel outside of the plantation itself, they are not generally away from the mill for very long. If there were a biogas refinery right next to the mill, it could thus also act as the refueling station.

Power up

"Marketing methane as a fuel in remote areas is very attractive economically, especially if you are in remote areas in Sabah and Sarawak," Azhar explains. "In such areas, diesel can cost double or triple what it does in cities. From the users' perspective, NGV really is an option worth considering."

The biogas model certainly works, if Sweden's story is anything to go by. According to Azhar, more than 50-percent of the vehicles on Sweden's roads run on biogas that is harvested from the country's cattle industry and municipal solid waste. In Brisbane, Australia, the city council's Luggage Point wastewater treatment plant converts biogas into electricity. The city council also uses biogas-powered vehicles purchased from Scania Group: a major manufacturer of buses based in Sweden.

"I was just up at a plantation in Sabah, where many of the plant's vehicles run on diesel," says Azhar. "Diesel supply is always an issue in those remote parts, and they really appreciate our efforts at trying to find a sustainable, reliable and renewable fuel source. They are really looking forward to the day they can convert their vehicles into NGV vehicles and never worry about when the next diesel tanker is going to show up again."

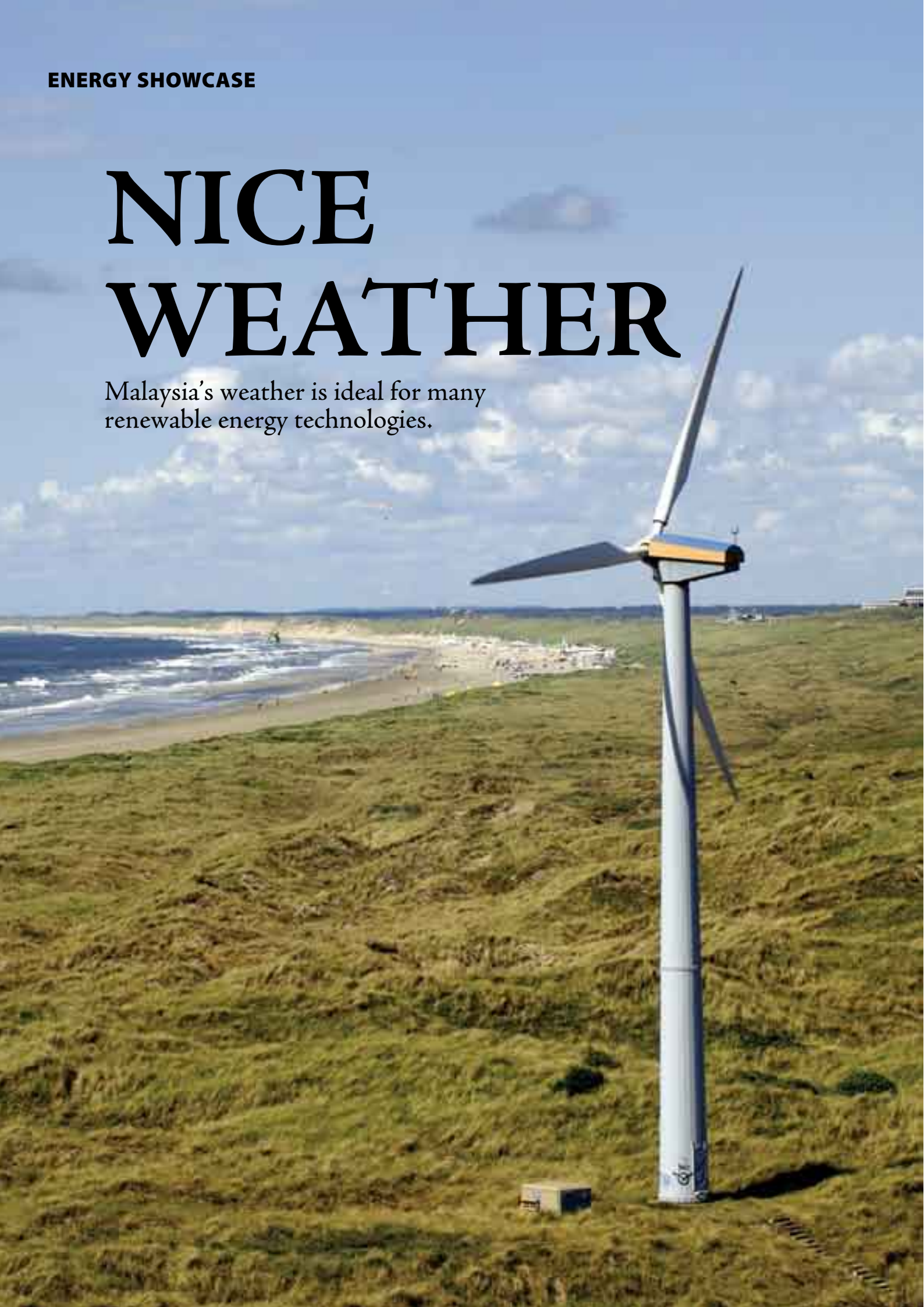
Unfortunately, these success stories are not good enough to inspire investment locally. Before palm oil mills can be convinced to affix their vehicles with LNG storage cylinders and convert their engines to run on natural gas, and before they are willing to invest into the technology needed for methane capture-and-storage, they want to see some real business benefits set in a local context. However, Azhar is confident that they will come around soon.

A water treatment and biogas plant in Hamburg, Germany.

The Biogas Project team also includes Isnazunita Ismail, Researcher, Environmental Management Technology Programme at SIRIM; Hassan Ismail, Executive, Energy and Process Engineering Programme at SIRIM; and Mohd Faisal Mohd Yunus from Sime Darby.

NICE WEATHER

Malaysia's weather is ideal for many renewable energy technologies.



IF IT IS TRUE THAT ENERGY CANNOT BE created or destroyed, then the world's energy must be finite. All we have been really doing thus far is burning energy that has been trapped in physical form – fossil fuels, wood, uranium cores – and releasing that energy back into the ecosystem. It was not always so, however – before petrochemicals and the nuclear age, mankind's greatest energy allies were much simpler things: the sun, wind and water.

Ironically, it is these old allies which may hold the answer to the world's current energy woes.

Windy weather

It should come as no surprise that while current worldwide total output of wind energy stands at over 120,000 MW, Malaysia only contributes less than 1 MW to that total – we are an oil-rich nation, after all. The country's two biggest wind energy projects to date are in Pulau Perhentian and Pulau Layang-Layang, which have a combined energy capacity output of 350 kW.

Middelgrunden Wind Turbine Cooperative in Copenhagen, Denmark.

However, if Dr Baharum from the Energy and Process Engineering Programme at SIRIM has his way, that may soon change. He is not alone, either – the latest data from the World Wind Energy Association suggests that although wind energy currently represents a meagre 1.5% of worldwide electricity usage, capacity is growing fast at nearly 30% every year. In 2008, wind power accounted for 42% of new energy installations in the U.S and 36% of new installations in Europe.

"Malaysia cannot afford to ignore wind power as a source of renewable energy," says Dr Baharum. "However, with Malaysia's low tariffs, wind energy is not always viable."

Dr Baharum says that wind energy is best applied to remote areas far off the national power grid.

When the government wanted to have an energy supply on Pulau Perhentian, for example, they knew building a power plant would not make economic sense. So, a wind farm was built instead. Nonetheless, the decision required a lot of thought.

Viable technology

There are three factors to be considered before embarking upon any wind energy programme: wind speed, the technology used, and economic viability.

Firstly, average wind speed must be favourable to wind turbines – not too slow, and definitely not too fast. Before a project can go ahead, wind speed must be measured over a period of twelve months to see if the location is suitable or not.

"The last study on wind patterns around Malaysia found that wind speed was best on the east coast of Peninsular Malaysia and in Sabah," says Dr Baharum. "We need an average speed of between 3m-25m per second. Anything less will not do the job, and anything more may cause the wind turbines to burn out."

The second factor to consider is the type of technology that is best suited for a particular location. Since the 1950s or so, the typical structure for wind turbines has always been the classic, horizontal-axis, three-bladed design. These days, however, experimental designs may be found everywhere, using a variety of materials and technologies. Around the world, hobbyists, professionals and schools are testing out different designs.

"Different locations need different types of technologies," Dr Baharum explains. "Wind speeds, average temperatures and humidity all affect the performance of turbines, so you have to choose the technology carefully."

The third factor to consider is the economics of the project. In the context of Malaysia where electricity from the national power grid is still relatively cheap, wind energy can cost as much as double the national energy tariff. Wind farms would therefore never be able to compete with conventional energy supply, except in remote areas far away from the national power grid where electricity does not even exist.

The Tip of Borneo, Simpang Mengayau, Sabah.

"We also have to look at security," says Dr Baharum. "Wind farms tend to be a favourite target of vandals, so we have to be careful where we install these systems."

Ultimately, however, the primary economic concern would be in how such a wind farm project would benefit the local community.

"Once the system is installed and up and running, there is very little actual operational cost involved to keep it that way," explains Dr Baharum. "All it needs is some regular maintenance to check for leaks and to ensure that all the nuts and bolts are still in place."

Storage power

One reason why wind farms have become such an attractive renewable energy option these days is because of the significant advancements made in battery technology in recent years. In the old days, all energy generated from wind turbines had to be used immediately or else be stored in inefficient, leaky systems. These days, however, unused energy can be stored in super-efficient storage batteries for later use, thus creating a sort of mini power-station where energy can be tapped on demand.

"Whenever faster wind speeds generate surplus energy that is not used by the community, the excess supply is stored in batteries," explains Dr Baharum. "Then, when there is no wind and therefore no energy output coming from the turbine itself, the community can still draw upon the stored energy for its needs. It is absolutely crucial that the wind technology used be compatible with battery technology."

Battery technology is improving at an astonishing pace. Three years ago, storage batteries had a lifespan of three years. Today, these batteries can last up to eight years. As battery lifespan improves, the lifecycle cost of wind turbine systems will fall and make them more competitive.

"Once the system is installed and up and running, there is very little actual operational cost involved."

Sun, wind and ocean

Dr Baharum's renewable energy project will come to life in sleepy hollow of Simpang Mengayau, sometimes referred to as the Tip of Borneo. Both wind speeds and tidal current patterns are favourable to his research here. There is also a good plot of land in which the wind turbines may be planted and installed, plus a nearby community that will serve as test users. There is even a road that connects the project site to the mainland.

The average household in Peninsular Malaysia consumes between one to three kilowatts of electricity per month. Dr Baharum plans to install four 25 kW wind turbines on the Tip of Borneo that will have a total capacity of about 100

kW – enough to serve between forty to fifty households in and around the project site.

"We are not going to stop at wind turbines, though," smiles Dr Baharum. "We will build a solar hybrid system that will also take advantage of this area's magnificent sunlight."

Because of nature's capricious weather patterns, relying upon one form of natural energy or the other can be a risky business for projects. As such, hybrid energy systems have become quite popular. In Dr Baharum's pet project, the energy generated from both the solar panels and the wind turbines will be channelled to the storage batteries before being distributed to users.

"We are already installing a small-scale version of the system on the Kuching waterfront," Dr Baharum smiles. "The system gives stakeholders a lot more confidence – if there is no wind, there is always the sun; and if it's a gloomy day with no sun, you'll have the windy weather."

Dr Baharum has also been given the go-ahead to explore the possibilities of ocean energy, which largely falls into three categories: wave energy, tidal energy and current energy. His research will concentrate on the first two. Before that, however, there are some interesting challenges to overcome and decisions to make.

Present wave technology requires energy densities to be at least 50 kW/m^2 in order to be commercially viable. Only a few locations in Sabah, Sarawak and Johor show promise, with energy densities of 1000 kWh/m^2. It will be difficult to choose suitable locations to run the test.

The second hurdle Dr Baharum faces is in choosing an appropriate ocean energy technology to pursue. Like many renewable energy sources, ocean energy systems are being exhaustively experimented with by major corporations to home hobbyists alike. Deciding which one of the twenty commercially available technologies is best suited to Malaysian seas and energy needs can be tricky.

"We can either evaluate existing technology, or talk to these inventors about coming up with a new technology," says Dr Baharum. "Either way, the choices are many."

The idea is to first test several locations with a single wave energy converter to see which ones are most promising. After gathering the data, SIRIM will advise the government where it should install more wave energy converters.

A solar/wind turbine energy lampost in Tokyo.

When asked where Dr Baharum intends to set up his ocean energy test site, he smiles cheekily and says: "The Tip of Borneo is my ideal test site, because I can research all four of my projects together all at once: jatropha, wind, sun and ocean energies. That would make it an ideal showcase for SIRIM's renewable energy work; a sort of renewable energy technology park, so to speak."

National effort

Whatever the technology – sun, wind or water – the research involves millions of ringgit. However, if the country's renewable energy initiative was viewed as a national effort instead of being placed squarely on the shoulders of a handful of government agencies, Dr Baharum is confident that things could speed up.

"The government has demonstrated its commitment towards exploring renewable energy for the future security of the country, but there is only so much it can do," Dr Baharum says. "What the country needs is for the private sector to come forward and allocate a small percentage of their R&D funds for a renewable energy programme."

Our energy is not always going to be as cheap as it is now. The time will come when fossil fuel-based power stations will burn dry. When that happens, it may be too late.

7 May 2009 –YBhg. Ir. Hj. Yahaya Ahmad, President and Chief Executive of SIRIM Berhad briefing YB Datuk Mukhriz Mahathir, International Trade and Industry Deputy Minister on cranofacial at the MetalTech 2009 Showcase for the machine tool industry in Putra World Trade Centre, Kuala Lumpur.

15 May 2009 – Vice President, Research and Technology Division, Dr. Zainal Abidin Mohd Yusof briefing the delegation from the National Committee for Business Development, Prime Minister's Office of the Laos People's Democratic Republic, led by H.E. Xayxengly Tengbriachue, Minister of the Prime Minister's Office on SIRIM's products and services.

22 May 2009 – SIRIM Berhad took part in mountain climbing at Mount Kinabalu, Sabah, as part of the Brainstorming & Teambuilding Programme organised by the Ministry of Science, Technology and Innovation.

3 June 2009 – Deputy Prime Minister, YB Tan Sri Muhyidin Yassin being briefed on SIRIM's research at the SMIDEX 2009 Showcase in Kuala Lumpur Convention Centre.

8 July 2009 – YAB Prime Minister Datuk Seri Najib Tun Razak launching the MyIdeas portal by the Ministry of Science, Innovation and Technology, in which SIRIM Berhad took part in producing the mini video.

1 June 2009 – YBhg. Ir. Hj. Yahaya Ahmad, President and Chief Executive of SIRIM Berhad during a discussion with the Delegation from the European Commission, led by His Excellency Vincent Piket, Ambassador and Head of European Commission Delegation to Malaysia.

12 June 2009 – SIRIM Berhad, through its subsidiary, SIRIM QAS International Sdn. Bhd. together with Road Safety Department held a road safety campaign to educate drivers on safety issues.

8 July 2009 – Participants of the Crash and Safety Workshop organised by SIRIM Berhad giving their full attention to the lecture on vehicle safety given by speakers from India and France.

16 July 2009 – Delegation of the Senior Management Programme on Managing RTO's at a photography session during the closing ceremony. Fourteen senior management heads representing Research and Technology Organisations from Iran, Sudan, India, Ghana, Nigeria, Thailand, Vietnam and Indonesia attended the four-day programme.

OLD AS NEW

Bioethanol from empty fruit bunches, polymer solar cells and solar-thermal dryers: Hamdan Mokhtar, Programme Head of the Energy and Process Engineering Programme, is a very busy man.

HAMDAN MOKHTAR IS A HAPPY man. His team has just received a grant from MOSTI to develop a process that promises to produce bioethanol from empty fruit bunches, thus addressing two of the country's biggest pollutants at one go: carbon dioxide from cars, and agricultural waste from the palm oil industry. He is currently evaluating suitable locations on which to build a pilot plant.

"Our lab scale results have been quite promising," says Hamdan. "Our current yield stands at about 20%, so one tonne of empty fruit bunches gives us about 200 litres of bioethanol. This makes the process quite viable economically, especially when you consider the costs of environmental damage."

Bioethanol is to petrol engines what biodiesel is to diesel engines, with one crucial difference: modern petrol engines cannot take pure bioethanol. Whereas diesel engines can run on pure biodiesel, petrol engines are generally a little more sensitive. Without modifications, petrol engines can only take petrol that has been blended with up to 5% of ethanol.

Even so, petrol-bioethanol blends can have a huge positive impact on the environment.

"The impact of bioethanol is so big because petrol engines make up almost all vehicles on the road," says Hamdan. "Even at a blend of five or ten percent, the volume of bioethanol consumption will be more than that of biodiesel."

Hamdan is also overseeing a couple of other renewable energy projects, including a solar-thermal dryer, currently under pilot in Sabah – the solar dryer accelerates the drying time of marine products by up to 50%, thus shortening the production cycle and improving the quality of the produce.

"Solar cells are still costly, and that is the primary barrier to solar energy's adoption," says Hamdan. "R&D is on-going to reduce and improve the overall performance of the solar Photovoltaic system."

Hamdan Mokhtar, Programme Head, Energy and Process Engineering Programme

Right now, AMREC's polymer solar cells have only managed to achieve 6-7% conversion efficiency. However, Hamdan is confident that these will improve over time. Despite his upbeat ebullience, Hamdan is pragmatic enough to admit that renewable energy technology cannot compete with conventional fossil-fuel energy systems.

"All we can do right now is complement conventional energy," says Hamdan.

However, he is quick to point out one of the biggest advantages of renewable energy: its mobility. Conventional power systems invariably require communities to be hooked up to the national power grid in order to receive the electricity. However, renewable energy systems like solar farms, wind farms or mini-hydro plants can be set up *in situ*.

"Renewable energy is all about finding new ways of looking at old problems," says Hamdan. "If we can do that well, we'll never have to worry about our energy needs and our environment."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There is worldwide consensus that developed countries need to reduce greenhouse gas (GHG) emissions to counter global warming. Clean Development Mechanism (CDM) is an opportunity for developed countries to achieve their GHG reduction obligations in meeting their commitments under the Kyoto protocol. Now, SIRIM QAS International can help Malaysian and international companies achieve sustainable development and market carbon credits as an additional revenue generating product. Every CDM project needs to comply with the United Nation Framework Convention on Climate Change (UNFCCC) eligibility criteria and that's where we come in.
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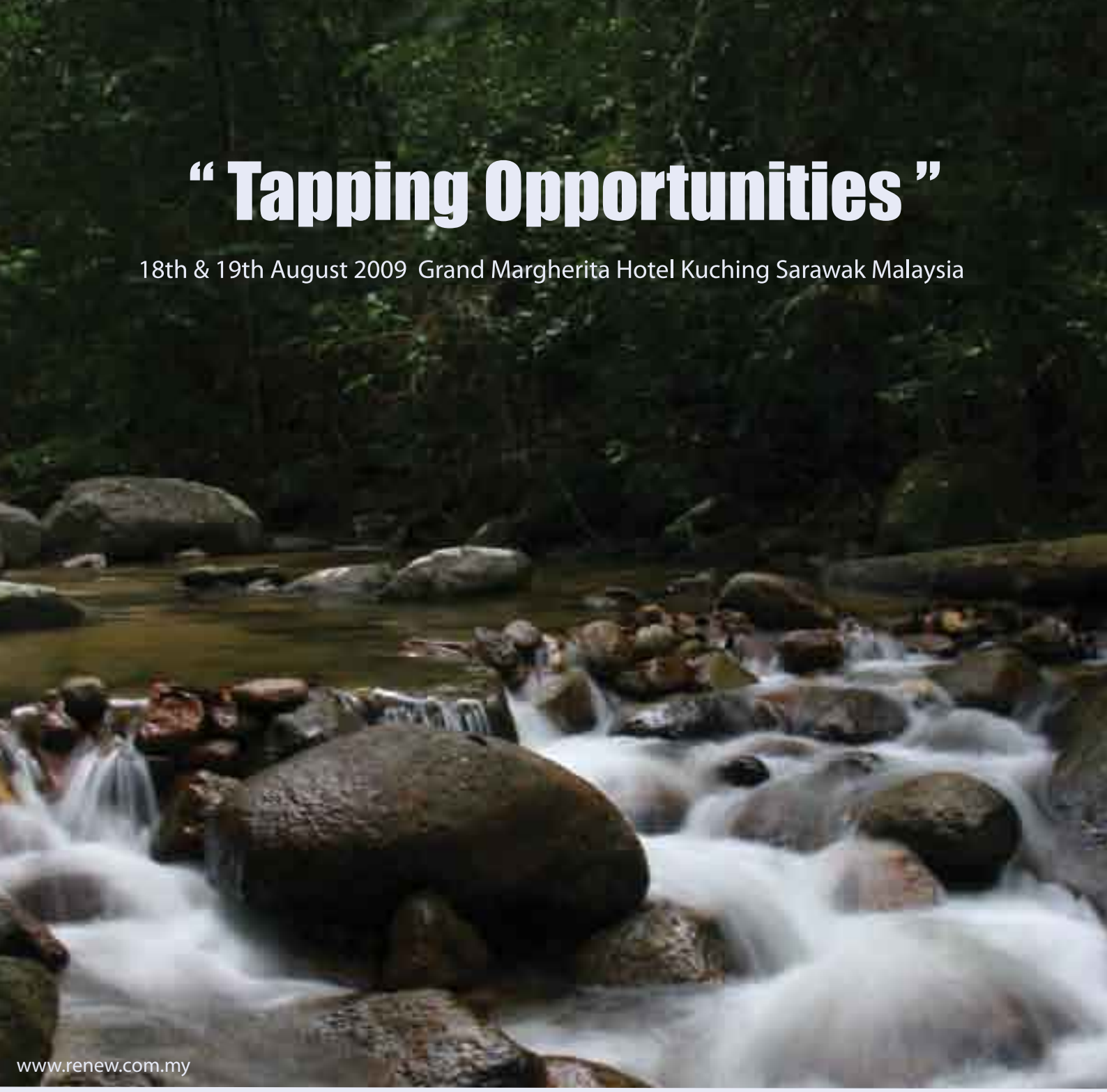

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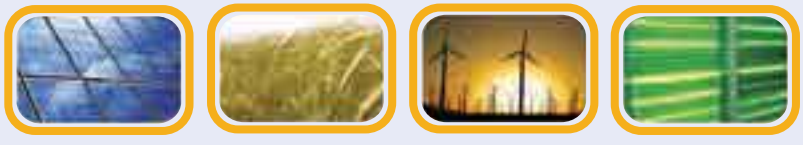

Keynote Address by :
The Honourable
Datuk Dr. Maximus Johnity Ongkili
Minister of Science, Technology and Innovation
Malaysia

Organised by :

SIRIM

Supporting Organisation :

MOSTI

SARAWAK CONVENTION BUREAU