

January–March 2013

ENERGY FUTURE

The Complete Energy Magazine

Volume 1 • Issue 2 • Annual-₹800

AFRICA'S RENEWABLE ENERGY REMAINS UNTAPPED

**Kudankulam: making a case
for nuclear energy**

**The European Supergrid:
possibilities and prospects**

VIEWPOINT

Andy Oldroyd

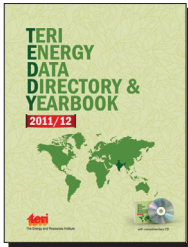
Managing Director, Oldbaum Services





The Energy and Resources Institute

teri press
BOOKS ON ENERGY



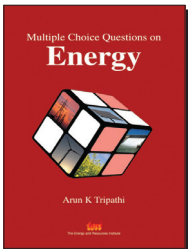
TERI Energy Data Directory & Yearbook (TEDDY) 2011/12

(with a complimentary CD)

A TERI Publication

TERI Energy Data Directory Yearbook, or TEDDY, is an annual publication brought out by TERI since 1986. TEDDY is often used as a reference in other peer-reviewed books and journals for energy and environment-related data. It gives an annual overview of the developments in the energy supplying and consuming sectors as well as the environment sector. It also provides a review of the government policies that have implications for these sectors of the Indian economy.

2012 • 500 pages • Hardback • 220mm x 280mm • 9788179933787 • ₹1995.00

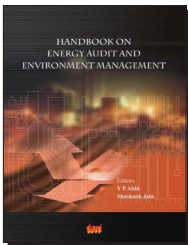


Multiple Choice Questions on Energy

Arun K Tripathi

Multiple Choice Questions on Energy contains about 1300 multiple choice questions covering various sectors of energy, including mechanical energy, electrical energy, chemical energy, nuclear energy, thermal energy, magnetic energy, sound energy, energy from coal, petroleum oil and natural gas, renewable energy, and energy conservation. An introduction to energy has been presented in a comprehensive yet simplified form. This book is useful for academicians, students pursuing engineering or agriculture-related courses, aspirants of various competitive exams, professionals, and stakeholders in the energy sector. It can also be a tool for various quiz programmes organized in schools, universities, and engineering institutions.

2011 • 354 pages • Hardback • 150mm x 240mm • 9788179933053 • ₹295.00

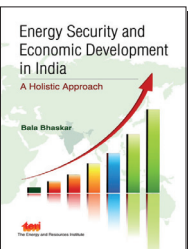


Handbook on Energy Audit and Environment Management

Y P Abbi and Shashank Jain

This book deals at length the energy audits and takes a closer look at the concept of environment management. TERI endeavour to bring its experience of over two decades in the field of energy audits provide methodology and guidelines to those involved in this field. Energy audits may be considered as the first step towards understanding how energy is being used in a given facility. It indicates the ways in which different forms of energy are being used and quantifies energy use according to discrete functions. The Handbook on Energy Audit and Environment Management offers an overview on industrial energy conservation.

Reprint 2012 • 302 pages • Hardback • 180mm x 240mm • 9788179930920 • ₹1500.00

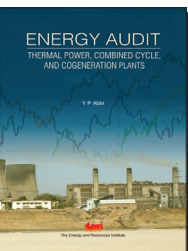


Energy Security and Economic Development in India: a holistic approach

Bala Bhaskar

This book attempts to construct an appropriate definition for the concept of energy security. The evolution of energy security is traced at both the global level and in the Indian context. This book elaborates on the concept of energy security, highlights its linkages, enumerates India's indigenous energy resources, examines the status of energy security in the country, and makes policy suggestions to ensure energy security in the country.

2012 • 376pages • Hardback • 160mm x 230mm • 9788179934609 • ₹795.00



Energy Audit of Thermal Power, Combined Cycle, and Cogeneration Plants

Yash Pal Abbi

Energy Audit of Thermal Power, Combined Cycle, and Cogeneration Plants attempts to refresh the fundamentals of the science and engineering of thermal power plants and establishes its link with the real power plant performance data through case studies, further developing techno-economics of the energy efficiency improvement measures. It is hoped that the book will rekindle interest in energy audits and analysis of data for designing implementation measures on a continuous basis.

2012 • 260 pages • Hardback • 210mm x 297mm • 9788179933114 • ₹1500.00

The Energy and Resources Institute
Attn: TERI Press
Darbari Seth Block
IHC Complex, Lodhi Road
New Delhi - 110 003

E-mail teripress@teri.res.in
Tel. 2468 2100 or 41504900
Fax 2468 2144 or 2468 2145
India +91 Delhi (0) 11
Web <http://bookstore.teri.in.org>

To purchase the book, visit our
online bookstore at
<http://bookstore.teri.in.org> or send
us your demand draft or cheque in
favour of TERI, payable at
New Delhi (outstation cheques are
not accepted).

Prices are subject to change

Chief Patron

R K Pachauri

Editor-in-chief

Amit Kumar

Editorial Board

Sumita Misra

Chief Electoral Officer-cum-Commissioner Election,
Government of Haryana

Rakesh Kakkar

Additional Secretary, Ministry of Consumer Affairs

V V N Kishore

Professor, TERI University

Dr A K Tripathi

Director, Ministry of New and Renewable Energy

Content Advisors

Parimita Mohanty

Shantanu Ganguly

Editorial Team

Anupama Jauhry

Roshni Sengupta

Hemambika Varma

Harish Alagappa

Arpita Dasgupta

Design

Santosh Gautam

Vijay Kumar

Production

Aman Sachdeva

R K Joshi

Image editor

Shilpa Mohan

Marketing and Sales

Yogesh Chander

Kakali Ghosh

Lutfullah Syed

Rahul Kumar

Avinash Kumar Shukla

Photo Credit

NREL

Head Office**TERI**

Darbari Seth Block, IHC Complex

Lodhi Road, New Delhi – 110 003

Tel. +91 (11) 2468 2100 or 2468 2111

Fax +91 (11) 2468 2144 or 2468 2145w

Regional Centres**Southern Regional Centre**

TERI, CA Site No. 2

4th Main, 2nd Stage Domlur

Bengaluru – 560 071

E-mail terisrc@teri.res.in

North-Eastern Regional Centre

TERI, Chachal Hengrabari

Express Highway, VIP Road

Guwahati – 781 036

Western Regional Centre

TERI, F-9, La Marvel Colony

Dona Paula, Panaji – 403 004 (Goa)

E-mail teriwr@goatelecom.com

Affiliate Institutes**TERI North America**

1152 15th Street NW Suite 300

Washington, DC 20005

E-mail terina@teri.res.in

TERI Europe

27 Albert Grove, London SW20 8PZ, UK

E-mail ritukumar@aol.com

OVERSEAS REPRESENTATION**TERI Japan**

C/o IGES

Nippon Press Centre Building (8th Floor)

2-2-1, Uchisaiwai-cho, Chiyodi-ku

Tokyo, Japan - 100-0011

E-mail teris@iges.or.jp

TERI South-East Asia

Unit 503, 5th Floor

Menara Mutiara Majestic

15 Jalan Othman, Seksyen 3, 4600 Petaling Jaya,

Selagor Darul Ehsan, Malaysia

E-mail nimtech@tm.net.my

TERI Gulf Centre

Flat No. 105, Dalal Building, Al Qusais,

Dubai, UAE

E-mail meejana@gmail.com

Printed on recycled paper



From the **editor's** desk...

The current issue of *Energy Future* in a sense reflects the diversity that is going to be the order of the day as far as our future energy scenario is concerned. A case in point is Africa, which is rich in natural energy resources like solar, biomass, wind, and geothermal. But, ironically, its vast stretches are still starved of energy, indicating the fact that conventional methods of dealing with the growing energy demands are not working. The alternative, therefore, is to exploit these dispersed renewable energy resources through decentralized and embedded plants. However, by nature, some of the intermittent resources like wind and solar pose a huge challenge to the utilities that are accustomed to dealing with firm electricity. Thus, what is being observed is that in the future there would be 'supergrids' inter-connecting not only a number of countries, but different geographical regions. Essentially, when such disparate locations are inter-connected through a supergrid, what we will have is a network that will help integrate with the grid, concentrating solar power in one location to offshore wind in another seamlessly.

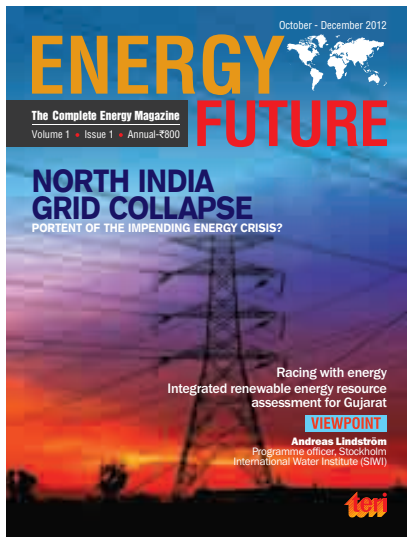
As is becoming pretty clear post-Fukushima, public perception matters and increasing civic enlightenment is something to take note of. Such a situation calls for greater transparency in putting forward the facts, and in today's global scenario where different countries are becoming more and more inter-dependent insofar as energy supply and technologies are concerned, mutual agreements have to be weighted carefully from long-term perspectives of national interests.

Amit Kumar
Director, TERI

Editor - in - chief: Amit Kumar

Printed and published by Dr R K Pachauri for The Energy and Resources Institute, Darbari Seth Block, IHC Complex, Lodhi Road, New Delhi- 110 003. Tel: +91(11) 24682100, 4150 4900, Fax +91(11) 2468 2144 or Email teripress@teri.res.in, and printed by Batra Art Press, A-41 Naraina Indl. Area PH- II, New Delhi-28.

© The Energy and Resources Institute. All rights reserved.



I was an avid reader of *The Solar Quarterly*, and your decision to revamp the magazine into one that covers all aspects of the energy sector and not just solar took me by surprise at first. I wondered if this new magazine would be anywhere as good as *TSQ*. I am happy to say that not only is *Energy Future* an excellent magazine that provides one with valuable insights into the renewable energy sector, it is a far more engaging, interesting, and captivating magazine than *The Solar Quarterly*. By broadening your horizons from the world of solar photovoltaics to the whole spectrum of renewable energy, you have also broadened the breadth and depth of the essays in the magazine. I thought the cover story on the Grid Collapse was fascinating, and was thankful to learn about the various processes and reasons that caused those two days of darkness in northern India. I think *Energy Future* is a massive improvement over *The Solar Quarterly*, both in content and in how well it has been presented. Keep up the good work!

K M Ramanathan
Chennai

I was very happy to see *Energy Future* magazine not try and stick to simple topics in its first few issues, but instead go straight for the jugular, as it were, and report on the big ticket stories in the energy industry. Covering questions such as India's Energy Security, the reasons behind the North India grid collapse, the question of energy storage, and whether hydrogen fuel cells can power our future was a good choice as it showed that the magazine does not shy away from asking tough questions and investigating the issues that matter. I think the Energy Insights section is providing an invaluable service to your readers, bringing them up-to-speed with all the major discussion points of renewable energy. This is what, in my opinion, makes *Energy Future* a truly good magazine, there are articles for people who are well-versed with the subject and there are sections for people

with only a passing interest in the field. Well done and all the best for the future.

A Venkat Rao
Secunderabad

As a doctoral candidate in the field of industrial energy, I am always pleased to receive my copy of *Energy Future*. There are very few magazines in the market today that I feel match up to the quality of articles that you publish which are both informative and engaging. Being a student of this discipline I must say that acquainting myself with the contents of this magazine has helped me immensely in my research work. In the current issue, I found the article on Energy Markets especially insightful. Keep up the good work!

Ruchira Brahma
Pune

I am firmly of the opinion that *Energy Future* is fast emerging as a competitor to most international magazines, including e-magazines, on energy and related issues, particularly with regard to its content and coverage. The issues addressed in this magazine, similar to its earlier avatar *The Solar Quarterly* of which I was a regular and avid reader, are comprehensive and in-depth making this publication one of the best in the business. Of particular importance are sections such as Energy Insights, Abstracts, Technical Corner, and Industry Registry, which not only provide information but do so in a succinct manner. I wish the editorial team all the best for the future and hope they carry forward the great work.

Nitin Yadav
Lucknow



Thank you very much for your encouragement. The editorial team of *Energy Future* will ensure that the magazine caters to your information and knowledge needs. We welcome your suggestions and comments to further improve our content and presentation.

Editor
Energy Future

CONTENTS



NEWS 4

COVER STORY

Africa's Renewable Energy Remains Untapped 12



FEATURES

- Kudankulam: making a case for nuclear energy 22
- The European Supergrid: possibilities and prospects 28
- Tesla, the electric car 34
- Will offshore wind power form a significant part of the future energy generation mix? 40

THE SOLAR QUARTERLY

- Mirror, mirror 46
- Japan: land of the rising solar boom 52



VIEWPOINT

- Mr Andy Oldroyd, Managing Director, Oldbaum Services 46

ENERGY INSIGHTS 62

ABSTRACTS 64

PRODUCT UPDATE 68



BOOK REVIEW 70

BOOK ALERT 71

TECHNICAL CORNER 72

INDUSTRY REGISTRY 74

EVENTS 75

RE STATISTICS 76



GAIL COMPLETES FIRST PHASE OF LNG PIPELINE

The state-owned GAIL India has completed work on the first phase of the pipeline that will connect the upcoming LNG import terminal in Kochi to consumers in Kerala. "Mechanical completion of the 40-km phase-I has been done and is ready for gas intake subject to availability of gas from Petronet LNG," Minister of State for Petroleum and Natural Gas, Panabaaka Lakshmi, informed the Rajya Sabha in a written reply.

Petronet is building a five-million tonne per annum liquefied natural gas (LNG) import terminal in Kochi. The facility is likely to be completed in the first quarter of 2013 after dredging of the navigational port is done. The phase-I of the pipeline will connect the Kochi terminal to the Fertilizer and Chemicals Travancore Ltd's (FACT) plant, she said. The 879-km phase-II pipeline to Mangalore and Bangalore in Karnataka is under implementation and the actual physical progress of the project is 64.1 per cent.

"Phase-II of the pipeline is passing through the States of Kerala (501 km), Tamil Nadu (312 km), and Karnataka (66 km). As per GAIL's board approval, the schedule date of completion of the project is December 2012, but the project has got delayed," she added.

The Minister said GAIL acquired Right of Use (RoU) in land from land owners/farmers to lay the pipeline and compensation was paid as per the Petroleum and Mineral Pipelines (Acquisition of Right of User in Land) Act, 1962. GAIL had completed the process of acquiring RoU, but was unable to hand over the RoU to contractors due to severe resistance from land owners/ farmers, she added.

Source: www.thehindu.com

WASTE-TO-ENERGY PLANT LEFT TO ROT WHILE GARBAGE MOUNTS IN MANDUR

Roiled by garbage trucks being allowed inside the Mandur landfill site despite protests, members of the Mandur gram panchayat said they would meet Chief Minister, Jagadish Shettar, shortly to discuss the matter. Lamenting the pathetic state of their village, the local residents vented their ire on the Bruhat Bangalore Mahanagara Palike and the state government for their apathy.

Grama panchayat member Rakesh Gowda rued, "We were promised by Mayor D Venkatesh Murthy and the then BBMP Commissioner Rajaneesh Goel that the number of garbage trucks reaching the landfill would be reduced to 150 in December. However, we see around 450-500 lorries unloading tonnes of garbage. A written agreement copy regarding complete garbage clearance from February 1 is pending."

"The chief minister had assured us that a park would be developed at the site within a year, soon after the landfill is cleared. However, no initiative has taken off the ground," he said. The villagers and panchayat members also pointed to the defunct waste-to-energy plant started six years ago by Srinivas Gayathri Resource Recovery Ltd.

Gram panchayat president Amrutha Manjunath complained: "A conveyor belt with trolleys is also lying in a

dilapidated state. If the power plant was functioning, power generated from burnt garbage would have lit many homes." Narendra Babu, a resident, said: "The open pit is where all the garbage is pushed in and covered with mud. This has resulted in the contamination of groundwater source, rendering it unfit for consumption. The areas mainly affected due to stench and water depletion are Mandur panchayat, Gundur, Byappanahalli, Kammasandra, Marasandra, Kattagollahalli, Bommanahalli, Bidarahalli, and Hancharahalli."

Source: www.deccanherald.com



RELIANCE INDUSTRIES COMPLETES 25 PER CENT STAKE SALE IN YEMEN OIL BLOCK

Reliance Industries (RIL) has completed sale of its 25 per cent stake in an oil block in Yemen to Indonesia's Medco Energi for about \$90 million. RIL had in 2001 won Yemen's Block 9 along with Hood Energy and Calvalley Petroleum Inc. RIL and Hood Energy held 25 per cent stake each while Calvalley had the remaining 50 per cent.

The Mukesh Ambani-led company had announced the sale of its stake in the oil producing block in August 2012. The stake sale followed RIL exiting two oil blocks in Kurdistan region of Iraq on 19 July 2012.

RIL's Dubai-based subsidiary Reliance Exploration and Production DMCC signed the completion documents for divestment of its 25 per cent working interest in the Yemen's Block-9 to Medco Yemen Malik Ltd, a wholly-owned subsidiary of PT Medco Energi Internasional Tbk of Indonesia. RIL said the sale agreement with Medco would be effective from 1 January 2013.

While the agreement is for a 25 per cent interest, Medco would effectively have a 21.25 per cent participating interest in the block because under a regulation in Yemen,



the contractor of a production-sharing agreement has to accommodate a working interest for the country, which is represented by the Yemen Oil and Gas Company, which will hold a 15 per cent stake. Accordingly, the operator Calvalley Petroleum would have 42.5 per cent interest and Hood Oil 21.25 per cent stake. RIL would get another \$5 million if the block produces 10,000 barrels of oil per day. The block currently produces between 6,000 bpd and 6,500 bpd.

Source: <http://businesstoday.intoday.in>

DANFOSS SIGNS MoU WITH TAMIL NADU GOVERNMENT FOR ₹500 CRORES INVESTMENT

The Chief Minister of Tamil Nadu, Selvi. J Jayalalithaa has signed a MoU with Mr Noel Ryan, President of Danfoss Industries Pvt. Ltd that will pave the way for the allotment of 50 acres of industrial land in Oragadam, an industrial area located on the outskirts of Chennai. As part of the agreement, Danfoss India has made a commitment to invest in an integrated campus at this site and over the years create jobs for 1,200 people.

Danfoss anticipates India's burgeoning urbanization and the influx of people to cities will drive demand for its products. As people move to the cities, demand for power and energy will grow. The same goes for ventilation, air conditioning, and a more efficient cold chain infrastructure to keep food fresh during transport and storage. This will fuel growth for Danfoss in areas such as industrial refrigeration, frequency converters, and products related to solar and wind power.

"Danfoss is a company, which pursues growth, wherever growth is. Our investment in India is one of the largest in the history of Danfoss and it signals the increasingly important role we expect India will play in Danfoss' global operations. Currently, India is Danfoss' twelfth largest market, but we expect it to be among the top five within the next five years," said Kim Fausing, Executive Vice President and COO,

Danfoss Group. This sets Danfoss on a major expansion track in India in line with 'India 2015', a growth strategy announced in November last year. 'India 2015' outlines Danfoss' plan to tap further into the fast growing Indian market and increase sales three fold by 2015.

Source: www.automationexcellence.com



DEADLINE FOR FILLING KYC FORMS EXTENDED

The government extended the deadline for filling of the Know Your Customer (KYC) forms by LPG consumers till 31 December 2012 from 15 November 2012 previously. The drive to weed out multiple connections at same addresses follow the September 2012 decision to cap supply of subsidized LPG to six cylinders per household in a year. The official clarified that only those figuring in the list of suspected households having multiple connections need to fill KYC form.

“Only multiple connection holders should submit the KYC details before the new deadline,” he said, adding oil companies have identified over 2 crore households were multiple connections have been taken at the same addresses under different names.

The official said oil firms are implementing the policy of ‘one household, one connection’ and have asked consumers to voluntarily give up additional connections. Multiple LPG connections in the ‘same name and at the same address’ as well as ‘husband and wife’ owning connections at the same address would be summarily disconnected. In case of multiple connections at same address under different names, distributors have been asked to collect KYC forms to verify genuine users.

New subsidized LPG connections will be issued after the completion of the KYC formalities and multiple connection

check. “All LPG consumers are eligible for three subsidized domestic cylinders during the remaining part of the current year ending 31 March 2013,” the official said. There is no restriction on the number of domestic non-subsidized cylinders that consumers can avail beyond the three subsidized LPG refills to meet their genuine demand. From 1 April 2013, LPG consumers can avail six domestic subsidized LPG refill cylinders in a financial year.

Source: <http://economictimes.indiatimes.com>



RUSSIA OFFERS STAKE IN TWO BLOCKS TO ONGC VIDESH LTD

Russia’s Rosneft has offered ONGC Videsh Ltd (OVL) a stake in Magadan-2 and Magadan-3 exploration blocks in the northern part of the Sea of Okhotsk in eastern Russia. OVL is the overseas arm of state-owned Oil and Natural Gas Corp (ONGC). “OVL team visited the data room and blocks are currently under evaluation,” Oil Minister M Veerappa Moily said in a written reply to a question in the Rajya Sabha recently. “Based on initial evaluation, blocks are indicated to be rank exploratory in nature and involve high risk of investment.”

Rosneft had last year obtained licences to explore in five areas in the Sea of Okhotsk—Magadan-1, -2, and -3, Lisyansky, and Kashevarovsky. The area is estimated to hold 2.8 billion tonnes of oil and oil equivalent natural gas. Sources said OVL had in May 2012 written to Rosneft expressing interest in taking a stake in oil and gas blocks in the Russia’s Arctic region, which have recently been given out to US major ExxonMobil, Italian giant ENI, and Norway’s Statoil for exploration.

Moily said the Okhotsk Sea is bound by mainland Russia in the west and north and by Kamchatka-Kuril peninsula towards east and northeast Hokkaido (Japan) to the south. The Russian firm had also recently roped in Statoil for four new joint ventures, including exploring the Magadan 1, Lisyansky, and Kashevarovsky blocks that have recoverable reserves of 1.4 billion tonnes.

OVL is keen to get a foothold in the Arctic projects and expand in Siberia and Far East Russia. The company has 20 per cent stake in the Sakhalin-1 oil and gas field in the Russian Pacific Ocean and had bought Imperial Energy, which has fields in Siberia, in 2008.

Source: <http://businesstoday.intoday.in>





BESCOM BEGINS WORK ON \$16.12-MILLION SMART GRID PROJECT IN INDIA

State-owned Bangalore Electricity Supply Company (Bescom) has started work on its ₹870-million (\$16.12 million) smart grid project in the Indian city of Bangalore. The latest project, which would improve and ensure efficient use of power, is expected to help consumers plan their consumption and enable them to interact with Bescom, according to Deccan Herald.

An American company has begun the feasibility study, which is being funded by the US Trade Development Authority, for this first-of-its kind project in India. Bescom is receiving this grant as a part of an agreement between Prime Minister Manmohan Singh and President Barack Obama for co-operation in clean energy and energy efficiency. This project has got clearance from the Central Power Research Institute, an autonomous society that works under the Indian power ministry.

Source: <http://utilitiesretail.energy-business-review.com>

GOVERNMENT'S SHALE GAS POLICY TO BE ANNOUNCED

To exploit unconventional hydrocarbon resources, the government is all set to introduce a shale gas exploration policy by end of December 2012. The Directorate General of Hydrocarbons (DGH) has proposed to offer areas for exploration of shale gas on royalty and production linked payments to the government. The government is planning to launch its first auction of shale gas block by the end of 2013.

"We will come out with a shale gas policy by the end of December. We are sticking to this deadline," Petroleum Secretary G C Chaturvedi said at the 11th Petro India Conference organized in New Delhi by the India Energy Forum and Observer Research Foundation. The DGH has prepared a draft policy, which does not permit cost recovery. Bidders would be asked to quote a percentage of the output they are willing to share with the government at different production slabs.

In this regard, the DGH's draft policy says: "This will minimize government intervention and remove complications in accounting and incentive for gold plating, which may occur while allowing profit sharing, based on cost recovery."

Source: <http://businesstoday.intoday.in>



UK ENERGY DEPARTMENT TO SUPPORT BIOMASS, SOLAR PROJECTS UNDER RENEWABLE OBLIGATION INITIATIVE

The UK Department of Energy and Climate Change (DECC) announced its support for biomass and solar photovoltaic (PV) developers in the country under the government's Renewables Obligation (RO) initiative. New biomass projects, boosted by the incentives of the RO initiative, could secure investments worth £600 million for the development of cost and carbon effective solutions.

DECC Secretary Edward Davey said that the government foresees an increased role for biomass projects in the generation of cost-effective and low-carbon renewable power in the country. Building-mounted solar PV projects will also obtain higher incentives when compared to ground-mounted projects to promote installation of solar projects at large factory or warehouse buildings. "We want to see a healthy solar industry that grows in a sustainable way," Davey added. The Renewable Energy Association (REA) commended the implementation of RO on biomass projects stating that the DECC has decided against restrictions on suppliers for biomass power.

REA chief executive Gaynor Hartnell said, "Instead of implementing legislation that would have stopped



investment in its tracks, DECC is taking more of a 'wait and see' approach, with the option of consulting if deployment exceeds 400 MW." Responding to the RO decision on solar, REA On-site renewables head Mike Landy remarked, "Government has heard the evidence provided by industry and has increased the support for large-scale solar PV compared with its consultation proposals, albeit only slightly."

Source: <http://biofuelsandbiomass.energy-business-review.com>



PLASCO TO DEVELOP 15-MW WASTE-TO-ENERGY FACILITY IN OTTAWA, CANADA

Canada-based Plasco Energy Group will set up a waste-to-energy conversion facility in Ottawa with a 150,000-tonne-per-annum capacity. City of Ottawa has leased a site for the construction of the plant at a nominal cost and will pay a tipping fee of \$83.25 for each processed tonne to Plasco. A 20-year contract to supply 109,500 tonnes of municipal solid waste has also been inked with the waste then expected to be converted into 15-MW net electricity for the local grid. The facility will be equipped with Plasco Conversion System (PCS) design and incorporate the company's three proprietary Integrated Converting and Refining System (ICARS) modules. Construction of the plant is scheduled to begin in June 2013 with commercial operations expected during early 2015. The contract is estimated to expand the life of Ottawa's existing landfill by 28 years and reduce \$250 million in capital costs. Construction and operation of the waste to energy facility is subject to approval from the Ontario Ministry of the Environment.

Source: <http://biofuelsandbiomass.energy-business-review.com>

AREVA TO PROVIDE WIND TURBINES FOR 400-MW OFFSHORE FARM IN GERMANY

Spanish offshore wind technology developer Iberdrola has selected French supplier Areva to provide the turbines for its 400-MW Wikinger offshore wind project in Germany. Proposed to be developed in the Baltic Sea, the wind farm is expected to be constructed in 2016 and 2017.

Areva Wind will offer a wide array of services for the project, including foundation and tower design optimization, project logistics, installation concept, and project certification. The offshore wind farm will feature the 5-MW M5000 turbines that are designed for installation in large-scale projects. Equipment transportation, installation, commissioning, and maintenance services will also be handled by Areva. The companies will now initiate negotiations to determine the commercial and technical details of the supply contract. Areva CEO Luc Oursel said that the contract further strengthens its objectives for the European market. "This new success further demonstrates the credibility of our long-term growth strategy and our long-term commitment towards renewable energies," said Oursel.

Source: <http://wind.energy-business-review.com>



ASIA REPORT: ANOTHER WEEK OF WOE FOR CHINA'S SOLAR PANEL MANUFACTURERS

China's beleaguered solar panel makers took another hit announcing either shipment downgrades or job cuts in response to global oversupply and higher production costs tied to recent import tariffs imposed by the US government. Trina Solar, which has reported a loss for the last consecutive

four quarters, slashed third-quarter guidance citing industry-wide oversupply and lower prices. The Chinese solar panel maker now estimates shipments in the third quarter would be in the 375-MW to 385-MW range, down from previous guidance of 450 MW to 480 MW, as margins were squeezed by anti-dumping duties in the US and an inventory write-down.

Trina had said recently that it was cutting an undisclosed number of jobs as part of a broader cost-saving measure. Currently, it was Suntech's turn to announce job cuts, saying it will reduce three production shifts to one and cut the workforce at its Goodyear, Ariz. solar panel manufacturing facility. The world's largest producer of solar panels said the rising costs of solar cells increases the cost of manufacturing solar panels in the US tariffs on solar cells come in addition to tariffs imposed by the US government in 2011 on aluminum frames, another key input for solar panel manufacturing. "Subsequent to our decision to invest in Arizona, unnecessary upstream trade barriers have made it difficult and more costly to manufacture solar panels in the US. In addition, these new tariffs limit our ability to utilize Suntech's advanced solar cell technology imported from China," said Mick McDaniel, Managing Director of Suntech America.

Source: www.renewableenergyworld.com



GREEKS CAN'T FIND EUROS TO BUY HEATING OIL IN WINTER ECONOMY

Greece is facing a severe heating-oil crisis. With an economy that has contracted for five years and an unemployment rate at a record 25 per cent, residents in northern Greece can't heat their homes. The Greek mountain town of Kastoria, less than an hour from the Albanian border, has not received funds from the central government to warm schools. The mayor said he will close all 53 of them rather than let children freeze, a step already taken in a nearby town. Truckloads of wood are arriving from Bulgaria as families search for alternative fuels.

According to the International Energy Agency, "heating oil reached 1,265 euros per 1,000 litres in the second quarter of 2012, surging 48 per cent from a year earlier". Because of limits imposed by the forestry service on the amount of timber that can be harvested, wood is imported from Bulgaria. Sales of wood for heating have soared 40 per cent from last year, according to Alexis Tsekouras, a Kastoria wood seller.

Austerity measures have cut government salaries and benefits, raised the retirement age and reduced services. The household price for heating oil in Greece reached 1,266

euros per 1,000 litres (264 gallons) in the second quarter of 2012, surging 48 per cent from a year earlier. The same quantity cost 700 pounds (861 euros) in the UK, according to the IEA, and \$1,045 (790 euros) in New York, according to a state agency. Greeks pay both excise and value-added taxes on heating oil that can make up 42 per cent of the total cost. The mayors of the region are petitioning the government to be exempted from the tax.

Source: www.businessweek.com



CHINA OPPOSES "UNILATERAL ENERGY EXPLORATION" IN SOUTH CHINA SEA

China has said that it "opposes any unilateral energy exploration" in the South China Sea, in response to a recent statement by Navy Chief Admiral D K Joshi that the Indian Navy was prepared to protect its interests and deploy its forces in the contested waters. Foreign Ministry spokesperson Hong Lei said China "hopes relevant countries respect China's sovereignty and national interests," when asked at a regular press briefing about Admiral Joshi's comments. Admiral Joshi had said in response to questions at a press briefing that the Indian Navy was "prepared" to go to the South China Sea to protect Indian interests. ONGC Videsh is now involved in three oil exploration blocks off the coast of Vietnam in the South China Sea, whose waters and islands are contested by China, Vietnam, and several other countries.

National Security Adviser Shivshankar Menon, who was in China on a two-day visit, played down the remarks, saying that the issue did not figure during his talks with the Chinese leadership. In recent weeks and months, a number of commentaries in the Chinese State-run media have debated India's role in the US move to "pivot" to Asia and strengthen its presence in the region, against the backdrop of resurfacing territorial disputes between China and a number of its neighbours, including Vietnam and the Philippines.

"The real threat posed by India to China is the military cooperation between India and Vietnam," said Du Jifeng, a scholar at the Chinese Academy of Social Sciences. "Moreover, India is now controlling several Indian Ocean islands at the entrance of the Malacca Strait, an international energy channel that sees 80 per cent of Chinese oil imports passing by every year."

Source: www.thehindu.com



DEWA SIGNS MoU WITH INTERNATIONAL RENEWABLE ENERGY AGENCY

A Memorandum of Understanding (MoU) has been signed between the Dubai Electricity and Water Authority (DEWA) and the International Renewable Energy Agency (IRENA) to promote renewable energy in the Emirate. HE Saeed Mohammed Al Tayer, MD and CEO of DEWA, and Adnan Amin, Director General of IRENA, signed the MoU in the presence of senior officials from both parties and several representatives of governmental departments. The MoU also aims to realise the vision of HH Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, to promote sustainable development in the Emirate. It aims to promote sustainable renewable energy deployment and further strengthen Dubai's position as a sustainable environment. According to the terms of the MoU, DEWA and IRENA will develop and implement policies and energy strategies to accelerate renewable energy implementation.

"The MoU supports the Dubai Integrated Energy Strategy 2030, which was formulated by the Supreme Council of Energy for Dubai to diversify the energy mix of the Emirate to be 71 per cent gas, 12 per cent nuclear energy, 12 per cent clean coal, and 5 per cent solar energy by 2030, while reducing energy consumption by 30 per cent," explained Al Tayer, adding that "achieving a green and sustainable future is a responsibility for us all. That's why DEWA is working relentlessly to share best practices and expertise in the field of renewable energy with all reputable and concerned organizations."

"IRENA is one of the key strategic partners of DEWA in this field and we both are seeking to achieve the UAE Vision 2021 to make the UAE one of the best countries in the world by having the highest standards of living and sustainable environment."

Source: www.ameinfo.com

UK CLEAN ENERGY FIRM TO BUILD AFRICA'S LARGEST SOLAR PV POWER PLANT

Cheshire-based Blue Energy is to build Africa's largest solar photovoltaic (PV) power plant in a move that could spark a renewable energy revolution in West Africa. The giant 155-megawatt Nzema project will be one of the biggest in the world—only three solar PV plants in operation today are bigger. It will increase Ghana's current generating capacity by 6 per cent and will meet 20 per cent of the government's target of generating 10 per cent of its electricity from renewable sources by 2020. The Nzema project will be the first to go ahead under Ghana's 2011 Renewable Energy Act, which set up a system of feed-in tariffs, and it is a success for the government's policy of attracting international finance. In November 2012, Energy Minister Joe Oteng-Adjei announced he was seeking \$1 billion of private investment to help Ghana achieve its renewables target.

The \$400-million scheme, which will be fully operational in 2015, reflects Blue Energy's ability to mount major projects in the region. The UK-based renewable energy investor and developer plans to develop further renewable energy power plants in West Africa and has a number of projects in the pipeline.

Chris Dean, CEO of Blue Energy, said: "Ghana's forward-thinking strategy puts it in a strong position to lead the renewable energy revolution in Sub-Saharan Africa. Nzema is a case study in how governments can unlock the huge potential for solar energy in Africa. We are delighted that it will make a strong contribution to the national economy, provide much needed generating capacity, and help develop the skills of the future."

Source: www.clickgreen.org.uk



A vast continent with infinite possibilities particularly with regard to development of renewable energy, Africa has largely remained on the leeward side of the global energy map. *Peter Kahare* explores the future energy potential in Africa and finds some startling yet encouraging facts about renewable energy in the continent.

AFRICA'S RENEWABLE ENERGY REMAINS UNTAPPED

At the scenic dormant Menengai crater in Kenya's Rift Valley province, evidence of once massive tectonic activities is clear; the deafening sound of steamy water shooting from beneath into the clear blue sky can be heard from afar, there is a flurry of activity as engineers drill deeper to bring forth the unexploited geothermal power. The crater has a potential of 1,600 MW according to the Geothermal Development Company (GDC) that is mandated to manage geothermal resources in Kenya. Geothermal power is the buzzword in East Africa currently. In the region,

a massive 15,000 MW of geothermal power remains unexploited and six countries, namely Kenya, Tanzania, Uganda, Djibouti, Ethiopia, and Eritrea, are seeking to adopt a comprehensive regional strategy to fully exploit this resource.

The six countries fall under African Rift Geothermal (Argeo) system, a mechanism formed in 2003 and funded by the United Nations to help these countries develop their large, untapped geothermal resource. Experts say that Africa has an abundance of untapped renewable resources that include, hydropower, wind, geothermal, solar,



and biofuels. The requirement for energy in the entire African continent is urgent; nearly half a billion people (70 per cent) of the population have no access to electricity in the continent. It is for this reason that up to 600 delegates from these countries met for the 4th African Rift Geothermal (Argeo) Conference in Kenya's capital Nairobi, in a four-day conference that ended on 23 November 2012.

The conference discussed—among other topics—the challenges and opportunities for developing renewable energy resources, specifically geothermal energy, strategic approaches, resource mobilization, and financing of geothermal projects. By the end of the conference, participants were even more resolute and positive about the important place geothermal energy will play in Africa's quest for cheap energy to power the continent's development projects and serve the widening population. Argeo members are upbeat about the future of geothermal energy, besides other forms of energy like wind, solar, biogas, and small hydro that are critical in off-grid power generation. "The African Rift, with a geothermal potential estimated at 15,000 MW,

is one of the most endowed regions with this resource. Unfortunately, the region is one of the least connected with electricity," says Kenya's Minister for Energy, Kiraitu Murungi. Of the African Rift countries, Kenya and Ethiopia are the only countries with operational geothermal plants. Being in the transition to a low-carbon and resource efficient green economy, Kenya is becoming used as an example by other countries. "However, Rwanda is ready to commence drilling in the Karisimbi geothermal field and will, therefore, soon join Kenya and Ethiopia," Murungi says.

The remaining countries like Djibouti, Uganda, and Tanzania are at various stages in assessing their geothermal potential. Dr Meseret Tekremariam, a Senior Geothermal Expert with the Department of Infrastructure and Energy, African Union Commission, and an Argeo Project Manager, says countries in the Africa Rift region should address challenges facing the development of geothermal energy. Dr Meseret believes that the challenges for geothermal exploration and other forms of renewable energy in the East Africa Rift region and in entire Africa are, more or less, identical. She notes

that the main challenge is high upfront cost for drilling, inadequate skilled work force, financing for investment for initial costs that are high, and inadequate private sector participation to enhance and accelerate geothermal production. Other limitations include a poor policy and legal framework, lack of coordination and linkages in renewable energy programmes, weak dissemination strategies, and low maintenance capacity. Drilling companies are also mostly disinclined to invest in drilling work due to the risks involved and the possibility of failed wells. Drilling and operating one well costs an average of 340 million Kenya shillings (\$4 million, ₹21.5 crore). According to windindustry.com, it costs between \$1.2 million and \$2.6 million to install a commercial wind turbine for every megawatt. The cost of establishing a co-generation plant requires an investment in the range of \$1.5 million per megawatt. Dr Meseret, however, notes that compared to ten years ago, there are many risk mitigation facilities, as the one developed in Argeo's support programme and several other programmes. "There are quite a number of programmes to encourage the public and private developers



to mitigate the risks associated with geothermal exploration in order to accelerate development of geothermal," says Dr Meseret.

The delegates at the Argeo conference agreed that a geothermal institute should be established in Kenya to allow training of geothermal engineers. According to Dr Peter Omenda, General Manager of GDC, up to 100 engineers were sent abroad in 2011 for studies since universities in Kenya do not train geothermal engineers. Dr Omenda told *Energy Future* that at the Menengai Crater and Olkaria geothermal sites in Kenya, which are some of the biggest sites in East Africa and Africa as well, exploration risks have been minimized. Menengai field is found in Nakuru County, Central Rift Valley province, 190 km Northwest of Nairobi city. "The drilling success rate at Menengai is over 80 per cent, drillers can recover up to 10 MW in a well, this reduces the unit cost," says Meseret. Currently, Ethiopia is generating a total installed capacity of about 7.2 MW, in the Aluta Langano pilot geothermal project; the government of Ethiopia is in preparation to expand the field to 70 MW. Another site discovered recently in Ethiopia is the Tendaho geothermal site in the North East of the Ethiopian Rift where six wells have been drilled. There are 18 geothermal sites in Ethiopia that are useful for power production and numerous other sites useful in agriculture, horticulture, and other activities. "The total generation capacity in Ethiopia is 500 MW with hydro power giving more than 450 MW. However, with enhanced technology, it is possible to drill a well and get more than 10 MW; this could be more," says Meseret.

In Tanzania—one of the countries that have not begun geothermal exploration—petroleum, hydropower, and coal are the major sources of commercial energy in the country.

According to the Tanzanian Ministry of Energy and Minerals website, biomass accounts for 90 per cent of total energy consumption. Electricity contributes 2 per cent to the national grid and 8 per cent of the total energy consumption comes from petroleum products. In Tanzania, only three-quarters of the country, mainly in urban areas, are connected to the national grid. Through the National Energy Policy of 2003, the Tanzanian government is encouraging investment to expand generating capacity, distribution system, and development of indigenous sources of energy. However, very little efforts have been made to exploit wind and solar energy in Tanzania, which could be an important source for energy. In Kenya's Vision 2030, a development blue print expected to propel the country to a middle-income economy, the East African country aims to generate 5,000 MW from geothermal. The development of these megawatts is to be realized at an estimated cost of \$20 billion. "This is a colossal amount of money to be expected to come from direct exchequer support, the private sector's participation is, therefore, critical in the realization of this desired goal," says Energy Minister Murungi. In 2009, OrPower 4, an independent company expanded the 48-MW Olkaria III geothermal power plant located in Naivasha town, 100 km Northwest



of Nairobi city. "The company has embarked on a drilling campaign to harness another 52 MW to bring it to total 100 MW of power. This is a clear demonstration of the contribution the private sector can make towards geothermal power production," says Murungi.

The government of Kenya is encouraging the development of



geothermal under a Private Partner Participation (PPP) framework using three models. The first model involves the Geothermal Development Company developing steam and selling it to Independent Power Producer (IPPs) for conversion into electricity at a fee. Private power sectors may singly or jointly, with other parties, opt to participate in the steam conversion. In the third model, the private sector firms are licensed under the Geothermal Resources Act of 1982, to conduct geothermal exploration, steam development, and construction of power plants under strict timelines. According to www.energy.go.ke, three companies have so far been licensed in the last five years while the licence of one company was recently revoked owing to inadequate performance. Kenya has developed 203 MW from geothermal for grid electricity at Olkaria and 2.5 MW at Eburu, both sites situated in Naivasha town.

Currently, Kenya is producing up to 1,350 MW of power from various sources against a demand of 3,000 MW. Experts say that the demand for power in East Africa's biggest



economy is bound to grow as the country pursues industrialization and as the population continues to bulge. "Energy is a critical factor in social and economic development of any country, we must, therefore, take advantage of our vast geothermal resources to improve the economy of the region and uplift the living standards of our people," Stephen Kalonzo Musyoka, Vice President of Kenya, told the Argeo conference. Mr Musyoka expressed optimism that the countries in the Argeo region will accelerate efforts to exploit the 15,000 MW to spur economic growth. Mr Musyoka noted that regional collaboration and cooperation should be at the core of geothermal development. "This gives the region a competitive edge in the global sphere, geothermal is affordable, reliable, and green energy for electricity, this will make the region more attractive for investment," Mr Musyoka stated. Various companies in Kenya have begun using geothermal in processing of goods, in agriculture and for space heating. Oserian Flower Company in Naivasha town is one of the companies that is using geothermal to grow flowers.

Geothermal Development Company (GDC) plans to drill 1,400 steam wells to provide steam for up to 5,000 MW of geothermal power capacity by 2030. According to GDC's Managing Director Silas Masinde Simiyu, only 2 per cent of the total geothermal potential has been exploited in Kenya. The total potential of geothermal power capacity in Kenya is estimated to be between 7,000 to 10,000 MW. Besides the Olkaria and Menengai crater geothermal fields, Kenya Electricity Generating Company and GDC—which are government owned—are also drilling wells for geothermal power at the Bogoria-Silali block in the northern part of the Rift Valley.

In Uganda, 93 per cent of energy comes from fuel wood, 6 per cent from imported petroleum, and 1 per cent from electricity according to www.norway.go.ug/Embassy. Norway is a major development partner with Uganda in the energy sector. Acute shortage of power in Uganda is largely caused by lack of public and private investment in energy infrastructure and rising demand for energy. The government of Uganda is considering increased import of thermal energy,



which is rather expensive than hydro. The Ugandan government is also promoting renewable energy development projects like use of solar cells and solar heaters and construction of hydropower plants to address energy shortage. In a report dubbed 'Low-Carbon Africa' Christian Aid, an international agency that seeks solutions to chronic poverty in various nations, says that decentralizing and diversifying renewable energy power generation technologies could be the panacea to save many countries in Africa from unreliable and expensive power supplied by hydro and thermal power generation. The organization says that up to 719 million people in Sub-Saharan Africa have severely limited access to energy. Christian Aid says that lack of clean energy in Africa has hampered efforts to meet the "UN-agreed Millennium Development Goals and contributes to the deaths of hundreds of thousands of children under five years every year through respiratory ailments caused by smoke fumes from open cooking stoves." In a continent, which is largely untapped, says Christian Aid, geothermal, small-scale hydro, solar, wind, tidal, and biomass fuels, including agricultural wastes, all offer significant potential for delivering both basic needs and for unlocking economic growth.



Christian Aid says that empowering communities in rural areas in Kenya to produce power through renewable, cleaner sources could reduce overreliance on hydropower and fully exploit the renewable energy potential. Christian Aid observes that if empowered, communities can come up with innovative projects that can boost their economic potential and economic status of their countries. "Local communities in Africa should participate in renewable energy technology projects, such as small/micro hydro, wind, solar, bagasse co-generation, and improved stoves. This could increase energy security and

mitigate against climate change effects that badly affect the hydropower generation technology," says Alison Doig, the report's lead author and senior climate change advisor at Christian Aid. Doig says that African countries that are already experiencing the effects of climate change through depletion of water resources and soil erosion need help to realize their huge energy potential. "The funding must be reliable and substantial," Doig said. "It is estimated that about \$20 billion per year is needed to deliver basic energy to all by 2030, and \$30–35 billion a year to deliver a higher level of low-carbon development," she



stated in the report. Christian Aid states that African countries need to plan for a low-carbon future, while rich countries' assistance should be in form of technology transfer, bilateral and multilateral investment, and participatory market approaches. Doig states that decentralized renewable energy projects would be beneficial in terms of mitigating the risk of climate change, poor hydrology, and environmental degradation as well as high international fuel costs. Christian Aid points to the "lack of a framework to promote renewable energy investments at the lowest levels in Africa, which has isolated rural areas and caused them to fall behind in installing such projects."

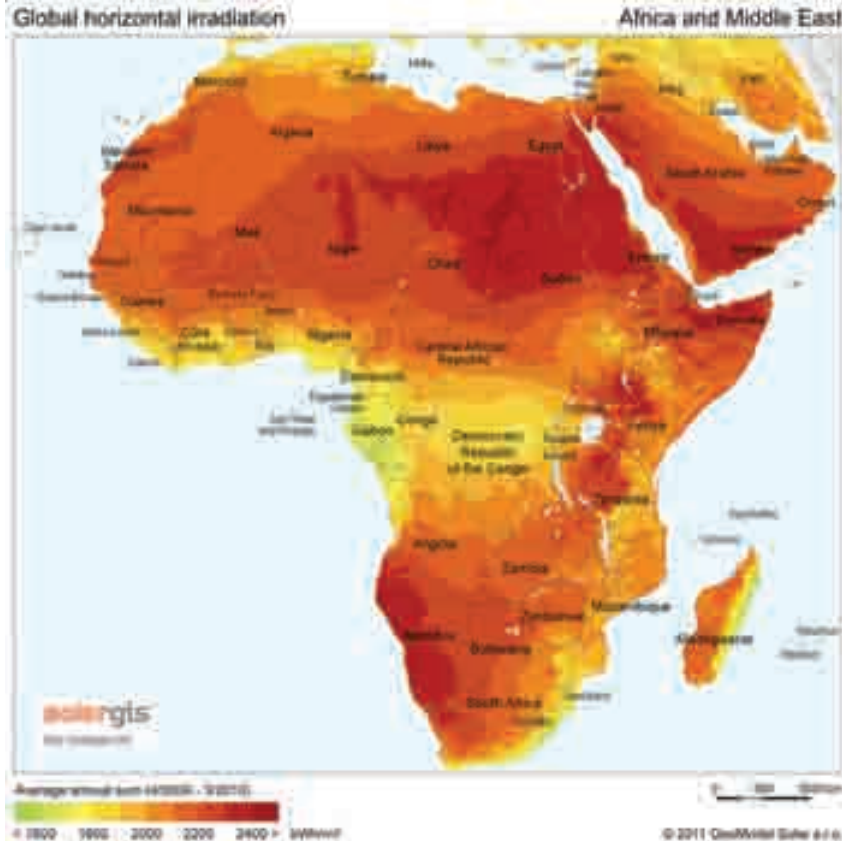
Due to lack of off-grid and innovative power generation, Kenyans suffered record high costs of energy over the past two years following erratic hydropower generation due to low water levels in major dams that

generate power, a trend that led power producer Kenya Electric Generating Company to rely on expensive imported fuel to produce power. "The cost of fuel on the international market has been high, this means that Kenyans will have to pay more for electricity consumption," said Eddy Njoroge, the Kenya Power and Lighting Company director, commenting on the power rationing programme that took place for the better part of 2011 in Kenya. According to Scaling-up Renewable Energy Program (SREP) investment plan for Kenya 2011 by the Ministry of Energy, Kenya is a net importer of oil and depends on large hydropower and thermal electricity for 57.7 per cent of its power. In Kenya, only 5 per cent of rural and 51 per cent of the urban population has access to electricity currently. In addition, 67 per cent of Kenya's total population uses biomass as a source of energy for cooking, according to a 2005 government study.



Solar power

The study on energy by Christian Aid says that Kenya has significant potential for solar energy to be exploited, particularly in Northern Kenya. According to African Energy Policy Research Network 2004, Kenya receives an estimated 4 to 6 kWh per square metre per day of solar insolation. However, Christian Aid says Solar PV is not available to the majority of Kenyans due to its high cost and the lack of knowledge about how the systems work in case of a breakdown. "Most areas in Kenya receive more than six hours of direct sunlight per day, therefore, the solar potential is very high," says Doig. The Kenyan government formulated Solar Water Heating Regulations in 2010, which it hoped would increase the uptake of solar water heating technology. The regulations are set to provide a relief from the over-reliance on petroleum imports by institutions and households.



Pico, mini, and micro hydro

The potential of pico, mini, and micro-hydro is estimated to be 3,000 MW across Kenya, yet only six mini-hydro plants are in operation with a total capacity of 13.64 MW, according to small-hydro.com. For now, one plant is supplying 0.3 MW to the National grid, a mini-hydro plant at Imenti tea factory in Meru Township, which is more than 300 kilometres east of Nairobi city.



Wind power

Kenya has one of the best wind resources in the world, averaging between 3 and 10 m/s, with northern Kenya recording speeds of up to 11 m/s. Installed capacity from wind-generated power is currently 5.1 MW. Christian Aid notes that Northern Kenya and along the coast are ideal sites for setting up wind farms. Wind energy can be located where agricultural production is impractical like in the North Eastern province, states the report. Currently, the Lake Turkana Wind Project, which is being constructed in the arid North Eastern province, is projected to add 300 MW of wind power to the national grid. However, the project is not without challenges as the World Bank decided to pull out of the mega project in October 2012. The Washington-based

bank withdrew from the project saying that the national grid did not have adequate capacity to exhaustively manage power from the Turkana wind farm. The bank stated that the project as proposed was not good for it, adding that high volumes of power from the project would go to waste and would hurt income from the plant. This, the bank observed, would eventually hamper loan repayment by the government. The government of Kenya is now seeking viable financial options like the German KfW bank to continue financing the project.

Biomass power

Christian Aid says there is great potential to generate electricity from agricultural residue, for example, bagasse and rice husks. Currently, an estimated 38 MW of capacity is installed

at Kenya's six operational sugar factories that use bagasse to generate electricity. The government set up the National Climate Change Response Strategy in 2010, which emphasizes the promotion of renewable energy resources, such as geothermal, solar, and wind. The strategy acknowledges the significant economic growth recorded in Kenya for the last four years, translating to vibrant industrial growth. Kenya was expected to inject an additional 201 MW by 2009–10 to meet the rising demand for electricity. In 2008, the government introduced feed-in tariffs policy for electricity generated from small hydro, wind, and biomass. Local companies benefiting from these tariffs include the Mumias Sugar Company, which supplies 26 MW to the national grid through bagasse-based co-generation, and

lmenti tea factory, which supplies 0.3 MW through small hydro. According to Permanent Secretary in the Ministry of Energy, Patrick Nyoike, it is the government's commitment through SREP to support the grid extension and decentralization of energy systems with a view to expanding the percentage of population with access to non-fossil-fuelled electricity. Mr Nyoike says that off-grid rural electrification, co-generation, wind feasibility studies, solar energy for rural Kenya, small hydro, wind, and biogas are some of the renewable energy initiatives considered in the energy

programme for Kenya. He concurs that financing renewable energy has been one of the biggest challenges due to perceived high risk and expensive nature of these systems. "We all know that in the 2011–12 national budget, the government allocated 70 billion Kenyan Shillings (\$753 million), the highest amount so far, to the Ministry of Energy; 30 per cent was channelled to geothermal development. With donor funds coming in, the country will finance other systems of renewable energy sources," Nyoike says.

The Christian Aid report recommends establishing a leapfrog

fund with a capacity building and business management component targeting communities. Different stakeholders in energy production, the report says, should adopt the fund. In **South Africa**, only one per cent of electricity supplied by Eskom, South Africa's state company for energy production and supply, is renewable. Africa's economic giant heavily relies on coal for power (68 per cent), hence, it is one of the major contributors to global carbon dioxide emissions. Renewable energy accounts for 8 per cent in total; gas, 2 per cent; nuclear, 3 per cent; and crude oil accounts for 19 per cent of South Africa's energy mix, according to the Christian Aid report. Through the South African Industrial Action Plan for 2010–13, the government is targeting the installation of one million solar water heaters (SWHs) by 2014 to meet the renewable energy goal of 10,000 GWh. According to Christian Aid, South Africa is among countries with the highest solar potential in the world, estimated at 548 GW. However, various barriers hinder the solar industry in South Africa, which includes the subsidy process and lack of a vibrant local manufacturing sector. The 2013 solar target is the only form of renewable energy prioritized by the South African government with the economy premised on coal and nuclear. In general, barriers in the way of low-carbon development in South Africa include an economy that largely relies on maintaining the minerals-energy complex; an energy sector committed to coal and nuclear development, lack of state finance to support renewable energy, continued subsidization for mining and related large corporations, amongst others.

In **Rwanda**, a landlocked country, the primary source of energy is biomass, which makes up 86 per cent of energy used. Energy from electricity makes up 3 per cent of total energy used while petroleum products make up



the rest with 11 per cent. The country has installed capacity of 85 MW and available capacity of about 77 MW. The majority of Rwandans (90 per cent) do not have access to electricity and rely solely on biomass as the main source of energy. Rwanda is increasingly relying on thermal power plants as the main source of power, which is expensive. However, the government is keen to develop sustainable, commercially viable energy. Chukwumerije Okereke and Sally Tyldesley, researchers from Smith School of Enterprise and Environment, University of Oxford, say that Rwanda has the potential for both, decentralized and large-scale generation from hydropower. At present, Rwanda is generating hydropower from four domestic plants, two regional plants, and five micro-hydro plants. A hydropower atlas, published by the Ministry of Infrastructure of Rwanda in 2007, shows that the total hydropower potential for Rwanda is 82.6 MW. The country also has the largest solar PV farm in Africa, located at Jali Hill in the Gasabo district. The researchers say that the solar plant injects to the grid up to 250 KW of energy is a clear demonstration that Rwanda is a viable option. Geothermal potential for Rwanda is yet to be established as it is still at an early stage. Surface studies for geothermal have been carried out in the Western region of Gisenyi, Karisimbi, and Kiningi. Other sources in the energy-mix for Rwanda are methane and biogas. Lake Kivu, along the border of Rwanda and the Democratic Republic of Congo, is believed to contain 55 billion cubic metres of methane gas. The quantity of methane is believed to be sufficient power for 700 MW of electricity generation over a period of 55 years.

In **Ghana**, a country in West Africa, approximately 67 per cent of the population has access to grid electricity. This is far higher compared to 22 per cent of grid connectivity in



Sub-Saharan Africa and 18 per cent for entire Western Africa. However, the Christian Aid report states that electricity is still a reserve of the urban areas with 78 per cent of urban people having access to electricity compared to 30 per cent of their rural counterparts. The country has huge solar, wind, and hydropower potential, but it is still highly reliant on hydropower and biomass as the main sources of energy. Ghana produces electricity from two main sources, hydro and thermal, with a total installed capacity of 2,011 MW. Ghana faces a number of challenges in the area of policy, financing, and regulation in pursuit of climate compatible development.

According to the United Nations Environmental Programme (UNEP)

Deputy Executive Director in Kenya Amina Mohammed, energy use in Africa is largely underdeveloped. "The statistics reveal a worrying scenario; Africa has 13 per cent of the global population, its share in global electricity consumption is less than 3 per cent, and only 25 per cent of Africans have access to electricity," says Amina. She says this trend reflects a very low level in energy utilization in economic production, widespread deforestation, erosion, and loss of fertile agricultural land. Amina told *Energy Future* that the often high and quite unpredictable costs of fossil fuels significantly undermine the economic competitiveness of Africa. ■

Peter Kahare is a freelance journalist based in Kenya, East Africa.

KUDANKULAM

Making a case for nuclear energy

Is nuclear power the way towards an energy secure future? Are policy-makers disregarding the human dimension of the expansion of nuclear energy related infrastructure? *Viraj Desai* explores the various facets of the debate on the Kudankulam nuclear facility.







Sixty-five years after independence, a quarter of India's population has no access to basic electricity; essential energy access is one of the most crucial requirements for India to grow at a faster pace today. The irony is that the country, which has been pegged as one of the fastest growing economies in the world and is touted as an emerging superpower along with its neighbour China, witnessed the worst blackouts in history this year with the Northern power grid breaking down twice in 36 hours. A shortage of 17,000 megawatts (MW) is gargantuan and experts feel that renewable energy may be a solution in the future. However, problems related to cost dynamics and still evolving technology have led the country to look at nuclear power for its increasing energy needs.

The inception of Kudankulam nuclear power plant

The power-deprived state of Tamil Nadu was to reap the benefits of nuclear power through the inception of the Kudankulam Nuclear Power Plant (KKNPP) two decades ago, when Prime Minister Rajiv Gandhi signed an agreement with Soviet Premier Mikhail Gorbachev for the construction of two reactors. The village, located in Tirunelveli district, is extremely close to Kanyakumari, the southernmost tip of mainland India. Nevertheless, things did not make headway further due to domestic opposition as well as political upheavals internationally, especially in the Soviet Union. It was only in 1997 that India and Russia signed another agreement for the revival of KKNPP and the actual construction of the estimated ₹14,000 crore plant began only in 2001.

New agreement and its troubles

The new agreement had two notable changes. First, the highly radioactive expended nuclear fuel would be stored and reprocessed in India, unlike the original agreement that stated that the used fuel would be shipped to Russia. Apart from this, the new agreement entailed the construction of six desalination plants instead of the previous proposal of sending piped water from Pechiparai dam. Both these were sending out signals on possible impacts on the ecology and marine life close to the plant. Ironically, in India, the lack of complete information and the government's failure in presenting details transparently to its citizens, has more often than not hauled up projects, which are expected to benefit people. Kudankulam is no exception to this and has been mired by protests from People's Movement

Against Nuclear Energy as well as the local population. NGOs have also jumped on to the bandwagon in criticizing the safety aspect of the nuclear power plant. Some of these NGOs have allegedly been receiving funding from abroad who have vested interests in sabotaging the progress of construction.

The 2,000 MW plant can tremendously help in addressing the power woes of Tamil Nadu, which is falling short of close to 4,000 MW of power. The plant will also supply a part of its generation to Karnataka as well as Kerala, helping them with their power needs as well.

Ambitious nuclear energy plans on the anvil

The country has drawn up an ambitious plan to derive 25 per cent of its energy needs from nuclear energy by 2050, from the current level of less than 3 per cent. This is a gigantic task and the country is already preparing for the surge with almost 20 plants under construction that aim to add another

5,000 MW, in addition to the existing 4,700 MW. The country is the sixth largest producer of nuclear energy worldwide, and with the signing of the India-US Civil Nuclear Agreement, the country would be able to procure the fuel, Uranium, from the Nuclear Suppliers Group, which is expected to give a thrust to its nuclear programme. In fact, the country is looking to increase the electricity generated through nuclear power from 2 to 9 per cent in the next 25 years. Policymakers need to draw up a systematic plan on not only the targets but also on how to go about implementation. This will entail active public participation as well as involving the local community.

Same concerns, various sites

This is not the first time that people have come to blows against the government over implementation of nuclear energy; there were similar disputes in Jaitapur a few years ago. Now, we have another agitation over the Kudankulam nuclear energy plant. The premise of the

dispute, however, remains the same in both cases. Although safety and viability issues have been discussed repeatedly, a solution to the successful implementation of nuclear energy on a larger platform in India has been the Achilles heel. Add to that the memory of the Fukushima nuclear disaster is still as fresh as if it had happened yesterday, invoking fears of another Fukushima-like situation in Kudankulam.

The construction of the nuclear plant at Kudankulam has come to a grinding halt with protestors from the People's Movement Against Nuclear Energy questioning the plant's safety. They base their premise on the fact that an area within 30 km radius of the construction is inhabited by almost 1 million people, a number difficult to evacuate quickly, if a Fukushima-like disaster were to strike.

This population figure also far exceeds the estimations of the Atomic Energy Regulatory Board (AERB). The plant has been termed unsafe and non-compliant with the safety standards of a nuclear plant by the protestors, while



the government is crying foul saying that AERB's inspection of the reactor pressure vessel of Unit-1 found no defects therein.

What is worth observing is that, people don't protest against the use of biotechnology to increase food production in a starved nation like ours. Nor do they protest with full gusto against genetically modified foods like the BT Brinjal. However, while accelerated use of fossil fuels is causing global warming, extreme temperatures, and making the sea level rise, which presents a bigger environmental threat to human life—to poor coastal fishing communities in Kudankulam—we protest without seeing reason. The villagers have raised the issue that while development benefits would be shared by all, risks are borne by their families.

India is facing an unprecedented demand for energy. Moreover, Tamil Nadu in particular, is running gravely short of energy. It must be noted that power plants that run on fossil fuels like coal cause invariably more damage to human life through ionising radiation, than nuclear power plants could cause. Wind energy, when executed on a large platform, can cause environmental concerns to migratory birds. Solar panels do not come cheap and they are inefficient since they depend on

precious earth elements, the mining of which causes environmental hazards. What is surprising is the reluctance of environmentalists to support nuclear energy implementation.

Major reasons for scepticism

Although concerns have perennially been a part of the discussion on setting up of any nuclear plant, some of the recent events have led to the heightened anxiety. The Fukushima tragedy in Japan last year is one of the worst and the largest nuclear disasters since Chernobyl in Russia and Three Mile Island in the United States over two decades back. The disaster prompted countries like Germany and Italy deciding to shut down their nuclear plants in a few years.

Concerns such as the preparedness of authorities in case of contingencies like Fukushima, as well as a question mark on the proper disposal of nuclear waste have led to many activists coming forward against the plant. Even though the Nuclear Power Corporation of India Ltd, the government-run organization responsible for setting up of the plant, has tried to make presentations to the public on the need for nuclear power and the safeguards put in place, fear still persists amongst the people. Even advanced countries like the US and Japan have just been

able to reprocess a third of the spent fuel, then can a country whose nuclear power programme is at a nascent stage handle the storage and reprocessing of the fuel.

In addition to this, high noise levels during the testing stage of the power plant brought it further into limelight and innocent villagers dread the installation of the plant. Furthermore, the Indian government's nuclear programme has been shrouded under a veil of secrecy and only after the 123 Agreement with US in 2008, have the authorities started engaging the public. Surely, the transformation was not going to be easy.

Activists have questioned India's signing an agreement with Russia that makes a Russian company non-liable to pay in case of any accident. Some state that a possible defect in the reactor will put the entire liability on the exchequer, which would lead to burdening the taxpayer with an amount that may run into millions. The Civil Liability for Nuclear Damage Act, 2010, states that the liability of a nuclear operator, Nuclear Power Corporation of India Limited, will be restricted to ₹1,500 crore. There also exists the possibility to waive off this limited liability and pass it on to the exchequer. These lacunas are just perfect for a supplier to be uncaring towards equipping the reactor with adequate safety features.

The Indian government needs to learn the part of involving the public in a discussion from countries like France, which generates a majority of its power needs through nuclear power. The policy of actively engaging the public to tell them the details about the project, including its benefits for 12–15 months and then a public debate which would involve giving suggestions or feedback. These initiatives not only lead to greater transparency, people putting faith in the project, but also better awareness





among them, which would ensure that there are minimal obstacles during the project implementation.

Last but not the least, handling the protests through the use of brute force will only make people distrust the authorities more. It is to be remembered that disasters such as the Bhopal Gas Tragedy, which happened almost three decades back, are fresh in the minds of the public as justice still eludes many who were victims of the horror.

Are we being over-calculative?

India's infrastructure projects are notorious for forcibly evacuating the population without providing adequate compensation. On the other hand, the Kudankulam nuclear power plant has ensured that land was acquired at fair rates. In addition, nuclear leaks have caused no deaths which means it has a cleaner record than many of the other industries. The excitement surrounding it may seem a little unwarranted as a plant like the

Kudankulam nuclear plant has been given a green signal by the scientist and former President APJ Abdul Kalam.

Yes, risks of a nuclear plant being damaged or destroyed may indeed be catastrophic, but then risk of lives being lost and people injured are largely possible even in a mine or a coal-fired power plant. Another important difference between conventional power plants and a nuclear power plant is the latter gives out the least pollution; no fly ash, acid rain, or carbon dioxide released into the environment.

We forget that delays in implementation lead to cost escalations and a delay of one year with Kudankulam 1 and 2 has led to increase in tariffs from ₹3 to ₹3.25 per KWH. The more the delays, the more would be the cost borne by the consumers.

Conclusion

The threat and apprehensions surrounding nuclear plants are quite reasonable and even so in case of

Kudankulam, which has been declared a safe project lately by the Supreme Court. On the government's part, it must ensure that transparency is ensured through proper information dissemination to the public. On the other hand, citizens must understand the importance of such large-scale projects over the long term. It is a win-win situation for citizens, companies, as well as countries if implementation is done systematically.

Kudankulam can be a shining example of an infrastructure project providing large-scale local employment to many who may want this opportunity to give a helping hand to their financial woes, and aiding the power deficit state of Tamil Nadu at the same time. The will rests with the government to convince its people on the need to adopt nuclear power eventually as an important source of energy driving India to become energy abundant. ■

Viraj Desai is a freelance writer based in Delhi.

THE EUROPEAN SUPERGRID

possibilities and prospects

The “Supergrid” or the “mega-grid” are the new buzzwords on the future energy horizon. *Sushumna Kannan* reports on the European Supergrid and how it is all set to change the manner in which the world fathoms energy.

