Renewable Energy & Sustainable Development in Indonesia: Past Experience - Future Challenges

e8, UNSW – ADRA/AusAID & STTNAS
Joint Workshop
Jakarta, 19-20 January 2009

Final Report

Maria Retnanestri
Hugh Outhred

March 2009



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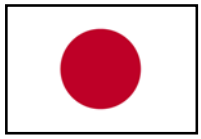


e8 Network of Expertise for the Global Environment

e8-155

E8/UNSW-ADRA/AusAID/STTNAS Workshop on Renewable Energy & Sustainable Development in Indonesia

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LIST OF ACRONYMS & ABBREVIATIONS

ADD	*Alokasi Dana Daerah* (Regional Fund Allocation)
ADRA	Australian Development Research Award
AFTA	ASEAN Free Trade Area
APBD	*Anggaran Pendapatan & Belanja Daerah* (Regional Revenue & Expenditure)
APBN	*Anggaran Pendapatan & Belanja Negara* (State Revenue & Expenditure)
APEC	Asia-Pacific Economic Cooperation
APSURYA	*AsosiasiPerusahaan Surya* (Photovoltaic Business Association)
ASEAN	Association of South East Asia Nation
AusAID	Australian Agency for International Development
B2TE	*Balai Besar Teknologi Energi* Energy Technology Laboratory)
Bappenas	*Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency)
BLM	*Bantuan Langsung Masyarakat* (Direct Funding Assistance)
BPPT	*Badan Pengkajian & Penerapan Teknologi* (The Agency of Assessment & Application of Technology)
BP PEN	Blue Print *Pengelolaan Energi Nasional* (National Energy Management)
BRI	*Bank Rakyat Indonesia* (Indonesian People's Bank)
BUMN	*Badan Usaha Milik Negara* (State-owned Enterprise)
BUMD	Badan Usaha Milik Daerah (Regional-owned Enterprise)
CDM	Clean Development Mechanism
CEEM	Center for Energy & Environmental Markets
CER	Certified Emissions Reductions
CIDA	Canadian International Development Agency
COP/MOP	Conference of the Parties/Meetings of the Parties
DEN	*Dewan Energi Nasional* (National Energy Council)
Depdagri	*Departemen Dalam Negeri* (Department of Home Affair)
Depkop	*Departemen Koperasi* (Department of Coopertives)
DGEEU	Directorate General of Energy & Electricity Utilization
Dirjen	*Direktorat Jendral* (Directorate General)
DNA	Designated National Authorities
DME	*Desa Mandiri Energi* (Energy Self-Sustaining Village)
DPR	*Dewan Perwakilan Rakyat* (Parliament House)
e8	Electricity companies from G8 countries (Canada, France, Germany, Italy, Japan, Russia, UK, US)
EB	Executive Board
EDF	Électricité de France
EPIA	European Photovoltaic Industry Association
ESDM	*Energi & Sumber Daya Mineral* (Energy & Mine Resources)
GEF	Global Environment Facility
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (German organisation for technical cooperation)
GW	Giga Watt
ICDC	Integrated Collector Drying Chamber

IPB	*Institut Pertanian Bogor* (Bogor Agricultural Institute)
ITS	*Institut Teknologi Sepuluh Nopember* (Sepuluh Nopember Engineering Institute)
JICA	Japan International Cooperation Agency
KDP	*Kecamatan* (District) Development Program
KNPDT	*Kementerian Negara Pembangunan Daerah Tertinggal* (Ministry of Development of the Disadvantaged Regions)
KUEP	*Kelompok Usaha Ekonomi Pedesaan* (Village Economic Activity Group)
kW	Kilo Watt
LAPAN	*Lembaga Penelitian Antariksa Nasional* (National Institute of Aeronautics & Space)
LEN	*Lembaga Elektronika Nasional* (National Electronics Institute)
LIPI	*Lembaga Ilmu Pengetahuan Indonesia* (The Indonesian Institute of Science)
METI	*Masyarakat Energi Terbarukan Indonesia* (Indonesian Renewable Energy Society/IRES)
MH	Micro Hydro
MW, MWp	Mega Watt, Mega Watt peak
NTB	*Nusa Tenggara Barat* (Western part of the South-Eastern Indonesia Islands)
NTT	*Nusa Tenggara Timur* (Eastern part of the South-Eastern Indonesia Islands)
PDD	Project Design Document
PDT	*Pembangunan Daerah Tertinggal* (Development of Disadvantaged Region)
Perpres	*Peraturan Presiden* (Presidential Decree)
PLD	*Pengelolaan Listrik Desa* (Village Electricity Management)
PLN	*Perusahaan Listrik Negara* (State-owned Electricity Utility)
PNPM	*Program Nasional Pemberdayaan Masyarakat* (Community Empowerment National Program)
PSK Tersebar	*Pembangkit Skala Kecil Teknologi Energi untuk Rakyat dengan Sumber Energi Terbarukan* (Small scale energy generation for public using renewable energy resources)
PV	Photovoltaic
RE	Renewable Energy
RESCO	Renewable Energy Service Company
RISTEK	*Riset & Teknologi* (Research & Development)
RKP	*Rencana Kerja Pemerintah* (Government Work Plan)
RUKD	*Rencana Usaha Kelistrikan Daerah* (Regional Electricity Plan)
RWE	Rheinisch-Westfälische Elektrizitätswerke (German Power Supplier)
SCC	Sindicatum Carbon Capital
SHS	Solar Home Systems
STTNAS	*Sekolah Tinggi Teknologi Nasional* (National Engineering College)
UNSW	University of New South Wales
WOMINTRA	Woman in Transition
WSSD	World Summit on Sustainable Development
YBUL	*Yayasan Bina Usaha Lingkungan* (Environmental Improvement Foundation)

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1. PREFACE

Human society faces a set of interconnected energy challenges, which are often summarised as energy security, energy pricing and climate change. Each country faces its own specific version of these challenges and must find its own solutions. However, in all countries, more frugal use of energy and increased use of local renewable energy resources will form part of the answer. Frugal use of energy is already the norm for rural communities that are not connected to an electricity supply system and local renewable energy resources may already provide the best energy supply options for them, so long as projects are planned and implemented in an appropriate way with strong community participation.

When conventional electricity supply is available, renewable energy resources may fail to compete with other electricity generation options in direct-cost terms. However, societies may prefer them to other options when issues, such as energy security, climate change and other environmental impacts and local manufacturing and employment opportunities are taken into account. In that case, government policy measures can bridge the financial gap seen by potential investors in renewable energy technologies. However, it is then important that the set of government policies address the complexities of renewable energy technologies and preference those near-term opportunities that are also in society's long-term interests. Importantly, such policies should create a context for renewable energy development that is systematic, stable and consistent in the long-term. The context should address education and training and industry development as investment incentives and strategies that ensure engagement of community stakeholders from the inception of individual projects.

The e8/UNSW-ADRA/AusAID/STTNAS joint workshop on Renewable Energy and Sustainable Development in Indonesia, held in Jakarta on 19 & 20 January 2009, explored these important questions through assessment of past experience and the development of lessons for the future. It should be regarded as the first in a series of workshops rather than an end in its own right.

Maria Retnanestri and Hugh Outhred
Sydney, March 2009

2. INTRODUCTION

2.1. ABOUT THE WORKSHOP

Motivated by shared interests in the promotion of successful renewable energy projects in Indonesia, the e8 (e8 Network of Expertise)[1], AusAID[2], UNSW (with funding from an Australian Development Research Award research project)[3] and STTNAS Jogjakarta College[4] organised and conducted this two-day workshop, held in Jakarta on 19 & 20 January 2009.

In 2006, more than 100 million Indonesians remained without access to electricity supply. Given their abundance and wide distribution in Indonesia, renewable energy resources such as solar, hydro, geothermal, wind (in certain areas) and biomass could play an important role in rural electrification in Indonesia while also facilitating sustainable development. Indonesia, as stated in its Blue Print for National Energy Management (BP PEN)[5], aims to achieve a 17% share of renewable energy for its energy portfolio by 2025.

Many institutions (government, donors, international energy companies, domestic enterprises, NGOs, universities) have actively promoted and installed renewable energy systems in Indonesia since the 1970's. However, such projects still face financial, technical, social and institutional barriers because the decentralized nature of renewable energy resources requires decentralized investment, institutions and expertise

To achieve effective deployment and on-going operation of sustainable renewable energy projects in Indonesia, it is important that project developers learn and share lessons from past experience in renewable energy project implementation in Indonesia, by looking at what worked well, what went wrong and what still needs to be done, considering institutional, financial, technological, social and ecological dimensions of sustainabilty

The objectives of the e8-155/UNSW-ADRA/AusAID/STTNAS workshop on Renewable Energy & Sustainable Development in Indonesia were:

- To learn from hands-on field experience in both stand-alone and grid-connected renewable energy projects in Indonesia
- To review recent theoretical developments and policy trends in renewable energy project design and implementation at national, regional and global levels
- To draw on these understandings for the purpose of refining and updating project design and implementation guidelines

[1] E8: www.e8.org
[2] AusAID: www.ausaid.gov.au
[3] ADRA project: http://www.ceem.unsw.edu.au/content/userDocs/AusAIDADRAEFC011MediaRelease.pdf
[4] STTNAS: www.sttnas.ac.id
[5] BP PEN: www.esdm.go.id/publikasi/lainlain/doc_download/714-**blue-print-pengelolaan-energi-nasional**-pen.html

- To formulate strategy and policy recommendations for government and donors, including for the purpose of renewable energy training and education (via NGO, training bodies and universities)
- To produce a report on past experience, lessons learned and revised project design and implementation guidelines.
- To disseminate the outcomes of the workshop for the purposes of awareness raising and capacity building.

To achieve those objectives, the workshop was divided into four main activities below:

- Presentations, which were used to set the scene,
- Interactive sessions following the presentations,
- Group discussions to elicit issues, ideas and recommendations from all participants, and
- Presentation of group discussions outcome by discussion group representatives.

The presentations were arranged to present RE experience that highlighted and identified the issues, challenges and opportunities in RE projects, considering what went well, what went wrong and what should be changed considering the institutional, financial, technological, social and ecological dimensions of RE implementation. The presentations reported on project experience in Indonesia and other developing countries, wich provided with rich information on hands-on field experience and reviews on current renewable energy developments and policy trends. Such rich information can inform the refining and updating of guidelines for project design and implementation. Recommendations, see Section 5, were drawn from the presenter recommendations, the discussion during the interactive sessions (summarized at the end of each presentation), the outcomes of the group discussions (Appendix 6), and the results from the questionnaire (Appendices 4 & 5). The presentations and outcomes of the workshop have been made available online for dissemination purposes (http://www.ceem.unsw.edu.au/content/RenewableEnergyinIndonesia.cfm?ss=1).

The most prominent message of this workshop, which probably is not new, is a call for more sustainable practices in renewable energy policy, project design and implementation. More specifically:

- *Institutional aspects:* long term stability in policy settings, better coordination between central government departments and better coordination between central and provincial levels of government
- *Financial aspects:* cost-reflective and transparent energy pricing, market mapping, supplementary funding for RE (eg CDM), long term budgeting
- *Technological aspects:* strengthening of domestic manufacturing capability, RE standards & testing facilities, appropriate technology transfer
- *Social aspects:* RE education, research, community awareness
- *Ecological aspects:* ensure RE projects address environmental concerns and then recognize those non-monetary values.

It should be noted that these aspects are interrelated rather than independent of one another.

2.2. WORKSHOP SPONSORS

THE E8

Created in the wake of the 1992 Rio Summit, the e8 is a non-profit international organization, composed of 10 leading electricity companies from the G8 countries, with a mission to play an active role in global electricity issues within the international framework and to promote sustainable energy development through electricity sector projects and human capacity building activities in developing and emerging nations worldwide. In line with its core mission to promote sustainable energy development and share its members' expertise with counterparts in developing and emerging countries worldwide, the e8 has, since its inception, implemented over 43 human capacity building and technical assistance activities, on a pro-bono basis. Interactive workshops, seminars and technical training sessions continue to be developed in partnership with UN agencies and key local and regional partners in the fields of energy efficiency, rural electrification, renewable energy systems, institutional strengthening and project management, all within the overall framework of sustainable energy development. More information on the e8 is available at www.e8.org.

The e8 was represented at the workshop by Bruno Menard (e8 Secretariat, Canada), Guy Marboeuf (EDF, France), Takao Shiraisi (Kansai Electric, Japan) and Claus Dauselt (RWE, Germany).

UNSW-ADRA/AUSAID AND STTNAS JOGJAKARTA

In late 2007, the School of Electrical Engineering & Telecommunications of the University of New South Wales (UNSW) was awarded an Australian Development Research Award (ADRA Project EFCC011) on *Overcoming Barriers to Renewable Energy in Rural Indonesia by Community Capacity Building*. As indicated in the project title, the objective of this interdisciplinary and collaborative research project is to identify and disseminate ways to overcome barriers to the use of renewable energy resources.

This project also involves Indonesian institutions, including STTNAS College. Based in Jogjakarta, STTNAS College is a private university established in 1973 that provides four-year bachelor degree courses and three-year diploma courses in engineering. Dr. Maria Retnanestri, who was awarded her PhD from UNSW in 2008 and is the research leader of the ADRA EFCC 0011 project, is a staff member of the Electrical Engineering Department of STTNAS as well as a Research Associate at UNSW. The ADRA project further develops and applies concepts developed in Dr Retnanestri's PhD project. Lessons from this project will be incorporated into STTNAS curricula and student projects. More information on the UNSW research team and the ADRA project is available at http://www.ceem.unsw.edu.au/content/RenewableEnergyinIndonesia.cfm?ss=1.

Dr Retnanestri and Professor Hugh Outhred (from UNSW and also ADRA Project EFCC011 Principal Investigator) represented UNSW and STTNAS at the workshop.

2.3. WORKSHOP PARTICIPANTS

There were more than 100 workshop participants from various institutions (government, embassies, donors, research bodies, universities, private companies and NGOs) and countries (Australia, Canada, Finland, France, Germany, Indonesia, Japan, Switzerland, UK, and the USA). Indonesian workshop participants included representatives of central and regional governments, NGOs, universities and private businesses (large and small) from Western and Eastern Indonesia. Appendix 2 contains a full list of participants.

2.4. WORKSHOP PROCEEDINGS

This workshop report, individual presentations and other workshop documents are available for downloading from:

- The e8's website, http://www.e8.org and
- The Center for Energy & Environment Market of the University of New South Wales (CEEM UNSW) website, http://www.ceem.unsw.edu.au/content/RenewableEnergyinIndonesia.cfm?ss=1

2.5. ACKNOWLEDGMENT

This workshop was made possible by the generous support of e8, UNSW-ADRA/AusAID and STTNAS in terms of funding for the workshop and/or in-kind services. In particular, the e8 provided financial support for 16 participants from West Sumatra, Lampung, West Java, East Java, Jogjakarta, Bali, NTB and NTT provinces, ranging from government officials, NGOs, small enterprise and academics. Their participation was highly important for the purpose of exchange in knowledge and experience, and more importantly in understanding the local context of diverse Indonesia. The event organizing team made the workshop runs smoothly and efficiently. The workshop moderators, facilitators of group discussions and all participants played an active role in the workshop, making it possible to reach meaningful outcomes as presented in this report.

e8 and UNSW-ADRA/AUSAID team:

1. Bruno Ménard (e8 Secretariat, Canada)
2. Dr. Claus Dauselt (e8 & RWE Germany)
3. Takao Shiraishi (e8 & Kansai Electric Japan)
4. Guy Marboeuf (e8 & EDF France)
5. Prof. Hugh Outhred (UNSW-ADRA/AusAID, Australia)
6. Dr. Maria Retnanestri (UNSW-ADRA/AusAID, Australia & STTNAS Jogjakarta, Indonesia).

Workshop organizers:

1. Dr. Maria Retnanestri (UNSW & STTNAS, Jogjakarta, Indonesia).
2. Dr. Claus Dauselt (e8 & RWE Germany)

Event organizing team:

1. Workshop summary:
   1) Prof. Hugh Outhred (UNSW, Sydney)
   2) Dr. Maria Anityasari (ITS University, Surabya)
   3) Dr. Wayan Gede Ariastina (Udayana University, Denpasar)
2. Presentation management: Ir. Tugino MT (STTNAS, Jogjakarta)
3. Audio recording: Dian Figana (STTNAS, Jogjakarta)
4. Photography: Muhammad Susilo Adiyanto (ITS University, Surabaya)
5. Workshop reception:
   1) Dr. Maria Anityasari (ITS University, Surabaya)
   2) Ratna Sudharsana (Womintra NGO & Udayana University, Denpasar)
   3) Mety Serang (Womintra NGO, Kupang, NTT Province),
   4) Ibu Yuni (Surya Kencana Co, Lampung, Sumatra Island).

Moderators:

1. Yani Witjaksono (Bronzeoak Indonesia and YBUL NGO, Jakarta)
2. Dr. Lolo Panggabean (YBUL NGO, Jakarta).

Facilitators of the group discussions:

1. Dr. Lolo Panggabean (YBUL NGO, Jakarta).
2. Prof. Harijono Djojodihardjo (Al-Azhar University).
3. Prof. Herliyani Suharta (BPPT).

3. WORKSHOP PRESENTATIONS AND KEY POINTS OF DISCUSSIONS

5.1. WORKSHOP OPENING SESSION

1. **Bruno Menard** of e8: Welcome and brief remarks about the e8
   Online: http://www.ceem.unsw.edu.au/content/userDocs/1Openingbythee8.pdf
2. **Prof. Hugh Outhred** of UNSW-ADRA/AusAID: Welcome and brief remarks about the workshop objectives
3. **Dr. Maria Retnanestri** of UNSW-ADRA/AusAID & STTNAS: Welcome and brief remarks about the workshop activities

5.2. SESSION 1. INSTITUTIONAL ASPECTS: RENEWABLE ENERGY POLICY, REGULATIONS, ADMINISTRATION, PROGRAMS

3.2.1. Presentation 1. *Menuju Kedaulatan Energi* (Towards Energy Sovereignty)

Dr. Sonny Keraf, Former Indonesian Minister of Environment, Vice-Chairman of Commission VII of the Indonesian Parliament House (DPR), www.dpr.go.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P1SonnyKeraf.pdf

Experience presented:

1. The legislation supporting the Indonesian National Energy Management: National Constitution, Energy policies on oil & gas, electricity, mineral, geothermal, etc.
2. The policies aimed at reducing the negative impacts from energy utilization: Environmental regulation, Kyoto Protocol, WSSD, AFTA 2003, APEC 2020.
3. The vision, mission & targets for Indonesian national energy policy:
   - To achieve energy sovereignty, energy self-reliance based on domestic resources & capabilities, environmentally benign energy utilization, affordable energy for the poor and remote citizens;
   - To build accessible energy infrastructure, achieve energy diversification, utilize local, renewable energy resources, increase energy contributions to the national economy and to export, improve domestic & international partnerships, increase local content in energy technology and human resources,
   - To achieve by 2020 an electrification ratio of 90% and increase the non-large hydro renewable energy share to 5%
4. Institutional arrangements: Ministry of Mines & Energy and its directorates, National Energy Council (DEN)[6], regional governments. Stakeholders: Government & departments, universities & research agencies, business enterprises (BUMN & BUMD government enterprises, cooperatives, private sectors, community enterprises)

[6] DEN, http://www.senternovem.nl/mmfiles/National%20Energy%20Counsil_tcm24-288053.pdf

Issues presented: The current Indonesian energy situation:

1. Indonesia and the world more generally face serious issues related to water, food and energy and there are further pressing issues arising from climate change and volatile oil price
2. Indonesia is still far from achieving its energy vision, mission & targets: The ratio of electrification remains less than 60%, energy elasticity is high, there is now more import than export in petroleum fuels, high dependence on fossil fuel becomes an excuse for not developing renewable energy resources and fossil fuel subsidies are a burden on the national budget and also discriminate against renewable energy resources.
3. RE utilization remains well below its potential because of unclear fiscal regulations, inadequate infrastructure and limited support for RE research.
4. Energy implementation is sectoral, sporadic, fragmented, discrete and inconsistent. This can create confusion for investors. For example, investors had invested in a biomass venture but there was no government policy to ensure sustainability of this program. Other ad hoc programs: coal briquette, blue sky, smart card, kerosene control programs.
5. Energy export is too focused on generating foreign exchange (eg for coal and gas) without paying sufficient attention to fulfilling domestic needs
6. Lack of incentives to encourage energy diversification and end use efficiency

Presenter recommendations:

1. Achieve energy self-sufficiency & avoid/minimize energy import, for example the plan to import electricity from Malaysia should be reviewed
2. Restructure the energy sector, define incentives, tax, fiscal and funding schemes to accelerate energy diversification (for example geothermal needs clear regulation to achieve its great potential and benefits), improve energy infrastructure & energy efficiency, encourage domestic manufacturing, energy service enterprises and empower community
3. Decentralize energy management and delegate more authority and autonomy to the regional government/ authorities
4. The National Energy Council (DEN) should develop and coordinate an integrated approach for RE deployment
5. Seek grant funding rather than loans for sustainable energy development in Indonesia under international climate change related agreements such as Kyoto Protocol

3.2.2. Presentation 2. Renewable Energy Development in Indonesia

Hilmi Panigoro, Medco Energy www.medcoenergi.com/and METI (The Indonesian Renewable Energy Society/IRES), www.meti.or.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P2HilmiPanigoro.pdf

Experience& issues presented: This presentation reviewed progress with government policies in RE, including pricing policy and the Blue Print for National Energy Management (BP PEN), and discussed the potential versus the actual deployment of RE in Indonesia (Hydro, Geothermal, Biofuel, Solar):

1. RE target: 15% of the Indonesian energy mix by 2025
2. Micro Hydro: Total potential 200 MW, installed 4.3 MW, in-progress 81 MW. Government plans to set a regulation that installations of capacity ≤ 10 MW will be without auction, and PLN[7] plans to set a long term fixed-price contract to buy the electricity, which would make MH bankable and profitable. The government should ensure that this regulation is implemented.
3. Geothermal: Total potential 27 GW, installed 0.8 GW, 2014 target 2.1 GW, 2018 target 7.9 GW. However pricing issues must be resolved to achieve these targets
4. Phase I of the PLN Power Plant crash program[8] (10,000 MW, 2006-2009) focused on fossil fuel. However, Phase II of the program (10 GW, 2012-2014) has allocated 30% for RE (Geothermal 2.1 GW, Hydro & Micro Hydro 300 MW). This will create a large market for RE.
5. Solar PV: 12 MW installed, 880 MW target for 2025. The gap implies that Indonesia needs to install 58 MWp per year to meet the latter target.
6. Biofuel: Biofuel is a complicated undertaking that involves upstream (plantation) and downstream (refining) businesses. The plantation sector, involving farmers, is a challenge to organise. However, the downstream refinery process is more straightforward. The presenter noted that the Brazilian government provides long term credit financing with low interest rate for plantations, undertakes and publically disseminates R&D in alliance with large companies. The Petrobras[9] piping infrastructure is used to distribute the biofuel. This makes the whole biofuel chain from plantation to refinery and distribution cheaper & more affordable.
7. The government program for remote areas Desa Mandiri Energi (DME)[10] (villages which are energy self-sufficient), citing the wind energy installation in Nusa Penida Island (Bali) and the PV-Wind hybrid installation in Rote Island (NTT province). DME is regarded as having been highly successful.
8. The role of METI in advancing RE in Indonesia (see www.meti.or.id for more information)

Presenter recommendations:

1. Government needs to innovate rather than continue to do business as usual. Government, academics and private sectors must communicate effectively to develop policy and regulations that encourage RE businesses. Companies will develop RE projects naturally once they are commercially viable.
2. Pricing policy (fee, tax exemption, tariff, incentives) is the most critical issue for RE and should be viewed an investment in capacity building for the nation, not a subsidy.
3. Peak oil is imminent and Indonesia must prepare beforehand. 70% of the world biggest oil capacity is declining, no new capacity is being built, it will not be surprising if by 2011 the

[7] PLN, the Indonesian state electricity utility, www.pln.co.id
[8] *Peraturan Presiden* (Presidential Decree) 71/2006 about the 10,000 MW coal power plant crash program: http://www.legalitas.org/incl-php/buka.php?d=2000+6&f=perpres71-2006.htm
[9] Brazilian Petroleum Corporation or Petroleo Brasileiro, http://www2.petrobras.com.br/ingles/index.asp
[10] Desa Mandiri Energi/DME (called SSEV in this presentation): An Indonesian government program launched on 14 February 2007, targeted at remote villages, which are highly dependent on fossil-fuel, to be energy self-sustaining, using local primary resources such as jatropha, hydro, solar and wind, in which the government provides bio-fuel seed plants (jatropha, sugar cane, palm oil & cassava) and involves seven departments in the implementation (Mine & Energy, Agriculture, Employment & Transmigration, Home Affair, Development of Disadvantaged Regions, Government Enterprise, and Marine & Fisheries).
Ref.: http://pse.litbang.deptan.go.id/ind/index.php?option=com_content&task=view&id=564&Itemid=65 and http://www.esdm.go.id/berita/listrik/39-listrik/1154-hingga-2009-dibangun-1000-desa-mandiri-energi.html

world oil price reaches above US$ 150/barrel. If Indonesia does not start to build its RE capacity now and remains unprepared for peak oil, Indonesia will be in a big trouble and the cost of recovery will be very high. Thus Indonesia has an urgent need to develop RE.

3.2.3. Presentation 3. EDF's Experience in the Field of Rural Electrification in Developing Countries

Guy Marboeuf, EdF France, www.edf.fr
Online: http://www.ceem.unsw.edu.au/content/userDocs/P3GuyMarboeuf.pdf

Experience& issues presented: EdF has been engaged in rural electrification projects in Asia & Indonesia since the mid 1990s:

1. Mid 1970s: EdF completed the French rural electrification program.
2. Mid 1990s: EdF & the World Bank assisted PLN to develop the Indonesian 20 year rural electrification master plan. Activity under that master plan included village socioeconomic studies to understand local needs (bottom-up approach), tools for rural electrification investment, REPLASYS software based on geographical information system (GIS) to follow-up the rural electrification implementation, construction of rural single phase medium voltage/MV networks, planning tools called LAPER and ELVIRA were developed.
3. Mid 1990s:
   1) Western & Central Africa: Pilot projects to learn the socioeconomic & technical aspects of rural electrification, such as local needs, institutional capacities, ability to pay, project economics and field testing of equipment.
   2) Mali, Benin & Burkina-Faso: Establish Communication & Activity Centers (local management) for rural PV systems using commercial & non-commercial models
   3) Ivory-Coast & Cameroon: Installation of micro-grid diesel generators, with size tailored to local needs
4. Development & implementation of the RESCO model in which local operators sell energy services: This uses a clear & facilitating framework and a public private partnership (PPP) model with external support through investment subsidies, while end-use customers pay recurrent costs at an affordable tariff. This is multi-service multi-energy approach that responds to local needs without imposing preconceived solutions. Installations use conventional or renewable primary energy resources in either grid-connected or off-grid configurations. Examples include:
   1) Mali: a) 1999 – Diesel generator micro grid, b) 2001: SHS, Jatropha biofuel & 72 kWp PV-Diesel hybrid system
   2) Morocco: 2002 – 26,600 systems providing SHS and LPG for cooking/heating.
   3) South Africa: 2008 – SHS for households & 400 schools
5. Feedback from field: Acceptability is high if the community has a clear understanding of the technology (SHS), donor's involvement is high and a local partner is involved.

Presenter recommendations: Key success for rural electrification program:

1. Strong involvement of donor, state & local partner with each taking an appropriate share of risks
2. A stable framework that achieves sustainability through clear and appropriate rules, priorities and objectives.
3. A facilitating institutional framework that addresses fairness and ensures financial viability for the State, the operators and customers (including financial backing, tax exemptions, possibly carbon finance although there is uncertainty for the latter regarding the future of Kyoto Protocol)
4. Flexible choice of technology to match local resources and needs, an on-going training program and a programmatic approach (scale, MDG, etc).

3.2.4. Presentation 4. *Pengembangan Energi Terbarukan di Nusa Tenggara Timur/NTT* (Renewable Energy Development in Eastern Indonesia Islands Province)

Budi Dharma Utama, NTT Provincial Government, www.nttprov.go.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P4BudiDharmaUtama.pdf

Experience& issues presented: RE potential, implementation & issues in the NTT Province

1. NTT situation: Population 4.4 million with 23% electrification ratio (1,485 out of 2,836 villages or 208.7 thousand out of 914.5 thousand households are electrified)
2. Energy-related issues: High growth in energy consumption, no indigenous fossil fuel resources in NTT, high dependence on fossil fuels resulting in high NTT government subsidy when oil price increases, low purchasing power, high energy elasticity, inadequate energy infrastructure, lack of facilitating climate resulting in low involvement of private sector in the energy business/enterprise, growing adverse impact on environment from fossil fuel utilization
3. RE potentials are high in NTT (Hydro, Solar, Wind, Biomass, Geothermal, Ocean) but utilization is still low because:
   1) Lack of implementation policies for RE
   2) Lack of human resources for RE, lack of local industry capability in RE supply & servicing
   3) Fossil fuel subsidies discriminate against RE and block its development
   4) Lack of interest from the private sector due to small RE market size, high investment cost due partly to the need to import components and partly to lack of economies of scale in small-scale RE deployment. These factors result in high project cost.
   5) RE resources used only for electricity generation, resulting in low utilisation.
   6) The variable and non-storable nature of many RE resources results in unreliable energy supply
4. RE implementation in NTT Province to date:
   1) Solar PV: In 1997-2007, more than 23,000 SHS were installed (1.1 MW) with a failure rate $\leq 5\%$
   2) Micro Hydro: In 1998-2005, 11 units with ratings of 15 kW to 35 kW were installed
   3) Wind: A number of small wind turbine have been installed for lighting and water pumping. Many agencies have studied the wind potential in NTT including BPPT, LAPAN and

4) Womintra. Imported components & specialised maintenance requirements have been identified as barriers to wind energy. There is a need to measure NTT's wind resource over longer periods of time.
5) Biogas: 6 units of 5 cubic metre capacity have been installed by the NTT government in a number of regencies.
6) Geothermal: Many regencies of NTT have resources capable of supporting projects from 6 MW to 54 MW in capacity. Two geothermal power projects (25 MW and 54 MW) have been awarded with construction to commence in 2009
7) Fuel savings: RE has displaced kerosene use of 2.1 million litres per year

Presenter recommendations: Strategies to develop renewable energy in NTT Province:
1. Develop RE for productive activities that create jobs and generate income
2. Integrate RE into the DME/ energy self-sustaining village
3. Develop community based projects
4. Encourage RE manufacture for local use and export
5. Develop a partnership program and effective financing

3.2.5. Session 1 Discussion & Recommendations

Audience contribution 1, question to P1 and P4: *How to solve the problem of geothermal exploration if the resources are located in conservation areas? Will there be any conflict with Department of Forestry from that?*

P4: The government will facilitate the process for geothermal resources in conservation areas.
P1: Geothermal is environmentally friendly as it will only last if the forest and environment are conserved, so geothermal energy utilization does not destroy the environment.

Audience contribution 2: *After three decades, RE has not progressed in Indonesia. Government and all stakeholders need to be more serious and work harder. A stronger political will is required for RE to be successful. RE costs are high, partly due to novelty & lack of scale. India has been more successful than Indonesia due to more "political will". Two initiatives may improve this situation:*
1) *Institutional: Learn from India, which has a ministry for RE while Indonesia deals with RE at Echelon II level*
2) *Tariff: Electricity tariffs should be discussed transparently. Again learn from India where a state-level committee sets electricity tariffs, while in Indonesia, PLN and ESDM propose tariffs for approval by DPR.*

P1: The National Energy Council (DEN), comprising various stakeholders (ministers, academic, private sector, consumers) will address these issues of political will, consistent policy including tariff policy and consistent implementation.

Moderator's comment: With DEN members comprising mostly of the same old players from PLN, how can we expect government to do business differently? Let's give DEN 6 months to

demonstrate how it will address critical energy issues in Indonesia. If no significant progress is demonstrated, then government should find another way of addressing this issue.

Audience contribution, question to all speakers:

1) *It's important for Indonesia to have a shared national vision and objectives as to when we will stop using fossil fuels, how to make a transition to RE and how to make long term investments in RE.*
2) *Government should not position itself as merely a seller of energy, thus in looking at electricity pricing, it is important to view the Indonesian people as shareholders rather than consumers.*
3) *Better understanding of "soft-loan" for an RE project funding. Often what was understood as a "grant" was actually a soft loan that was onerous in the long term.*
4) *Local government should set an example in RE utilization as they deal with problems more closely at a local level compared to central government. The plan to construct a coal power plant in NTT and import coal from Kalimantan needs to be reviewed.*

P2: Agree that the Indonesian people should be seen as shareholders rather than consumers, and that funding allocated for RE should be seen as an investment in RE capacity building rather than a subsidy. Profit from oil can be allocated for that purpose. For example Medco's production cost is US$ 8 / barrel. At US$ 40 / barrel, the profit is high and 85% of this is transferred to the government, amounting to US$ 1 billion in 2008. Part of that profit, seen as belonging to the Indonesian people as shareholders, should be allocated for investment in RE capacity building.

P3: RE development has been restricted by people's low purchase power and by small market share. Some local governments have decided to start building infrastructure to trigger economic development and to increase RE market share. The coal-fired power plant in NTT is part of the Phase I 10,000 MW coal power plant crash program. At the same time, RE resources are being developed to assist eastern Indonesia, which is less developed than western Indonesia.

5.3. SESSION 2. FINANCIAL ASPECTS: RENEWABLE ENERGY FINANCING & INVESTMENT

3.3.1. Presentation 5. Experience in Rural Electrification Financing under the *PNPM Mandiri Pedesaan* Program

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Online: http://www.ceem.unsw.edu.au/content/userDocs/P5PrabawaEkaSoesanta.pdf

Experience presented: Financing of bottom-up village electrification under the *PNPM Mandiri Pedesaan* Program using a participatory approach

1. *PNPM Mandiri Pedesaan* Program: The *Program Nasional Pemberdayaan Masyarakat* (Community Empowerment National Program) commenced in 1998, initially funded by the

2. World Bank and known as *Kecamatan* Development Project/KDP[11]. It is administered by the Depdagri (Department of Home Affair) and is aimed at alleviating poverty in Indonesia, strengthening local institutions and improving local governance.
3. PNPM financing is only one of many funding sources for local development (state government level APBN, regional government level APBD), Corporate Social Responsibility/CSR, village allocation budget ADD, direct funding assistance BLM, etc. PNPM is district level funding, given as a block grant of Rp. 1 to 3 billion, transferred directly into local community bank account. The local region provides 20 to 70% of the project funding, depending on regional fiscal capability.
4. PNPM Program steps: 1) Information dissemination & program socialization, 2) Participatory planning process at village and district levels, 3) Project selection at village & district level, 4) Project undertaking, 5) Accountability & progress report
5. PNPM is a generic program aimed at addressing local poverty in diverse Indonesia. It is an open menu approach in which the local people define their own development program, whether in infrastructure development, economic activities or other categories. Important categories to date have been road & bridge projects (80%) and cooperatives (loan & saving activities), whereas electricity has been less than 0.1 % and mainly Micro Hydro in Sulawesi (with the support of facilitators from CIDA & Denmark).

Issues presented: With technology programs, including electrification, there is a communication gap between research agencies, the private sector and the community. Research agencies tend to follow a technocratic approach believing that they know what the community needs. The private sector tends to focus on profit. Neither may respond to actual local community needs and objectives. Case studies presented:

1. Failed diesel power project: 1) Local people used the electricity for leisure activities (including playing VCDs). 2) When the diesel engine broke local people could not repair it and resorted to protesting to local authorities. A micro-hydro project experienced similar outcomes.
2. A sago processing machine, intended to improve sago processing efficiency, was rejected by a community in favour of the traditional method. In the extended family system, in which family members live together in a *rumah panjang* (long house/common house), sago collection in the bush provided husband & wife with private time. The newly introduced technology, albeit efficient, was seen as a threat to this custom.

Presenter recommendations:

1. Rural electrification for un-electrified areas requires careful planning, noting the risk of culture shock. For example, the sudden introduction of bright lights can be too great a change.
2. Involve local people actively in project planning and decision-making to increase the prospects that projects achieve their full working lives.
3. The role of women is critical for project success and especially to maintain accountability for finances. Case study: From the audit conducted on the 1998-2000 KDP program, the rate of success demonstrated by women in loan & savings projects was 99 % compared to men at 35%. Since 2001 loan & saving proposal are only approved if managed by women.

[11] PNPM & KDP http://www.kdp.or.id/default.asp?Language=1

4. Integrated planning is imperative. It should be top down in terms of policy and bottom-up in terms of identifying and prioritising local objectives.

3.3.2. Presentation 6. Experience with and Challenges Facing Commercial Micro Hydro Industry in Indonesia

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Online: http://www.ceem.unsw.edu.au/content/userDocs/P6KusetiadiRaharjo.pdf

Experience& issues presented:

1. History of micro hydro development in Indonesia from 1885 to date. More than 400 micro hydro installations were installed at tea estates during the Dutch administration period. Since 2000, more than 10 local MH manufacturers have been established in Indonesia.
2. GTZ, the German organisation for technical cooperation, has played an instrumental role in the establishment of MH manufacturing in Indonesia.
3. PT Heksa Prakarsa Teknik sells 80% of its production into the domestic market and exports 20% to Asia, Africa and Europe. Its initial MH projects were from the government, GTZ and YBUL NGO. Its products range from 10 kW to 2 MW using a number of turbine types: Cross-flow, Peltric, Propeller and Pelton. It offers a range of services including resource surveys, project design, construction, repair, maintenance & training.
4. Indonesian MH businesses have been facilitated by the following conditions:
   1) Government policy to reduce subsidy on kerosene and its distribution promoted MH development by 5 ministries (Mine & Energy (ESDM), Development of Disadvantaged Region (PDT), People's Welfare (Kesra), Public Works, Cooperatives (Depkop). 30 regencies now have MH programs.
   2) Having abandoned the old Dutch 110V MH for diesel and grid connection, tea estates have recently become interested in modern MH.
   3) Large hydro manufacturers in Europe lost interest in micro hydro as young employees wanted to work in high tech areas such as IT, aeronautics etc rather than MH technology. This created room for enterprises in developing countries.
5. MH manufacturers have now been established in Medan, Padang, Bandung, Makasar, NTB and Papua provinces, indicating private sector response to growing MH demand.
6. MH is often politicized with more projects announced prior to elections and fewer after elections have been held.

Presenter recommendations:

1. Micro hydro has great potential for domestic manufacture in Indonesia
2. Tariff policy, such as *PSK Tersebar*[12], should be made more attractive, such that private MH investors can make reasonable profits rather than depending on governmental projects.

[12] PSK Tersebar: Small-scale power generation of up to 1 MW using renewable energy resources, to be developed by private entities (individuals, small enterprises, cooperatives) , connected to the PLN's low or medium voltage network (380V or 20 kV), based on a standard power purchase agreement and tariffs, http://www.esdm.go.id/prokum/kepmen/2002/kepmen-1122-2002.pdf

3. In the mini hydro category:
   1) Mini hydro is very dependent on PLN to provide projects. However, PLN focuses on large generation and distribution projects and does not take allocate sufficient funds to this sector.
   2) Project opportunities should be given to domestic manufacturers to promote domestic capacity building for mini hydro, rather than to foreign manufacturers in countries such as China. For that purpose government projects should allow longer delivery times for procurement of components that must be imported (eg. generators from Europe) to meet equipment standard requirements.

3.3.3. Presentation 7. Photovoltaic Development Strategy Program in Indonesia

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Online: http://www.ceem.unsw.edu.au/content/userDocs/P7AgusSalimDasuki.pdf
Presented on behalf of Drs. Agus Salim Dasuki[13].

Experience& issues presented: History of PV programs in Indonesia and RE programs for the disadvantaged regions

1. Disadvantaged regions in Indonesia: a) Eastern Indonesia 123 regions – 62%, b) Sumatera 58 regions – 29%, c) Java & Bali 18 regions – 9%.
2. RE programs for the disadvantaged regions: a) 2006: 5,600 units of SHS and 2 units of Micro Hydro; b) 2007: 6,200 SHS, 19 units of centralized PV, 7 units of Micro Hydro; c) 2008: 17,200 SHS, 53 units of centralized PV, 26 units of Micro Hydro.
3. The Indonesian PV programs, totalling 10 MW to date: a) 1970s & 1980s Demonstration program, b) 1980s Multiple demonstration program, c) 1990s Dissemination program.
4. PV objectives: Renewable energy provision for remote areas, strengthening local institutions, improving local quality of life, support PV industry development in Indonesia to achieve 80% local content, establishing domestic testing facilities.
5. Source of PV financing during the Dissemination Program phase: a) Soft loan (AusAID, the World Bank), b) GEF grant, c) Matching grant from the Bavarian government.

Presenter recommendations:

1. PV is one of many options for rural electrification in Indonesia
2. Of importance in optimizing the Indonesian PV program: a) Market segmentation, b) Appropriate financing scheme, c) Strengthening PV domestic industry capability

[13] Drs. Dasuki's presentation on "PV Prospects for the Development of the Disadvantaged Regions", presented in Bahasa Indonesia on 15 July 2008 at a PV workshop at DGGEU, Jakarta, is available at http://www.ceem.unsw.edu.au/content/userDocs/15Jul08JakartaPVWorkshopProgram.htm

3.3.4. Presentation 8. Financing Renewable Energy Use in Indonesia – A Case of Solar PV

Soedjono Respati, APSURYA, The Indonesian PV Association
Online: http://www.ceem.unsw.edu.au/content/userDocs/P8JonRespati.pdf

Experience& issues presented:

1. RE financing is not the key issue in Indonesia. Rather, the problems are lack of coordination, implementation skills and managerial skills. Many government departments have RE programs such as DGEEU, Depdagri and also PDT as discussed in P7. But where is the coordination?
2. PV has been seen in Indonesia as a temporary solution prior to grid extension, whereas in other countries PV has become a mainstream RE technology. Globally, PV is a rapidly growing business and the EPIA reported global PV development from 78 MWp in 1996 to 2.5 GWp in 2007. Where is Indonesia in this picture with its resource of 4.8 kW/m2/day?
3. Stereotype: PV is expensive and not competitive. That is correct if the comparison is in simple monetary terms with respect to subsidized conventional fuel. However, the comparison should also take environmental impacts, sustainable development, etc into account.
4. PV price now is 0.25 €/kWh and is expected to be 0.07 €/kWh in 2030. At that time, PV will be competitive as we expect that the price of oil and gas will be very high by then. Indonesia will be in a good position to exploit PV being in the southern hemisphere with 1800 hours of irradiation per annum.
5. Example financing scheme by the Bank Rakyat Indonesia (BRI[14]): Consumer micro credit scheme for 50 Wp SHS: Rp 4 millions, 36 months, 15% flat interest rate. Operated initially in South Sumatra & South Sulawesi but extended to more regions with BRI branches.

Presenter recommendations:

1. Spend government money wisely. For example, stop giving PV free of charge as that is not a sustainable delivery model. It does not giving the end-users a sense of ownership and competes unfairly with independent PV companies. Instead fund the provision of incentives, technological capability development, after sales service infrastructure, etc.
2. Develop a funding model for the rural market segment. For example, implement a semi-commercial micro credit financing scheme for 50 Wp SHS at US$ 500 price: 20% government funding (as incentives), 20% international aid donor funding, 60% end user funding, credit term 4-5 years, interest rate 15%, down payment 25%, end-user monthly instalment of Rp 100 thousand to Rp 150 thousand/month, which is a level of energy budget of the rural customers.
3. Develop a funding model for the urban & industrial segment, on or off-grid. Example financing scheme: PV purchase rebate, credits, tax exemptions and Feed-in-Tariff (FIT) at Rp 2500-3000 per kWh for current electricity price levels.
4. PV incentives could be funded from government funds saved by reducing the fossil fuel subsidy, new business development programs, carbon credit under CDM and international/bilateral aid program.

[14] BRI, www.bri.co.id, http://www.bwtp.org/arcm/indonesia/II_Organisations/MF_Providers/BRI.htm

5. Channel PV funding through reputable banks to dedicated PV vendors, PV system integrators and domestic PV system component manufacturers.

3.3.5. Session 2 Discussion & Recommendations

Audience contribution 1:

1) *Government should educate the community on the necessity and amount of energy required for their activities*
2) *Regional governments should rely more on local primary resources for their energy needs. The decision to build a 22 MW coal-fired power station in NTT, which does not have indigenous coal resources, should be reviewed. In contrast to the limited budget made available for renewables, central government has allocated funding for the coal-fired power plant.*
3) *Build Partnership between developed & developing countries to scale up the use of renewable energy in developing countries.*

P4: NTT took the opportunity to build this coal-fired power plant under the Phase I Government's 10,000 MW crash program with the intention of improving NTT's electrification ratio and assisting the NTT economy. In parallel to that, renewable energy projects continue to be developed with the help of many departments and overseas donors.

Audience contribution 2, questions to P6:

1) *Other than government projects, are there MH projects with NGOs or other entities?*
2) *MH project cost is high, how can the manufacturing cost be reduced?*

P6: There are orders from NGOs from Indonesia (YBUL, Kehati and also from Kalimantan) and the Philippines. Heksa Prakarsa Teknik will reduce project cost by collaborating with competent local contractors for the erection and commissioning works. Heksa Prakarsa Teknik will provide only the mechanical and electrical equipment, which has been tested, verified & certified. That way the total cost can be reduced, as erection and commissioning are otherwise expensive for remote locations. Micro Hydro cost is getting cheaper now with manufacturing economy of scale. Equipment cost depends on the size of the installation (kW) and the effective head of the hydro resource.

Audience contribution 3, questions to all speakers:

1) *Most governmental projects are based on single year budgeting and use hit & run approach. The Jatropha case indicated how easily and quickly this program was abandoned. What is the solution to this? Is there any project review & evaluation for past projects before moving on onto next year activities?*

P7: The government budget cycle is indeed yearly. Evaluation has been lacking but by 2009, an evaluation project will be conducted to review the outcome of activities run in 2006. In terms of inter-departmental coordination, departments refer to the RKP (*Rencana Kerja Pemerintah*), government program plan, defined by Bappenas, in planning their activities. For example, in 2009 the RKP has decided on the installation of 100,000 SHS units, which will be managed by many departments for instance DGEEU (70,000 SHS), PDT, Dept of Marine & Fisheries, etc.

5.4. SESSION 3. TECHNOLOGICAL ASPECTS, PART I: RE SYSTEMS, RESEARCH, APPLICATIONS, DOMESTIC MANUFACTURING

3.4.1. Presentation 9. The Indonesian Mini Hydro Power Sector – An Incomplete Story?

Mark Hayton, Entec AG, www.entec.ch
Online: http://www.ceem.unsw.edu.au/content/userDocs/P9MarkHayton.pdf

Experience& issues presented: The history of the Micro Hydro development in Indonesia by private companies and barriers facing its large scale implementation.

1. Indonesia is frequently presented as a successful example of MHP technology transfer: Domestic manufacturing (cross-flow and propeller turbine types), established capacities in design, manufacturing, installation & commissioning, standardized civil structure designs, development of control technology, appropriate institutional models, and export to Asia, Africa & Europe in the last ten years.
2. MH has also contributed to rural development and poverty alleviation in Indonesia. However its overall contribution to the Indonesian rural electrification remains low as this can only realistically be achieved through renewable energy integration into grid network
3. The introduction of the government legislation, PSK Tersebar, had resulted in the installation of four MH projects: Seloliman in East Java 50 kW, Cinta Mekar in West Java 100 kW, Melong in West Java 100 kW and Wanganaji in Central Java 140kW. PLN supports small scale hydro projects development in remote areas, creating a win-win situation from avoided investment for PLN and by local job creation.
4. However further progress has stalled due to:
    1) Institutional related aspects: a) Inconsistent interpretation of the law between PLN and the Government, b) Lack of clarity in authority and role between the district and central government since decentralization, c) Resulting from these issues, a return to an ineffective case by case negotiation with PLN for individual projects.
    2) Financial related aspects: a) Lack of transparency in PLN tariff setting process, b) A short contract period that makes potential investors feel insecure, c) Financial institutions have no experience in financing MH projects creating difficulties in funding, d) Large RE sponsors tend to support large scale projects leaving small scale RE project developers on their own.

Presenter recommendations:

1. MH is by far the most promising RE for Indonesia and its development should be prioritized.
2. Government should provide a facilitating environment & genuine assistance for MH project developers by setting attractive tariffs and contract periods.
3. PSK Tersebar Law needs to be replaced with a scheme for generators of < 1 MW that is directly under PLN with tariffs and standard contracts provided by PLN central, removing any negotiation process at regional level.
4. Encourage investors to finance the < 1 MW size range.

5. Develop standard ownership structures that include participation by municipalities and village institutions
6. Remove or reduce import taxes on RE components and equipment. This has been negotiated for the last 15 years but there has been no progress to date.

3.4.2. Presentation 10. PV-Wind-Diesel Hybrid Sytem – Stand Alone Electricity Supply in NTT Province

Dr. Claus Jürgen Dauselt, e8 & RWE Power AG, Germany,
http://www.rwe.com/generator.aspx/rwe-power-icw/language=en/id=152096/rwe-power.html
Online: http://www.ceem.unsw.edu.au/content/userDocs/P10ClausDauselt.pdf

Experience& issues presented: Evaluation of an e8 stand alone renewable energy project in NTT, looking at the institutional, financial, technical & social aspects of the project

1. Institutional aspects:
   1) Stakeholders involved: The sponsors were e8, Indonesian government (Ministry of Environment & DGEEU) and the NTT government; the facilitators were Womintra NGO and PLD village electricity management; The end users were Oeledo villagers.
   2) Institutional capacity building: PLD members were selected from among end users (Oeledo villagers) and Womintra NGO trained them with technical and managerial skills to operate the PLD on professional basis, including cash flow, maintenance, performance monitoring, and contracts with end-users.
   3) PLD management has provided an annual monitoring report for each of the 10 years of operation to date, making it possible to evaluate its performance.
2. Financial aspects:
   1) e8 provided capital investment, while end users made down payments & pay for energy service usage
   2) The electricity price is Rp 800/kWh[15], with an overall record of 83% payment of bill amounts.
   3) Cash outflow increased after 3 years due to failed batteries (which were replaced from internally generated funds) and again in years 5 & 7 as additional batteries failed leading to the project stalling due to lack of cash (a common outcome in Indonesia). The NTT government and e8 then intervened to replace the batteries while villagers agreed to increase their user fees to collect more cash for future battery replacements (connection fee increased from Rp 125 thousand at project start to Rp 3 million now, which is similar to the connection fee charged by PLN in that region).
   4) The NTT government agreed to appoint PLD officers as casual employees paid by the NTT government, allowing PLD to reallocate its previous salary expenditure to O&M and future battery replacement.

[15] This price is higher compared to PLN electricity tariff at Rp 630/kWh (Source: PLN Statistics 2007, ISSN 0852 – 8179)

3. Technological aspects: Low utilisation ratio of ~30% (energy used versus potential energy production) due to the low level of electricity demand by the village households
4. Social aspects: Village average income has increased due to increased earnings capacity provided by the electricity supply, from Rp 62,000/month in 1999 to Rp 620,000/month in 2007

Presenter recommendations: Keys to project success:
1. Strong involvement of villagers since project inception; Clear understanding of project aim and scheme; PLD management by local people; Local & proactive control on PLD actions
2. Economic potential identified and revenues for O&M secured prior to project start
3. Simple design, clear specifications, rigorous control of construction and commissioning; end-user training, scheduled maintenance, provision of spare parts and a technician to maintain continued service availability

3.4.3. Presentation 11. Experience of Implementation of PV-Diesel Hybrid Systems

Adjat Sudradjat, Energy Technology Center, BPPT (The Agency of the Assessment & Application of Technology, www.bppt.go.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P11AdjatSudradjat.pdf

Experience& issues presented: Evaluation of four hybrid PV-Diesel project schemes looking at the technical and non-technical aspects
Project scheme & status:
1. 1997, DGEEU project, Subang, West Java province: 7 kW PV, 40 kVA diesel system installed for 350 households. Payment scheme was Rp 20,000-30,000 for connection fee and Rp 7,500 monthly subscription. The system was managed by the local government. Status: Failed after two years and currently no longer operating. Issues: a) This politicized project (a reward for the locals for their support for a political party) was not properly designed and installed due to limited timeframe and budget. b) Local energy demand was higher than available capacity, leading to overload.
2. 1998, Department of Transmigration Project, Sulawesi and East Kalimantan: Four 24 kW PV, 40 kVA diesel systems installed, each supplying up to 400 households. Funding: Soft-loan from French Protocol channeled through the Department of Transmigration. Payment scheme was Rp 25,000 for connection fee and usage fee of Rp 2,250-2,500/kWh (prepaid meter). The systems were managed by the Department of Transmigration. Status: Only two of the four units are currently operating. Issues: a) This bilateral project was well planned however the hybrid package (designed and supplied by a French company) did not meet local requirements. b) The prepaid metering system from South Africa came with limited time software license, which expired after two years due to failure to pay an on-going license fee.
3. 2000, BPPT & AusAID, Sulawesi: Fourteen 8 kW PV, 25 kVA diesel systems installed for 200-300 households each. The project was funded by AusAID and executed by BPPT. There was a Rp 250,000 fee for connection and a usage fee of Rp 1,250-1,500/kWh (prepaid metering). The systems were managed by cooperatives under a contract arrangement with

BPPT. Status: Only two out of the fourteen units are currently operating. Issues: This bilateral project was properly planned. However, the sponsor specified the package tightly by and all items of equipment (apart from energy limiter) were imported. The gel battery could not stand the high temperature of the local environment.

4. 2004, BPPT & Gorontalo government, Ponelo Island: A 24 kW PV, 125 kVA diesel system was installed for 400 households. Payment scheme was Rp 2.5 millions for connection fee with
5. a usage fee of Rp 3,500/kWh[16] (prepaid metering, the decision on price level was made by the locals). The system was managed by the local people & supervised by the regional government. Status: Still in operation, this project was well planned and commenced with local needs identification, program socialization, formation of local management with appropriate training prior to the system installation, use of mobile phones to facilitate technical support, and the use of electricity for income generating activities (electrical saw for furniture making).

Presenter recommendations:

1. Develop partnerships among the stakeholders and elect the local management committee from among the villagers. Local government involvement is critical to success.
2. Funding for battery replacement should be included in project design
3. Flooded lead acid batteries have been found to perform better than gel type. An Energy and Power limiter must be installed on each house to avoid overload. A national standard (SNI) and testing facilities for hybrid systems should be developed. Domestic components should be used to ensure continued availability (complete package system supplied from overseas not satisfactory). A technical expert should visit each project annually.
4. Accurate data on rural household electricity demand would facilitate better system design (with better understanding of local load profile).

3.4.4. Presentation 12. Dissemination of Hybrid ICDC Solar Drying Systems

Prof. Kamaruddin Abdullah, Laboratory of Solar Energy Conversion Technology, Darma Persada University, www.unsada.ac.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P12KamaruddinAbdullah.pdf

Experience presented: Progress in dissemination and evaluation of the Integrated Collector Drying Chamber (ICDC) solar drying system, which has been installed in Indonesia, other ASEAN countries and Africa

1. Research was initiated in 1992, dissemination commenced in 2004, four patents have been submitted
2. Funding source: JICA, USAID, Ministry of Research & Technology, private companies
3. The ICDC dryer combines solar heat collector & drying chamber, and uses many energy inputs - solar, wind and biomass – to maintain continuous operation regardless of weather conditions, with a drying capacity of up to 1000 kg/batch

[16] These three cases also indicated that the users paid a higher per kWh than the electricity prices paid by PLN subscribers, see previous footnote.

4. Overall benefits of ICDC dryer: Low cost, good adaptability to the local socio-economic situation, avoid fossil fuel use, can be operated at day or night in any weather conditions.
5. Dissemination approach: Hardware development associated with education programs
6. With uncertainties in oil price, demand for the ICDC has grown, not only for food items (corn, rice, fish, noodles, cassava etc.) but also for sea weed production and for drying in tanneries

Issues & Presenter recommendations:

1. Several new prototypes of the ICDC hybrid solar dryer have been developed and tested and they are attracting investment from SMEs. Support and assisstance have been received from the government, international donor agencies including NGOs. However, continued access to working capital and multi-year financing are imperative for the on-going dissemination effort.
2. Sustainability indicators have been formulated and are proposed as tools to evaluate new dissemination programs
3. The technology developed and the method for sustainable dissemination of RE technology can be used to monitor and evaluate the DME/ESSV program

3.4.5. Session 3 Discussion & Recommendations

Audience contribution 1, questions to P9:

1) The implementation of PSK Tersebar is very complicated in terms of administration. How can this be overcome?
2) Micro hydro spare parts are not readily available in all Indonesian regions, is it feasible to set up MH spare parts manufacturers in each region to simplify the supply chain?

P9: PSK Tersebar should be stopped and replaced by other scheme. Inconsistency in pricing & tariff setting discouraged private sector involvement. Unfortunately, it is not feasible to set up MH spare parts manufacturers in each region. It is more cost effective to improve communication and involve the private sector in the supply chain.

Audience contribution 2, general comments: *Local government (kabupaten) needs capacity building to develop its energy planning*

P11: According to RUKD, energy planning should start from *kabupaten* and then propagate up to provincial level then national level. However, in practice, the planning process is still led by central government. Specifically, PLN uses Markal to generate an "optimal" expansion plan.

Audience contribution 3, General Comments:

1) Indonesians are good at accepting technology transfer, but find it difficult to achieve large-scale implementation. How can this problem be overcome?
2) Service centres and spare part manufacturers should not be concentrated in certain areas but distributed to all areas in Indonesia
3) There have been many workshops similar to this, how can this one contribute to policy development?

P12: Indonesia should use the PEST approach – P (good policy), E (Economics), S (Social awareness) and T (Technology, domestic manufacturing).

P9: Government should appoint a Minister for Renewable Energy, to achieve sufficient priority at central government level.

P10: Consistency & accumulated effects from a series of workshops is of importance. For example, the next workshop should be based on the outcome of the current workshop and so on that we can speed up the accomplishment of RE development in Indonesia.

P11: Write a white paper and use METI to bring the results to the government.

5.5. SESSION 4. TECHNOLOGICAL ASPECTS, PART II

3.5.1. Presentation 13. Wind Development and Experience in Indonesia

Prof. Sahat Pakpahan & Drs. Soeripno MT, National Institute of Aeronautics & Space (LAPAN), www.lapan.go.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P13SahatPakpahan.pdf

Experience presented:

1. Potentials: Stand-alone, hybrid and grid-connected; small scale <4m/s (up to 10 kW), medium scale 4-5 m/s (10-100 kW) and large scale >5m/s (> 100 kW). Weibull method and Bin method have been used to estimate energy output
2. 150 wind farm sites have been identified in Indonesia as of 2008. Wind maps have been prepared for several regions in NTT.
3. Small-scale wind energy applications, of up to 10 kW:
   1) LAPAN 1992-2002, Jepara in Central Java, 31 units of 250W – 2.5 kW; East Lombok in NTB province 7 x 1 kW; also in other areas in Java
   2) Winrock 1998: NTT province, 1.5 kW & 10 kW for rural electrification, battery charging and water pumping
   3) Ristek[17] 2007: Rote Island in NTT province, Wind-PV-Diesel hybrid system 4 x 10kW
   4) Other installations by private companies
4. Medium-scale wind energy applications, 10 – 100 kW:
   1) PLN: Wind-PV-Diesel hybrid system, 3x85 & 6x80 kW in Nusa Penida island, Bali
   2) DGEEU: 80 kW turbines installed in several locations
5. Large scale ≥ 100 kW:
   1) Wind measurement & feasibility studies conducted by LAPAN, PLN, Windguard, Soluziana, Riso.

[17] Ministry of Research & Technology www.ristek.go.id

2) Identified areas: NTT, South Sulawesi, Central Java

6. Domestic manufacturers of components for wind turbines up to 10 kW include PINDAD Co (generators), PTDI Co (rotor blades), Korindo Co (wind tower) and LEN Co (electronic control subsystem)

Issues presented: Lack of policy support, funding support, lack of wind data for site selection, lack of capable technicians and problematic spare part availability at remote sites

Presenter recommendations:

1. National wind map should be prepared and wind measurements at ≥ 50 m for ≥ 1 year are necessary to produce an accurate and reliable wind energy database. This map is important to attract investors.
2. Local government should be actively involved
3. Many private companies have expressed interest in domestic manufacturing but require incentives and policy support to be profitable.

3.5.2. Presentation 14. Geothermal Energy Utilization for Crops Processing

Dr. Taufan Surana, Geothermal Energy Research Group, Center for Technology of Energy Conversion & Conservation, BPPT, www.bppt.go.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P14TaufanSurana.pdf

Experience presented: Concept, potential, applications and challenges focusing geothermal energy directly for crop processing in Indonesia

1. Research scope of the Geothermal Energy Research Group of BPPT: 1) Small-scale geothermal electrical power plant, 2) Geothermal energy direct use for crop processing
2. Types and applications of direct use of geothermal energy:
   - Natural, shallow well: Copra & cocoa drying in Lampung
   - Small capacity well: Mushroom cultivation in Kamojang geothermal field, West Java
   - Brine (separated hot water): 1) Palm sugar processing in Lahendong geothermal field, North Sulawesi, 2) Tea processing in Wayang Windu, West Java

Issues presented:

1. Copra case: although the product is cleaner compared to copra dried traditionally, the geothermal drying method is still unpopular. Lack of economy scale does not yield enough clean copra so that its market price remains similar to the copra produced traditionally
2. When acommercial scheme was promoted, the owner of a geothermal field (Pertamina) set a high price for the brine (previously seen as a waste) stalling investment.
3. A revolving funding program, with seed funding from the government, failed as borrowers from the first batch refused to repay their loans, arguing that as the government was for people, they did not need to pay back the loan.

Presenter recommendations:

1. Geothermal direct use is technologically proven and more cost effective than fossil fuel alternatives and suitable for both non-commercial & income generating activities. However, uptake has been slow.
2. Government should set up regulations as soon as possible to support direct use (community issues, pricing policy, and access to resources), to accelerate utilization and encourage investors, and to establish a sustainable and community-based development model as well as a business to business model.

3.5.3. Presentation 15. Lessons from e7 Bhutan Micro Hydro Power CDM Project

Takao Shiraisi, e8 & Kansai Electric Co, www.kepco.co.jp/english/
Online: http://www.ceem.unsw.edu.au/content/userDocs/P15TakaoShiraisi.pdf

Experience& issues presented:

1. The Bhutan MH project, installed in the Chendebji village, was the first micro-hydro project under CDM. Its objectives were to:
   - Support remote area rural electrification in Bhutan
   - Contribute to the CDM rule-making process by describing the problems encountered and corrective measures taken at international conference like COP/MOP meetings of UN.
2. The installed capacity is 70kW with 50m effective head and there is a 3km distribution line. The site is remote and travel difficult due to mountainous terrain. The equipment was manufactured in Nepal with MHPP support using a cross-flow turbine designed for minimum annual water conditions.
3. The project commenced in 2001 and was commissioned in 2005 followed by 2 years of monitoring (2007-2009).
4. The community has benefited from new commercial activity, improved educational opportunities and reduced kerosene use for lighting & heating.

Presenter recommendations:

1. Trust between the Annex I party and the host country is very important for CDM projects. Local people were consulted and involved from project inception through to operation creating a strong sense of ownership. Long-term commitment, close cooperation and appropriate technology transfer are all important to achieve project sustainability.
2. Need to start with small projects and then scale up as understanding improves
3. The CDM process is very bureaucratic and should be simplified. CDM institutions need to provide support as the CDM process (preparing the Project Design Document (PDD) etc) is complex. Developing countries require a strong, proactive and CDM conversant Designated National Authority (DNA) for CDM projects to be successful.
4. Emission reduction from such a small-scale project was too small to attract CDM investors, as transaction costs are too high. Thus other incentives are needed for small projects, for instance subsidy from public funds.

3.5.4. Presentation 16. Challenges of Biofuel Industry in Indonesia

Roy Hendroko Setyobudi, PT Bumimas Ekapersada, http://www.sinarmasgroup.com/app.html
Online: http://www.ceem.unsw.edu.au/content/userDocs/P16RoyHendroko.pdf

Experience presented:

1. Biofuel has been actively promoted throughout the world, including in China, Malaysia, India and other countries. Air New Zealand flew a commercial aircraft using a 50:50 blend of biofuel and fossil fuel on December 2008 and Continental Airlines will do the same in February 2009.
2. Biofuel can play an important role in reducing oil consumption especially in the transportation sector in Indonesia. Oil represents 52% of the current energy mix in Indonesia, while the biofuel share is negligible, in spite of fifteen regulations released by the government since 2001. Referring to BP PEN, oil share of the Indonesian energy mix is to reduce to 20% in 2025 and biofuel share (bio diesel, bio ethanol & bio oil) is to increase to 5%.
3. Increased use of biofuel can help create production jobs in Indonesia, reduce oil import, improve air quality & address environmental emissions from fossil fuel use (biofuels burn more cleanly than fossil fuels)
4. Indonesia is blessed with the right climate for palm oil and jatropha curcas, being located at the equator (the palm oil belt is near the equator while jatropha curcas has a wider growing region)
5. In 2008, the Ministry of Mine & Energy released a decree on Mandatory use of Biofuel, outlining gradual penetration of biofuel in the Indonesian energy sector (transportation, commercial industries & electricity generation), with biodiesel to reach 20% by 2025 and ethanol to reach 15% in 2025.
6. By 2009, there were 11 biodiesel companies and 4 ethanol companies operating in Indonesia, producing 1.1 million kilo litres of biodiesel and 52 million litres of ethanol.

Issues presented: Potential food-energy conflict:

1. Palm oil (CPO): currently no conflict, but at 20% blending, CPO use in fuels would take 55% of the national CPO production.
2. Cassava: 5% fuel blending would take 30% of the national cassava production, 10-15% blending would take between 60-90% of the national cassava production, which would be in conflict with food noting that since 2002 Indonesia has imported tapioca to meet its domestic needs

Presenter recommendations:

1. Biofuel utilization: Bio-kerosene from Jatropha for household use to support DME program. Many types of jatropha stove are manufactured in Indonesia
2. Use hydrous ethanol and ethanol gel to increase bio fuel efficiency
3. Increase cassava yield by intensifying production and extending plantings to avoid food-energy conflict
4. Build national biofuel capacity with continued research and training

3.5.5. Session 4 Discussion & Recommendations

Audience contribution 1, question to P16:

1. *How can Jatropha contribute to DME program, noting that government planned to create 2000 DMEs in 2007-2009, but has only achieved 430 to date?*
2. *How can Jatropha help reforestation in Indonesia?*

Audience contribution 2, comments about bio fuel:

1. *The idea that biofuel is cheaper than fossil fuel is misleading. Biofuel should be promoted more as a means of addressing environmental concerns than as cheaper fuel.*
2. *The idea that jatropha is a non-edible commodity and hence does not create food-energy conflict can be disastrous for farmers. If farmers are asked to invest in it and then fail to find buyers, it will mean that farmers waste their investment. If farmers instead cultivate edible commodities, they still can eat the crops if they fail to find buyers.*
3. *It is better for big companies to invest in jatropha plantations and pay farmers for its cultivation so that poor farmers are not put at financial risk if the venture fails.*

Audience contribution 3, comments & questions to P13 & P16: *RE controversies in Indonesia*

1. *Wind & micro hydro footprint: The Dutch, who colonized Indonesia, are well known for their reputation in windmills. However they did not build windmills in Indonesia during their administration, while using micro hydro frequently. Does that prove that wind technology is not feasible in Indonesia?*
2. *There is a risk of over-promoting jatropha: In 2007 I signed a collaboration in Austria to plant jatropha in Indonesia and to cover an area of 500 thousand hectares. Back in Indonesia I could not find an appropriate area or seeds for a jatropha plantation of that size.*

Responses from panel members:

P13: Yes, wind development is new, and more needs to be done, although small-scale wind energy applications are in place and suppliers available. We should move on to larger scale implementation noting that technology, wind data and information on appropriate locations are available. LAPAN as a research and development agency is charged with providing information, data & support. In-country and overseas institutions have also undertaken surveys and collected data. Institutions such as ESDM, local government (Pemda), PLN or others are responsible for implementation.

P16: The concept of "*jarak pagar*" for DME is for jatropha to be planted at household level to fulfil local energy needs. Jatropha, categorized as "primitive plant", is more suitable for small-scale cultivation, which is suitable for the DME concept, rather than for large-scale commercial purposes. Jatropha productivity is still low, at 2-3 tons per hectare. Research continues, aimed at producing good seed varieties able to produce of up to 9 tons/hectare Note that jatropha will be classified as productive if it reaches a productivity level of 10 tons/hectares. The belief that jatropha is water-free and maintenance-free, often touted by politicians, is misleading. Like other plants, jatropha needs water and fertilizer. Thus research continues to find better seed varieties. At this stage, jatropha's productivity is not yet proven. Referring to palm oil, 20-30 years ago people were reluctant to cultivate it. Now after 30-35 years of research it is a different story, compared to jatropha, for which research has only taken place in the last two years.

5.6. SESSION 5. SOCIAL & ECOLOGICAL ASPECTS: ACCEPTANCE, SOCIOECONOMIC DEVELOPMENT, CDM & RE

3.6.1. Presentation 17. A Holistic Approach to Overcoming Barriers to Renewable Energy in Indonesia using the I3A Framework

Dr. Maria Retnanestri, CEEM UNSW www.ceem.unsw.edu.au & STTNAS Jogjakarta www.sttnas.ac.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P17MariaRetnanestri.pdf

Experience presented: Assessment of RE case studies (PV & Micro Hydro) looking at both successful & failed examples in Indonesia, using the I3A (Implementation, Accessibility, Availability & Acceptability) framework as an assessment or design tool for a sustainable renewable energy service delivery

Issues presented: Lack of insights from a failure to view the Hardware, Software & Orgware aspects of RE as an integrated whole has led to early failure in most RE projects in Indonesia & developing countries more generally.

Presenter recommendations: A holistic approach should be adopted that considers the hardware-software-orgware dimensions of RE holistically to address the institutional, financial, technological, social and ecological issues related to RE implementation. This approach should be aimed at:

1. Sustainable Implementation of RE: Promote a civic network among stakeholders (donors, government, facilitators, end users); strengthen local governance; build user autonomy and capacity to actively participate; create a facilitating environment (policy, regulation, administration, coordination) to allow RE service delivery to be sustained (being accessible, available & acceptable during & beyond project life)
2. RE Accessibility: Facilitate access to financing, skills and networking and undertake market mapping to ensure an appropriate approach is adopted for different market segments. The four quadrant model is proposed for market mapping purposes, with X-axis for Technological Capacity and Y-axis for Financial Capacity:
   - Quadrant I: High technological & financial capacities – most autonomous segment, requires least external actors & resources and is suitable for a fully commercial approach
   - Quadrant II: Low technological capacity but high financial capacity – semi autonomous segment, suitable for a semi-commercial approach that emphasises technical assistance
   - Quadrant III: Low technological capacity and low financial capacity – least autonomous segment, requires most actors & resources, suitable for development model & cross sectoral approach and requiring a programmatic approach including financial intervention, technical assistance and community empowerment
   - Quadrant IV: High technological capacity but low financial capacity – a semi autonomous segment suitable for a semi-commercial approach that emphasises financial intervention

3. RE Availability: Ensure RE service availability during & beyond project life (technical standards, proper installation practices, domestic manufacturing, warranty, after-sales infrastructure, local capable agent, end-user education)
4. RE Acceptability: Utilize and enhance pre-existing resources (primary resources, local knowledge, local institutions), acculturation of RE technology into local life as it meets local needs/requirements.

3.6.2. Presentation 18. Social Impact of PV on Lifestyles in Pusu Village, NTT Province

Ratna Sudharsana, Womintra & Udayana University www.unud.ac.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P18RatnaSudharsana.pdf

Experience presented:

1. Studies of the impact of Solar Home Systems (SHS) on the lifestyle of Pusu villagers, in which the village poor were introduced to a new concept of lighting technology, economic activities, energy management, enterprise management, and social interaction within the family, among village members as well as external institutions such as NGOs and Regional government
2. Community empowerment program undertaken by the Kupang-based Womintra NGO, using SHS as a means of improving village quality of life, by the following steps: 1) Community Preparation, 2) Community Organisation (formation of village electricity management/PLD, formation of village economic activity group/KUEP, provision of seed capital for the KUEP groups), 3) SHS procurement & installation, 4) Technical & managerial training for the PLDs & KUEPs, 5) Provide guidance for the first 18 months of the PLD and KUEP operation, 6) Monitoring and evaluation, 7) Advocacy and publication.
3. Outcome of the community empowerment program: 1) Institutional aspects: PLDs are functioning well in managing SHS fund, end-user meetings and maintenance, 2) Financial aspects: PLD submitted the collected SHS instalments to the regional government, PLD has generated revenue to support its operation, KUEP economic activities from handicraft making (able to work for longer hours in the evening thanks to SHS lighting) have increased household income, 3) Technical aspects: SHS is functioning, spare parts are made available at the PLD office, PLD technicians are able to trouble-shoot and resolve technical issues, 4) Social aspects: SHS lighting facilitates extended working hours, evening study and evening social activities, improved hygiene and access to communication and infotainment.

Issues presented and Presenter recommendations: Such a comprehensive program (from preparation through to monitoring and evaluation) requires significant funding and commitment for at least five years.

3.6.3. Presentation 19. Renewable Energy/Green Education Program in Indonesia

Prof. Armansyah Tambunan, Laboratory of Agricultural Energy and Rural Electrification, Bogor Agricultural Institute IPB, www.fateta.ipb.ac.id
Online: http://www.ceem.unsw.edu.au/content/userDocs/P19ArmansyahTambunan.pdf

Experience presented: IPB's experience in providing renewable energy education

1. Focal area: Agricultural energy and rural electrification
2. Projected renewable energy job opportunities in Indonesia: 1) Biodiesel – 3 million people, 2) Rural electrification, 3) Community empowerment activities
3. Educational programs offered: Degree programs (undergraduate and postgraduate degrees), RE research and RE technology development
4. Learning and teaching method: Use of intra and extra curriculum as well as formal and field laboratories

Presenter recommendations:

1. RE is more labour intensive than fossil fuels or nuclear power, which is consistent with the Indonesian Presidential policy of "pro-growth, pro-job, pro-poor"
2. RE education is prospective not only for jobs but more importantly to have a critical mass of graduates with good awareness of renewable energy, noting that companies are keen to employ graduates with knowledge of emerging technologies
3. RE education can start by incorporating sustainable energy knowledge into existing curricula

3.6.4. Presentation 20. CDM Experience in Indonesia

Brandon Courban, Sindicatum Carbon Capital, www.carbon-capital.com
Online: http://www.ceem.unsw.edu.au/content/userDocs/P20BrandonCourban.pdf

Experience presented:

1. Kyoto Protocol and the CDM mechanism
2. Sindicatum Carbon Capital (SCC) specialization: Develop climate change projects and originate, accredit and commercialize CDM projects
3. SCC's CDM projects in RE in Indonesia and Asia: 1) 2007 Tambun LPG Plant – registered, 2) 2008 Bangkok Landfill – registered, 3) 2008 Batam Gas Engine Power Plant, 4) Other projects at validation stage: Landfill gas, N2O, hydro, biogas and coal-mine methane in Indonesia and China

Issues presented:

1. The uptake of CDM in Indonesia has been slow although now accelerating with 22 projects registered so far compared to 371 projects in China and 386 projects in India

2. Post Kyoto uncertainty means that the window is closing to get money back and the stringent Executive Board (EB) process leads to delays or non-issuance of Certified Emissions Reductions (CER) from existing operational projects. Project rejections are occurring due to a failure to prove additionality. Moreover, additionality itself is more of an art than a science.

Presenter recommendations: CDM is a potential source of RE project funding if the hurdles can be overcome.

3.6.5. Session 5 Discussion & Recommendations

Moderator questions to P17: *How do you see the current Indonesian RE situation from the Four Quadrant perspective?*

Indonesia has communities in all four quadrants – hence need context-sensitive approach, eg. market mapping that considers local RE resources, the local socioeconomic situation and pre-existing local institutions, all of which are instrumental in designing an appropriate RE delivery scheme for specific areas.

Audience contribution1 in the form of a question to P17: *Why has RE not progressed further and is still regarded as a means for poverty alleviation rather than a mainstream alternative energy?*

RE has to be seen as a means to build community resiliency to become mainstream, which includes poverty alleviation, energy security, sustainable development etc. However this requires long term planning and a multi-sectoral approach rather than a single year budget, ad hoc approach. A process for coordination and consolidation among government institutions is required. There is no short answer to this question, but multi-stakeholder forums like this workshop may be instrumental in finding a formulation for that purpose. Follow-on activities are required to address issues raised in this workshop. As an example, the follow-on workshop to be held in July 2009 by ITS University in Surabaya will look at the role of RE stakeholders in accelerating RE deployment in Indonesia, based on the outcomes of this workshop.

Audience contribution 2 in the form of a question to P18: *How has SHS affected evening working hours for women and the birth rate? Which government department is the most suitable to deliver SHS projects using Womintra's approach?*

Women now work from 7-11 pm so working hours have increased. SHS electricity has affected the birth rate as families have cleaner lifestyles and often divide the big common room into several smaller rooms.

Audience contribution 3 in the form of a question to P20: Do you accept registration post 2012 for CDM and small RE projects – what is possible?

SCC does not accept registration after 2012.A number of small-scale RE projects may be funded by CDM. Viable size RE projects, depending on the sector, must pass through "a rigorous process" within a year. There is a high cost of compliance and also expenses for validation and periodical re-assessment. Bundling small projects may help. The UN proposes "program" validation for a group of small projects but no projects have passed through this process yet. Sindicatum takes a share in the achieved CDM credits rather than working for a fixed fee.

5.7. PARALLEL GROUP DISCUSSIONS

Speakers and participants grouped themselves into two groups. Group 1 discussed issues related to the institutional, financial and technological aspects of renewable energy and sustainable development in Indonesia, and formulated recommendations based on the discussion. Group 2 discussed the social and ecological issues and formulated relevant recommendations.

Prof. Harijono Dhojodihardjo of the University of Al-Azhar facilitated Group 1 discussion and Prof. Herliyani Suharta of BPPT reported the outcomes of the group discussion 1 to the ensuing plenary session. Dr. Lolo Panggabean of YBUL NGO facilitated the Group 2 discussion and reported the findings to the ensuing plenary session. Appendix 4 contains summaries of the outcomes of the group discussions.

5.8. WORKSHOP CLOSING SESSION

Bruno Menard of the e8, Prof. Hugh Outhred of UNSW and Dr. Maria Retnanestri of UNSW and STTNAS delivered closing remarks. Dr. Budi Santosa of ITS University announced a follow-on workshop, to be held at ITS University in Surabaya on 22-23 July 2009. The draft program for this follow-on workshop is presented in Appendix 7.

4. WORKSHOP EVALUATIONS

Workshop evaluation forms were distributed to all participants and fifteen completed forms were returned to the workshop organisers. These form the basis of the following analysis.

Responses from workshop participants indicate that they thought that the workshop objectives were important and relevant and that they were being reasonably met at time of the workshop, noting that more needs to be done. Appendix 3 reports on participant responses to other questions related to the importance of a follow-up workshop, enhancements to workshop design, whether participants would be willing to speak at a follow-up workshop and other activities that would be beneficial apart from a follow-up workshop.

5. MAJOR RECOMMENDATIONS FROM THE WORKSHOP

The following recommendations are derived from presenter recommendations, the outcomes of the discussion following each presentation, the outcomes of group discussions and outcomes from the survey. Major recommendations are classified into five groups as listed below. For more details, see Section 3 and Appendices 4, 5 and 6.

5.1. INSTITUTIONAL ASPECTS

1) A holistic approach is required that considers the hardware, software and orgware dimensions of RE to address the institutional, financial, technological, social and ecological issues of RE implementation.
2) Government should create a facilitating framework and provide genuine and sustained assistance for RE. It should provide a clear framework and long term policy stability to achieve sustainability, including rules, regulations, objectives, and priorities.
3) Better coordination is required between central and provincial government departments with effective communication among all stakeholders. An integrated and programmatic approach (long-term, multi-year, cross-sectoral) is required rather than an individual project approach.
4) The Public-Private Partnership model can be used if it involves local people actively from project design stage through implementation to operation and monitoring.
5) Energy sector restructuring and decentralization would facilitate RE development.
6) Institutional capacity building should include partnership between developed and developing countries to scale up RE utilization.
7) Appoint a Minister for RE
8) BP PEN does not have an elaborated action plan, which should be prepared and disseminated. *PSK Tersebar* should be replaced with more workable policies that encourage private enterprise to undertake small scale RE projects.

5.2. FINANCIAL ASPECTS

1) Pricing policy (tariffs, tax exemption, incentives, feed-in-tariff) should encourage domestic and foreign investment in RE projects.
2) Transparent pricing, market mapping, long-term budgeting and carbon financing would facilitate RE projects.
3) Use grants rather than loans for renewable energy projects until commercial viability is proven.
4) Employ market segmentation to achieve correct targeting of commercial and developmental approaches to RE project implementation.
5) Deploy government budget correctly for RE capacity building. Giving heavy subsidies or worse free RE systems to villagers are not sustainable policies.
6) Contract periods should be sufficiently long to make RE investment bankable and provide security for investors.
7) Large private companies should undertake RE research in addition to government funded research.

5.3. TECHNOLOGICAL ASPECTS

1) Improve energy infrastructure, energy efficiency and energy diversification
2) Strengthen domestic technology capability
3) Encourage domestic manufacturing and minimize the importation of components. Domestic manufacturers should be given priority for RE projects for capacity-building purposes.
4) Develop RE standards and build RE testing facilities. Strengthen RE research and training, both through public and private education systems
5) Undertake technology transfer that addresses local needs
6) Aim for simple design, clear specifications, strict control of construction and commissioning, technical training, scheduled maintenance, provision of spare parts and local technicians to maintain continued service availability.

5.4. SOCIAL ASPECTS

1) Understand local needs and requirements. Empower community, develop community-based development. Develop RE for productive activities, income generation and job creation
2) Enhance community awareness of RE
3) View RE beyond its role in poverty alleviation. Mainstream RE technology for the purpose of building community resiliency, energy security and more general sustainable development.

5.5. ECOLOGICAL ASPECTS

1) Rely primarily on local resources to fulfill local energy needs
2) Utilize RE resources to address environmental concerns rather than focusing solely on monetary issues
3) Undertake resource mapping for wind, solar, hydro, geothermal and other RE resources.
4) Deploy RE for Climate Change mitigation purposes. CDM has potential but procedures should be simplified and support should be given to small RE projects

5.6. RECOMMENDATIONS FOR FUTURE EVENTS & ACTIONS

1) Series of systematic workshops to follow-up on key issues (energy policy, pricing policy, stakeholders' roles, develop action plans, etc.)
2) Specific workshop focusing on specific RE technologies, local issues, RE project evaluation
3) Fieldwork to RE sites
4) Focus group discussions focusing on certain issues
5) Continue dialogue with governments
6) Develop internet-based networking and an online forum for RE
7) Mapping, documentation and dissemination of Indonesian RE project resources and experience.

APPENDIX 1. FINAL WORKSHOP AGENDA

Day 1 – 19 January 2009

Time	Activity	Topic, Presenter, Panelist
08.00-08.45	Registration	
08.45-09.00	Opening Session	Sponsor: e8 and UNSW
09.00-10.30	Presentation and Panel Discussion 1	**INSTITUTIONAL ASPECTS**: Policy, regulation, legislation, administration, government program (national level, provincial level)
	09.00-09.20 – P1	**Sonny Keraf**, Vice-Chairman, Comm. VII, DPR Indonesia: Energy, Environment and Sustainable Development in Indonesia
	09.20-09.40 – P2	**Hilmi Panigoro**, Chairman Indonesian Renewable Energy Society, Situation of Renewable Energy Development in Indonesia
	09.40-10.00 – P3	**Guy Marboeuf,** e8-EDF: EDF Experience in Renewable Energy in Developing Countries – Practical Examples and Lessons Learned
	10.00-10.20 – P4	**Budi D. Utama,** NTT Government: Renewable Energy Experience in Eastern Indonesia (NTT)
	10.20-10.40	**Panel Discussion 1**: Lessons learned, what needs to be done All participants, moderator Yani Witjaksono
10.40-11.00	**Tea/Coffee**	
11.00-12.30	Presentation and Panel Discussion 2	**FINANCIAL ASPECTS**: Project financing, investment, incentives, market mapping, finance mobilization, domestic manufacturing
	11.00-11.20 – P5	**Prabawa Eka Soesanta,** Depdagri (Ministry of Home Affair): PNPM Rural Electrification Project andFinancing at Kecamatan Level
	11.20-11.40 – P6	**Kusetiadi Raharjo**, Heksa Prakarsa Teknik: Experience and Challenges Facing Commercial Micro Hydro Industry Development in Indonesia (investment, manufacturing, export, etc.)
	11.40-12.00 – P7	**Agus Salim Dasuki**, PDT: Evaluation of Indonesian Renewable EnergyProjects – Financing Issues
	12.00-12:20 – P8	**Jon Respati**, APSURYA**:** Renewable Energy Project Financing and Performance: Experience, Challenges, Opportunities
	12.20-12.40	**Panel Discussion 2**: Lessons learned, what needs to be done All participants, moderator Yani Witjaksono
12.40-13.40	**Lunch**	
13.40-15.00	Presentation and Panel Discussion 3	**TECHNOLOGICAL ASPECTS 1**: Experience, evaluation, standards, after-sales service, spare parts, technical training
	13.40-14.00 – P9	**Mark Hayton**, MHPP: The Indonesian Mini Hydro Sector: An incomplete Success Story?
	14.00-14.20 – P10	**Claus Dauselt,** e8: Rural Electrification: Evaluation of e8 Funded PV-Wind Hybrid Project NTT
	14:20-14.40 – P11	**Adjat Sudrajat,** BPPT/LSDE:Experience with the Implementation of PV-Diesel Hybrid Systems
	14.40-15.00 – P12	**Kamaruddin Abdullah**, UNSADA: Dissemination of Hybrid GHE Solar Drying Systems
	15.00-15.20	**Panel Discussion 3**: Lessons learned, what needs to be done All participants, moderator Yani Witjaksono
15.20-15.40	**Tea/Coffee**	
	15.40-16.40	**Group Discussion 1**: Institutional and Finance (This activity was relocated to Day 2)
	15.40-16.40	**Group Discussion 2**: Technical (This activity was relocated to Day 2)
16.40-17.10	**Workshop Summary Discussion 1 / 2, Networking, Free time**	

Day 2 – 20 January 2009

Time	Activity	Topic, Presenter, Panelist
08.00-08.45	Registration	
09.00-10:40	Presentation and Panel Discussion 4	**TECHNOLOGICAL ASPECTS 2**: Experience, evaluation, standards, after-sales service, spare parts, technical training
	09.00-09.20 – P13	**Sahat Pakpahan**, LAPAN, Wind Development and Experience in Indonesia
	09.20-09.40 – P14	**Taufan Surana**, Geothermal Energy Utilization for Crop Processing
	09:40-10.00 – P15	**Takao Shiraishi,** e8-Kansai:e8 Renewable Projects in South Asia and Pacific region
	10.00-10.20 – P16	**Roy Hendroko Setyobudi,** IPB: Biofuel Utilization in Indonesia
	10.20-10.40	**Panel Discussion 4**: Lessons learned, what needs to be done All participants, moderator Lolo Panggabean
10.40-11.00	**Tea/Coffee**	
11.00-12.20	Presentation and Panel Discussion 5	**SOCIAL and ECOLOGICAL ASPECTS:**Acceptance, socioeconomic development, CO2 emission reduction, Ecological issues
	11.00-11.20 – P17	**Maria Retnanestri,** UNSW/STTNAS: A Holistic Approach toOvercoming Barriers to RE in Indonesia using the I3A Framework
	11.20-11.40 – P18	**Ratna Sudharsana,** Womintraand University of Udayana:*Dampak Sosial Penggunaan Energi Alternatif Tenaga Surya Tehadap Gaya Hidup Masyarakat desa Pusu, NTT* (Social Impact of PV on Lifestyles in Pusu Village, NTT)
	11.40-12.00 – P19	**Armansyah Tambunan,** IPB: Renewable Energy Education in Indonesia
	12.00-12-20 – P20	**Brandon Courban,** Syndicatum Carbon Capital: CDM Experience in Renewable Energy Projects in Indonesia
	12.20-12.40	Panel Discussion 5: Lessons learned, what needs to be done All participants, moderator Lolo Panggabean
12.40-13.40	**Lunch**	
	13.40-14.40	**Group Discussion 1**: Institutional, Financial and Technological Aspects Facilitator: Prof. Harijono Djojodihardjo, Drs. Jon Respati, Mark Hayton Group Discussion Report: Prof. Herliyani Suharta
	13.40-14.40	**Group Discussion 2**: Social and Ecological Aspects Facilitator and Reporting: Lolo Panggabean
14.40-15.40	**Workshop Summary: Where we go from here**	
15.40-16.00	**Workshop Closing Session** **Completing & submitting questionnaire** **Collection of Workshop Certificates** **Networking, Free time**	

APPENDIX 2. WORKSHOP PARTICIPANTS

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APPENDIX 3. WORKSHOP PHOTOS

Figure 1. Workshop registration

Figure 2. Workshop opening by the e8, UNSW-ADRA/AusAID and STTNAS representatives

Figure 3. Session 1 Presentations and discussions: Dr. Sonny Keraf of DPR, Hilmi Panigoro of METI/IRES, Guy Marboeuf of EDF, and Budi Dharma Utama of NTT Government.

Figure 4. Session 2: Prabawa Eka Soesanta of Depdagri, Dr. Siswa Trihadi of Department of PDT, Ir. Kusetiadi Raharjo of Heksa Prakarsa Teknik Co, and Soedjono Respati of APSURYA.

Figure 5. Session 3: Mark Hayton of Entec, Dr. Claus Dauselt of e8 and RWE, Ir. Adjat Sudradjat MSc of B2TE/BPPT, Prof. Kamaruddin Abdullah of Darma Persada University.

Figure 6. Session 4: Prof. Sahat Pakpahan of LAPAN, Dr. Taufan Surana of BPPT, Takao Shiraisi of Kansai Electric, and Roy Hendroko of Bumimas Ekapersada Co.

Figure 7. Session 5: Dr. Maria Retnanestri of UNSW and STTNAS, Ratna Sudharsana of Womintra and Udayana University, Prof. Armansyah Tambunan of IPB, and Brandon Courban of SCC.

Figure 8. Group discussion activities.

Figure 9. Networking activities among participants.

Figure 10. People behind the stage: Dr. Claus Dauselt, Dr. Maria Retnanestri, Prof. Hugh Outhred, Dr. Maria Anityasari, Dr. Wayan Gede Ariastina, Ir. Tugino MT, Dian Figana, Muhammad Susilo Adiyanto.

APPENDIX 4. QUESTIONNAIRE RESULTS – PART I

WORKSHOP DESIGN & IMPLEMENTATION

1. Responses on Workshop Objectives

Workshop Objectives	Question and Response, Scale 1-5 (Low-High) How important is this objective?	Question and Response, Scale 1-5 (Low-High) How well has this objective been met (at this time)?
1). To learn from hands-on field experience in both stand-alone and grid-connected renewable energy projects in Indonesia	**4.3**	**3.9**
2). To review recent theoretical developments and policy trends in renewable energy project design and implementation at national, regional and global levels	**4.4**	**3.8**
3). To draw on these understandings for the purpose of refining and updating project design and implementation guidelines	**4.3**	**3.4**
4). To formulate strategy and policy recommendations for government and donors, including for the purpose of renewable energy training and education (via NGO, training bodies and universities)	**4.4**	**3.6**
5). To produce a report on past experience, lessons learned and revised project design and implementation guidelines.	**3.6**	**3.0**
6). To disseminate the outcomes of the workshop for the purposes of awareness raising and capacity building.	**4.3**	**3.7**

These responses from workshop participants indicate that participants thought that the workshop objectives were important and relevant and that they were being reasonably well met at the time of the workshop (noting that more needs to be done). It is interesting to note that Objective 5, to produce a report, was judged somewhat less important than the others. This may be because Objective 5 is a means to an end, rather than an end in itself.

2. Summary of responses to Question 2: What important objectives other than the above should a follow-up workshop have?

1) To hold a series of strategically designed focus group discussions, especially to follow-up key issues
2) To run decentralized workshops to better understand local issues
3) To formulate a clear strategy and method to communicate forum findings and conclusions both with the legislative and implementing branches

4) To involve and seek and input from PLN and government agencies
5) To identify the roles, commitment and strategy of each RE stakeholder to develop RE (including local government)
6) To submit authoritative recommendations on renewable energy policy to government, and exert political pressure on government in support of renewable energy
7) To evaluate pricing policies with respect to the cost structure of each renewable energy technology
8) To evaluate each renewable energy project implementation, separated into large-scale and small-scale categories, and how each technology should be implemented
9) To understand the state of the art of each technology and players in each technology
10) To demonstrate a "success story" for renewable energy in Indonesia for the purposes of replication and up-scaling
11) To establish a small group with interests in CDM projects to continue discussion by electronic and other means on how to promote renewable energy projects.

3. Summary of responses to Question 3: How could the designs of a follow-up workshop be improved compared to this one?

1) Some presentations showed considerable success at various levels in society but in my view a few more presentations should focus on high-level policy issues that really affect the ability of project developers to implement ideas. Consider:
   - Tariff issues, policies and long term plans
   - Contracting structures for long term Power Purchase Agreements
   - Biomass availability vs. implementation levels today and how to improve this. What are the issues and why are they not being tackled?
   - Subsidies are granted by way of tariff reductions to keep prices at what is perceived to be an acceptable electricity tariff for Indonesia. How does this compare in a global setting and is it realistic to maintain the contract for new capacity at a level that iscomparable to the subsidised electricity tariff (in relation to green energy and non-green energy)
   - Is Indonesia prepared to pay a premium in order to achieve its target of 17% green capacity by 2025?
2) Presentation slides should be in English even if the presentation is in Bahasa Indonesia. Presentation should focus not only on presenting data but also on identifying issues and overcoming barriers.
3) Distribute workshop papers and presentation slides prior to the workshop. Allow more time for group discussion especially when specific ideas arise. Disseminate the workshop outcomes and suggested improvements in specific fields by email
4) Invite end-users and other actors from the field, either as speakers or participants, to better understand the issues encountered in the field
5) The presence of PLN and ESDM is important. Participants from other sectors (industry, forestry, agriculture) are needed for the purpose of developing a multi-sectoral policy
6) Hold a separate workshop to discuss each technology (PV, wind, biofuel) in greater depth, involving people from government, industry and academia.
7) Organize workshops within government bodies (DEN, DJLPE etc.). Invite ESDM (Ministry of Mines and Energy) to make a presentation and participate in the workshop.

8) A follow-up workshop should focus on important issues arising from this workshop, for example: How to elevate DGEEU to become a ministry, Special workshop on Pricing Policy, Special Workshop on Biofuel or Micro Hydro, etc.

4. Summary of responses to Question 4: Would you like to speak at or otherwise contribute to a follow-up workshop in your field of expertise, or would you like to nominate others to do so?

1) Yes, willing to speak or contribute.
2) Invite speakers from financial institutions to discuss financing in RE projects from a commercial perspectives
3) Invite speakers from LIPI (eg Research Centre for Physics)

5. Summary of responses to Question 5: What other activities would be beneficial apart from a follow-up workshop?

1) The outcome of this workshop needs to be clear in its conclusions and it should define targets and plans to achieve the objectives that come out of this conference
2) Develop internet-based networking and on-line forums for follow-up discussion and communication
3) Map and document Indonesian renewable energy projects
4) Discuss the outcomes of this workshop with the government in order to encourage implementation of the workshop recommendations
5) Develop action plans that are less dependent on government policies
6) Run a workshop on bankable renewable energy projects
7) Field trip to successful and failed renewable energy projects
8) Create monitoring program activities
9) Conduct focus group discussions to follow up on key issues, including participants from industry, forestry and agriculture to give a more comprehensive, multi-sectoral assessment.

APPENDIX 5. QUESTIONNAIRE RESULTS – PART II

RENEWABLE ENERGY BARRIERS AND RECOMMENDED ACTIONS

Summary of participants' responses to questions about barriers to renewable energy in Indonesia and recommended response, based on survey forms submitted

1) What barriers to renewable energy and sustainable development in Indonesia are you aware of from your experience and/or expertise?

Institutional Aspects:

- Inconsistent and unclear regulations, disconnection between important renewable energy development activities (institutions, financial, technological, social, ecological).
- Failure to follow-through on renewable energy targets set in Perpres 5 / 2006 (National Energy Policy)[18]
- Lack of political will to support RE development
- Too much government intervention
- Lack of cooperation between PLN and specialist renewable energy companies to undertake renewable energy projects
- Use of a narrow technological approach rather than more holistic ones that consider community involvement, job creation and development of the local economy

Financial Aspects:

- Lack of access to funding sources.
- Electricity tariffs are too heavily subsidized
- Lack of macroeconomic understanding: RE projects always less profitable than fossil fuel projects when compared on micro-economic basis
- Government has planned to avoid giving a 100% subsidy and instead plans to provide partial subsidies combined with a credit scheme or CDM scheme. However cooperation with funding institutions is not yet in place.
- Yearly budgeting by government makes it difficult to take a holistic approach despite continued effort by government to promote RE
- For biomass to energy conversion, instability of the feedstock price is the biggest issue that scares away the investors. There is enough for at least 30,000MW capacity and only 400MW seems to have been implemented so far. It should be clear enough that something is wrong and needs to be fixed.

Technological Aspects:

- The RE technology implemented in some locations was not designed to be suitable for the available local primary resources

[18] *Peraturan Presiden* (Presidential Decree) 5/2006 about National Energy Policy: http://www.dim.esdm.go.id/kepmen_pp_uu/perpres%20no5%20tahun%202006.pdf

Social Aspects:

- The RE technology implemented in some locations was not suited to local community requirements

2) What general recommendations would you have for renewable energy and sustainable development in Indonesia from your experience and/or expertise?

- National energy policy should be comprehensive and address long-term sustainability as well as urgent needs. National energy systems should be progressively established: Infrastructure, Technology, Organization, Legal Aspects, Commercialization, Balanced-multi resources (human capital, formal and public education)
- Indonesia has a huge RE potential to improve its electrification ratio both for urban and rural electrification, on-grid and off-grid. On-grid context: Feed-in-tariff is an option. Off-grid context: It is difficult to reach all Indonesians by extending the electricity grid. Renewable energy should be integrated into government electricity supply strategy for un-electrified areas by: 1) Defining clear link between renewable energy and rural electrification, and clear rules and regulation for RE integration, 2) Change electricity institutional framework by creating a specific body, for instance local/private operators, to promote and follow-up rural electrification. This way, the task of improving national electrification ratio would be shared between national utility (PLN) and local private operators, 3) Reduce PLN monopoly in the electricity industry.
- Have an open mind, clear vision and think outside the box. The opportunities are simply enormous in almost any segment of green energy available today! With political will and positive mind set the sky will be the limit and the long term energy rates for EVERYBODY in Indonesia will be very acceptable whilst at the same time the dependability on the rest of the world will be minimized as all internal resources will be utilized to the maximum potential.
- Identify the shortcomings in governance system and improve. All stakeholders share responsibility in RE development. Central and regional government institutions need input and active participation by all stakeholders for that purpose. Stakeholders should meet and clarify and negotiate their roles rather than blame each other. Promote the Public-Private Partnership model for RE implementation more widely.
- Listen to each other's problems and resolve the issues together. Consider the developers and Independent Power Producers as partners. The same is true for the IPP's and Developers, they should consider the government and the PLN as their long-term partners and not as tough guys that make life difficult.
- Improve coordination among stakeholders (central and regional governments, industry, and academia). Develop an effective dialogue/communication between PLN, ESDM and other actors such as private companies.
- Move from an energy focus to a multi-sectoral approach. Use a needs-based approach rather than a renewable energy project based approach. Better integrate the economic, ecological and societal considerations in policy, design and implementation of development program, and engage all development actors. Replace the project-centred approach with a community-centred approach focusing on job creation and local economic development.

- Develop regulations that encourage greater private sector involvement. Go purely commercial to reduce dependency on government policy, including both project implementation and information dissemination
- Increase the level of government commitment to RE development. Establish a new institution with a high commitment to RE. Community group to act as a pressure group to improve political will.
- Undertake capacity building for government and private institutions.

Financial Aspects:
- Provide input to government to develop appropriate pricing policy (society seen as shareholders, long-term objectives, investment for developing RE technology, consider single-year budgets to be part of a multiyear budgeting strategy)
- Do not depend on or wait for foreign assistance, be resourceful and capitalize on national potential and capabilities.
- Increase electricity tariffs by reducing government subsidies
- Provide appropriate incentives to spur commercial development of RE
- Establish a specific fund to subsidize investment in RE. Define clear rules and regulations to make RE projects bankable while keeping electricity affordable to end-users
- Stop the current practice of implementing discrete and ad hoc electricity projects, each sponsored and managed by a different body without coordination and prone to discontinuation or failure before reaching the end of its technical life. This practice is unsustainable and wastes money.

Technological Aspects:
- Strengthen domestic manufacturing of RE technology
- Increase technology transfer activities to strengthen local and small RE enterprises
- Decentralize equipment manufacturing to regional areas in association with a comprehensive training program
- Identify RE technologies that will be appropriate in different locations, for both electricity generation and direct end-use
- Standardize RE technology
- Expand PLN grid to prospective renewable energy project areas

Social Aspects:
- Improve community awareness about RE
- Always include social issues in feasibility studies for renewable energy projects

Ecological/Resources Aspects:
- Don’t allow all resources to fall into the hands of Multi-national Corporations. Use RE resources for national development.

APPENDIX 6. OUTCOMES OF WORKSHOP DISCUSSION GROUPS

Workgroup 1: Institutional, Financial and Technological Aspects

Online: http://www.ceem.unsw.edu.au/content/userDocs/GroupDiscussion1Report.pdf

- Clarify the link between the technology and education in rural electrification
- What is the relation between the people's will and the institutional will?
- Is there freedom in choosing energy resources?
- Continue efforts to raise the electrification ratio
- How to implement BPPEN, and coordinate and monitor projects?
- Who could pursue all of these objectives?
- In case of geothermal energy, policy input should be at a higher level(minimum Dirjen)
- Missing technical concept in low level
- Funding should be delivered directly to the implementation level without any middle man
- Need to deploy the central budget
- Develop a clear mechanism (who should do what) for better coordination
- Establish a wind map for Indonesia in order to promote wind energy development
- Local governments don't know what to do in the long term, need appropriate instruments
- BPPEN does not have an elaborated action plan, which needs to be prepared and disseminated
- Government needs to adopt successful mechanism from other countries and implement them in a well-coordinated manner.
- Where to get initial capital?
- Describe/investigate the best available technology
- Deepen our understanding about how to design and implement renewable energy projects
- Each local government should develop their own renewable energy regulation
- Each stakeholder has a different approach – not enough coordination
- Rural people don't have enough capacity to pay; cross subsidy is required.
- DJLPE needs more input in term of mechanism, partners and financial institutions
- Need project warranty obligations to support a long-term perspective.
- An energy planning institute should be established in order to implement BPPEN
- Suggestion: Improve coordination between the various stakeholders for energy projects.

Workgroup 2: Social and Ecological Aspects

Online: http://www.ceem.unsw.edu.au/content/userDocs/GroupDiscussion2Report.pdf

IDENTIFIED ISSUES

- Target community is often not ready for the application of renewable energy (RE)
- The RE applications are mostly initiated by government and donors, rather than arising from the community's need
- The suitability of the RE projects to meet the need of the community is usually neglected
- The community usually has no ability to maintain or look after the RE projects

- The SHS can be expensive and performance depends on the weather
- Inability to pay for RE is often a problem
- There can be little awareness and no need for electricity

RECOMMENDATIONS

- To be successful, RE projects, particularly for biofuels, have to generate sustainable income for the community (for example, the use of sorgum is under investigation)
- RE projects, particularly PV for off-grid should be fully commercial (free market)
  - Private sectors are able to trigger market, to perform intensive marketing
  - Create affordable and attractive packages of SHS (currently there is a package at Rp. 700.000)
  - Community should pay for the RE to engender a sense of belonging
- Indonesia should reconsider planning for electrification, to define those areas where grid will be built and those areas where it won't, so that private companies know which areas to target
- Consider stopping grid extensionand leaving the presently un-electrified areas to the supplied by RE
- Model RE pricing and develop a financial scheme for community to buy RE (Green Fund ala Grameen Bank)
- Develop an education program for remote community to create need for electricity
- Develop an electricity education program for remote communites to develop clear understanding among formal and informal community leaders
- Prepare clear documentation of RE technologies particularly for projects funded by grants or donations
- For top-down RE projects, government should refer to previous experience and not repeat the mistakes of the past.

APPENDIX 7. FUTURE EVENTS – A FOLLOW-ON WORKSHOP

Draft of the 22-23 July 2009 ITS Workshop Program

Renewable Energy and Sustainable Development in Indonesia[19]
Seminar, Workshop, and Exhibition 2009
Faculty of Industrial Technology ITS Surabaya[20]
Wednesday-Thursday, 22-23 July 2009

Day I Program – Wednesday, 22 July 2009

Time	Activity	Topic and Presenter	
07.00-08.00	Registration		EXHIBITION and DEMONSTRATION
08.00-08.30	Opening	- Organizing Committee Dean of FTI ITS - Main Sponsor - Opening Address by Rector ITS	
08.30–09.30	Plenary Session I	- Sustainable Development and the Global Movement in Renewable Energy (Claus Dauselt - e8) - National Energy Policy and Direction (ESDM) - Discussion	
09.30-10.00	Tea/Coffee Break		
10.00-11.30	Plenary Session 2	- Dewan Energi Nasional (DEN) – Its Expected Role to Solve Energy Crisis in Indonesia (Dr. Mukhtasor - DEN) - Future Role of PV in Indonesia (PT. Sundaya) - Potential and Implementation of Micro Hydro in Indonesia (PT. Citrakaton Dwitama) - Discussion	
11.30-12.30	Plenary Session 3	- Sustainability of Technologies in Renewable Energy (Prof.Hugh Outhred – UNSW) - Institutional, Financial, Technological, Social, and Ecological Impedements of Renewable Energy in Indonesia - A Report from Jakarta Workshop (Dr. Maria Retnanestri – UNSW) - Discussion	
12.30-13.30	Lunch		
13.30-15.30	Parallel Sessions	Paper Presentation	
15.30-15.45	Tea/Coffee Break		
15.45-17.45	Parallel Sessions	Paper Presentation	

[19] Online: http://www.fti.its.ac.id/SNI2009/main.html
[20] ITS: Institut Teknologi Sepuluh Nopember, www.fti.its.ac.id

Day II Program – Thursday, 23 July 2009

Time	Activity	Topic and Presenter	
07.30-09.30	Parallel Sessions	Paper Presentation	EXHIBITION and DEMONSTRATION
09.30-10.00	Tea/Coffee Break		
10.00-11.30	Workshop – Plenary 1	Dr. Maria Retnanestri - UNSW **Methodology for Developing a Plan to Enhance the Sustainability of Renewable Energy Service Delivery in Indonesia** (Presentation and discussion)	
11.30-12.00	Workshop – Parallel Group Introductions	Participants break into mixed groups of between 5-10 people drawn from the following categories: - Research Institutions (eg. BBPT, LIPI, LAPAN, UNSW, ...) - Educational Providers (eg. ITS, UNSW, IPB, Udayana, …) - Industries and utilities (eg. PLN, Sundaya, PT Citrakaton, Heksa Prakarsa Teknik) - Society and NGOs (eg. e8, Womintra, YBUL, …) - Government – Local and National Level (Parliament member, Bappenas, Ministry of Home Affair, NTT Bapeda, NTB Bapeda, …) - Donors and International Organizations (e8, AusAID, ...) Introductions and initial discussion	
12.00-13.00	Lunch		
13.00-14.30	Workshop – Parallel Group Discussion 1	Each group explore the following topics and summarise findings and recommendations: 1. Evaluation of Current Role, Activities, and Performance of each Stakeholder 2. Identification of Future and Ideal Roles of each Stakeholder to enhance the Sustainability of Renewable Energy Service Delivery in Indonesia 3. Development of a Strategic and Operational Collaboration Plan for All Stakeholders	
14.30-15.30	Workshop – Plenary 2	Presentations of initial proposals by a representative of each stakeholder group	
15.30-16.00	Tea/Coffee Break		
16.00-17.00	Workshop – Parallel Group Discussion 2	Refinement of proposals for submission to the workshop steering committee	
17.00-17.30	Closing (Steering Committee)	- Workshop summary and outcomes – Future Plan - Closing Address by Rector of ITS - Collection of Certificate	
17.30-18.00	Press Conference		