



# Annual Report 2014

## Promotion of Least Cost Renewables in Indonesia (LCORE-INDO)



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# Foreword

As a developing country, Indonesia has demonstrated leadership in combating climate change. It has set itself an ambitious target of reducing its own greenhouse gas (GHG) emissions by 26 percent in 2020 and consequently increase renewable energy share in its energy mix by 23 percent in 2025. The government's strong commitment led to the establishment of the Directorate General of New, Renewable Energy and Energy Conservation (DG NREEC) in 2010 that was tasked to formulate and implement policies and technical standardization governing the sector.

As the cost of Indonesia's transition to low carbon economy is massive, private sector involvement is crucial if the ambitious target is to be met. Increasing their participation by providing examples of commercially viable pilot projects in renewable energy has been one of the main reasons that the project "Promotion of Least Cost Renewables in Indonesia" (LCORE-INDO) was initiated. Its implementation which is jointly conducted together with DG NREEC, has supported clean energy initiatives that may lead to similar replication projects across Indonesia.

Setting the right policy is key in attracting private sector investment in the renewable energy field. One important milestone achieved from the collaboration between LCORE-INDO and DG NREEC in the year 2014 is the new bioenergy feed-in tariff which have been greatly welcomed by project developers. This game-changing policy is expected to spur the development of bioenergy projects in Indonesia by rendering many previously unfeasible projects, economically attractive.

LCORE-INDO project has worked with all important stakeholders in the public and private sectors. It has provided support in improving Indonesia's regulatory framework condition in renewable energy sector, published studies assessing Indonesia's true renewable energy potential, delivered important capacity building to relevant stakeholders, and most importantly, initiated innovative pilot projects in different application areas to show that renewable energies can be the least-cost options to solve Indonesia's pressing energy issues.

This Annual Report reflects the excellent works that have been achieved by LCORE-INDO and DG NREEC in the year of 2014. The broad variety of our activities as documented in this Annual Report could not have been realised without a dedicated team, excellent trust and cooperation from our counterpart and private companies and all who have worked closely together with us in the past year.

Thank you very much.

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## Abbreviations

<b>CAPEX</b>	capital expenditure
<b>COD</b>	Commercial Operation Date
<b>CPO</b>	crude palm oil
<b>DG NREEC</b>	Directorate General for New and Renewable Energy and Energy Conservation
<b>EFB</b>	empty fruit bunches (palm oil waste)
<b>FFB</b>	fresh fruit bunches
<b>FGD</b>	focus group discussion
<b>FiT</b>	feed-in tariff
<b>FORCLIME</b>	Forest and Climate Change Programme
<b>GE-LAMA-I</b>	Green Economy and Locally Appropriate Mitigation in Indonesia
<b>GHG</b>	greenhouse gas emission
<b>GIZ</b>	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
<b>GoI</b>	Government of Indonesia
<b>GWh</b>	gigawatt hours
<b>IDR</b>	Indonesian rupiah
<b>IPP</b>	independent power producer
<b>kWh</b>	kilowatt hours
<b>LCOE</b>	levelized cost of electricity
<b>LCORE-INDO</b>	Promotion of Least Cost Renewables in Indonesia
<b>M&amp;E</b>	monitoring and evaluation
<b>MEMR (ESDM)</b>	Indonesian Ministry of Energy and Mineral Resources
<b>NAMAS</b>	Nationally Appropriate Mitigation Actions
<b>MOU</b>	Memorandum of Understanding
<b>MRV</b>	monitoring, reporting and verification
<b>MWh</b>	megawatt hours
<b>DG NREEC</b>	Directorate General for New and Renewable Energy and Energy Conservation
<b>OPEX</b>	operational expenditure
<b>ORM</b>	operation, repair and maintenance
<b>PHI</b>	Passivhaus Institut
<b>PLN</b>	Perusahaan Listrik Negara (state-owned electricity company)
<b>POM</b>	palm oil mill
<b>POME</b>	palm oil mill effluent
<b>PPA</b>	power purchase agreement
<b>PV</b>	photovoltaics
<b>RE</b>	renewable energy
<b>RED</b>	Regional Economic Development (a GIZ project)
<b>TWh</b>	Terrawatt Hours





## Executive Summary

This annual report describes the activities of LCORE-INDO in 2014 which encompass studies, pilot projects, capacity building, action plan and best practice guidelines as well as monitoring and verification. These five activities are conducted within the three main application areas of the project namely, waste to energy, diesel substitution, and off-grid applications.

Two studies assessing the potential of grid-connected solar PV installations and electricity from biomass were completed during the year. The true potential is revealed by taking into account resource distribution as well as electricity grid capability and availability. A third study on grid-impact of renewable energy is currently underway which assists the state-electricity company in defining technical and operational guidelines.

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On-going innovative pilot projects are further consolidated. These many 'firsts' for Indonesia are expected to provide showcases to enable project replication by private sectors in Indonesia

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On-going pilot projects are further consolidated. In the bioenergy sector, an innovative approach to optimise the yield of a biogas plant is progressing with on-site assessment in Belitung completed and further tests to be finalized in the beginning of this year. A waste heat recovery project from biogas engines in a tapioca starch factory in Lampung is set to be implemented in the second quarter of 2015 following completed technical assessment and confirmed investment commitment. In the PV sector, the annual report details a pioneering project in Indonesia which combines both a PV grid-connected net metering scheme and a Passive House standard in a single building in Jakarta. In addition, an on-going viability check of a planned PV hybrid system at an eco-resort in Papua is about to deliver its results in the first quarter of 2015. Meanwhile, cooperation with a research institute in Germany quantified the technical and economic potential of solar-driven ice making machine with an example from Maluku Province.

In the area of capacity building, LCORE-INDO continuously improved capacities of relevant stakeholders in renewable energy. 2014 has been a busy year with more than 20 events took place. Five study trips were completed during the year including three in Germany with participation from the counter partner DG NREEC. Collaboration with other GIZ projects were also intensified resulting in opportunities to share knowledge with the "Regional Economic Development (RED)", "Project Development Program (PEP)" and "Green Economy and Locally Appropriate Mitigation in Indonesia (GE-LAMA-I)". Two focus group discussion on financing of bioenergy projects were also organised during the year to address such important barrier facing project developers in Indonesia.

Under the action plan and best practice guidelines, the report described LCORE-INDO assistance in the revision of the bioenergy feed-in tariff and the ongoing work in updating the guidelines for bioenergy project developers following the new bioenergy feed-in tariff regulation. A mapping study on palm oil mills in East Kalimantan was completed to assist the provincial in achieving their climate change mitigation goals through biogas-based electricity. Finally, a monitoring, reporting and verification (MRV) scheme for tracking the implementation of renewable energy projects has been developed. It will now be tested in collaboration with DG NREEEC and other involved ministries with the aim to quantify their contribution to climate change mitigation efforts.



## Objectives, Indicators and Application Areas

In cooperation with the Directorate General for New and Renewable Energy and Energy Conservation (DG NREEC), the project supports the development and implementation of new and best practice approaches to harness Indonesia's renewable energy potential on a least-cost basis. LCORE-INDO project is funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

### Objectives

LCORE-INDO objective is to enable DG-NREEC to develop practical policies and to promote programs for effective support of renewable energy implementations and to contribute substantially to the national climate strategy including Nationally Appropriate Mitigation Actions (NAMAs).

### Activities and Indicators

Specific measurable indicators are set and relate to each of the five project activities and proof the success of their ongoing implementation:

Activity	Indicator
Studies	Studies in 3 Main Implementation Areas deliver realistic technical and economic RE potential including CO2 saving potential
Pilot Projects / Case Studies	Pilot projects/ case studies in all 3 Main Implementation Areas demonstrate feasibility and business models
Information & Capacity Building	Capacity building measures inform key stakeholders about business models of pilot projects and case studies
Action Plans & Best Practice Guidelines	Action plans and best practice guidelines are jointly developed with public and private stakeholders
Monitoring and Evaluation	Monitoring and Evaluation at NREEC is established and a contribute in developing a MRV scheme

### Application areas

In line with the project objectives, LCORE-INDO identified three main application areas as particularly promising for the optimized cost-benefit promotion of renewable energy in Indonesia.

Application area	Description
Waste to energy	Utilization of biomass waste from the agricultural industry for power generation
Diesel substitution	Substitution of diesel fuel through grid-connected renewable energy power plants
Off-grid applications	New applications in off-grid renewable energy supply

# 1 Studies on RE potentials

**Chapter Outline** *This chapter describes the studies that were completed in the year of 2014 in the three main application areas*

## 1.1 PLN Grid Impact Study

The state-owned company PT. Perusahaan Listrik Negara (PLN) and LCORE-INDO have signed a cooperation agreement to intensify the ongoing cooperation on grid-connected renewable energy systems. An intended grid-impact study will investigate the technical and economic potentials and limitations for high-penetration of variable renewable energy sources (vRE). The study will be conducted on the grids of Bangka and Kupang and will help PLN to consequently define technical and operational guidelines for RE integration.

Whereas grid-interconnection studies on larger distribution grids with low vRE penetration level will be a showcase on grid-connection and extension requirements, high-penetration scenarios will show the impact on grid stability issues including generator control management to ensure a reliable power supply with increasing share of renewable energies. Both scenarios will show - besides the technical potential and requirements – an economic potential due to reduced local electricity generation costs.

In specific, the grid-impact study will cover areas such as load-flow and system loss analysis, bottlenecks investigation and grid expansion requirements, impacts of short time storages, short circuit scenarios, generation costs and diesel fuel reduction analysis, etc. The study is expected to be finalised by mid of 2015.



*The PLN grid in Bangka is one of two locations where the grid-impact study is set to be undertaken*

## 1.2 Biomass Potential Study

In April 2014, LCORE-INDO published a new study entitled “Overview of the Waste-to-Energy Potential for Grid-connected Electricity Generation (Solid Biomass & Biogas) in Indonesia”. The study serves as an overview of all studies related to biomass-biogas potential in Indonesia supplemented with in-house calculation on the technical potential based on latest available data from reliable sources. The study however only focuses on palm oil, rice paddy and sugar cane as they count for 80% of all residues in the Indonesian agro industry (palm oil crops with 100 mio tons per year are the most dominant followed by rice paddies with 69 mio tons and sugar cane with 30 mio tons per year). The three commodities have a combined theoretical power generation potential of total 328 TWh annually or equivalent with a power capacity of 46 GWe.

Having narrowed down the commodities, in the second step the study takes into account the availability of regional utility grid. This regional filtering show that the majority of agro businesses are distributed along the Sumatra-Java-Bali grid where grid-connection of potential power plants is easier to achieve. If all the wastes are utilised for power generation, this results in technical potential of electricity production at **43 TWh (6 GWe)** in total with CO<sub>2</sub> saving potential of approximately **39 mio tCO<sub>2</sub>e per year**. Such figure would fully cover all expected greenhouse gas (GHG) emission reduction targets in the energy and transport sector according to the national climate change action plan.

*Figure 1: Main biomass concentration and grid availability*



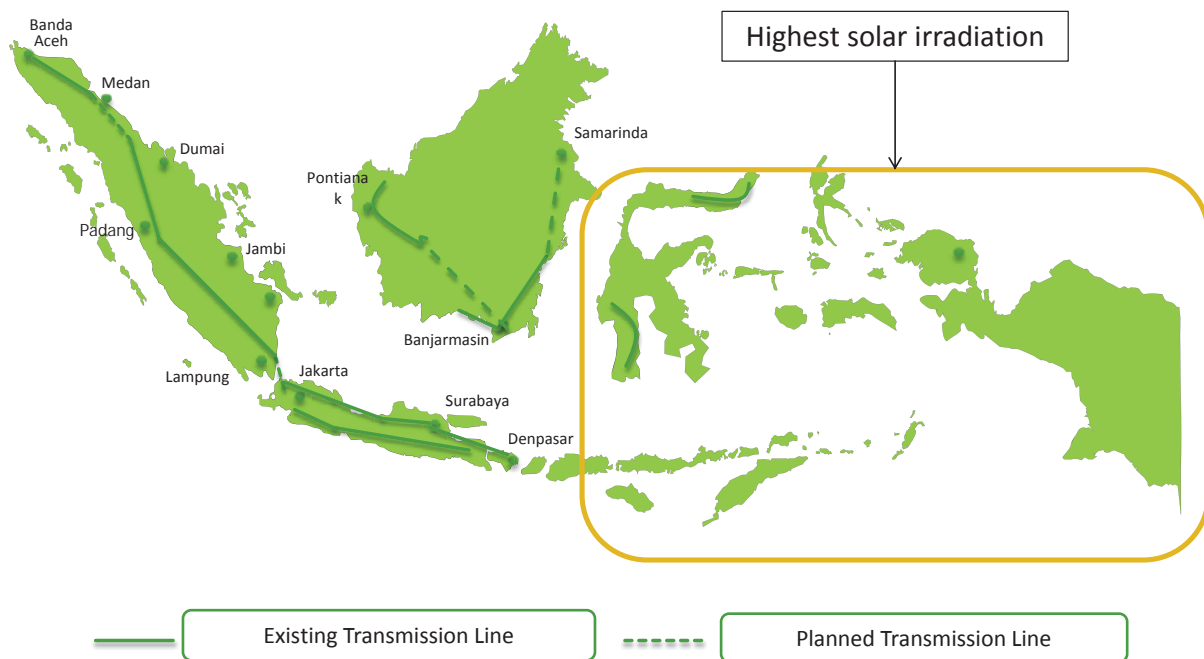
Source: GIZ 2014

### 1.3 Solar PV Potential Study

In November 2014, a study entitled “Potential Analysis for Grid-Connected Photovoltaic (PV) Systems in Indonesia” was published. This study focuses on how grid-connected solar energy can replace the current diesel generators in Indonesia's electricity energy supply. Especially in eastern part of Indonesia, power supply is mainly based on small decentralised diesel grids due to the archipelagic situation. The general baseline for technically reliable grid-penetration for PV systems was assumed to be 20% of the daily minimum load since this is the technically viable threshold. Generation costs of PV electricity is in the range of IDR 1500 up to per kWh, depending on the accessibility of the site. PLN production costs for diesel-powered electricity starts at a minimum of 2500 IDR / kWh.

It has been shown that even under this simplifying condition of only 20% grid penetration by PV, the technical potential stands at 4 GWp. This would result in diesel fuel reduction of 4.8 billion litres per year and would save around USD 4 billion for PLN as pff taker or investor of solar energy. Under these assumptions, the total GHG-emission reduction by 2020 accumulates to 13 MtCO<sub>2</sub>.

*Figure 2: Solar irradiation potential and grid availability*



Source: GIZ 2014



## 2 Pilot Projects

**Chapter Outline** This chapter provides description of new and on-going pilot projects with its various private sector partners. They are categorised according to the three main application areas: Waste-to-energy, Diesel Substitution, and Off-Grid application

### 2.1. Fossil Fuel Saving and CO<sub>2</sub> Emission Reduction at a Tapioca Starch Plant in Lampung



Coal-powered drying unit at the tapioca starch plant of PT. SPM

Tapioca Starch production is an agro-industry that is still not yet energy self-sufficient. With their high demand for coal or diesel oil for tapioca starch drying process, there exists a huge potential for substituting fossil fuels with renewables. One potential that is often overlooked is waste heat recovery.

LCORE-INDO is currently assisting one of its cooperation partners, PT. Sinar Pematang Mulia which owns a tapioca starch plant in implementing a waste heat recovery project. The project aims to reutilise waste heat in the form of exhaust gas from its biogas engines for the starch drying process. Under an optimum operation, about 20% of the exhaust gas can be recovered. A higher coal saving can be further achieved by reutilizing excess biogas from the biogas plant. These will reduce the current coal consumption for tapioca starch drying by half and save 12,500 tons of CO<sub>2</sub> equivalent annually.

Another option is to produce more electricity from excess biogas and supply it to PLN grid via 'Excess Power Scheme'. SPM will investigate further about these two options for their next on-site implementation.

LCORE-INDO has put SPM into contact with a prominent exhaust gas heat exchanger manufacturer from Germany and the project is set for implementation in early 2015.

Consultant	Task	Output
Chris Kwintkiewicz, ANNIES Export NZ Ltd. (New Zealand)	Initial energy audit	SPM Lampung Coal Saving and Power Generation Options ( <i>internal document</i> )

## 2.2 POME Biogas Optimisation Project in Belitung



*Waste water test sampling measurement*

LCORE-INDO is currently providing technical assistance to its cooperation partner, PT. Austindo Aufwind New Energy (PT. AANE) in optimising their bio-digester for increased power generation. The approach is to analyse the micro nutrients compositions of the bio-digester in order to determine suitable nutrients mixture for improved biogas yield.

A biogas expert from Germany, has been assigned as international consultant for this project. He visited the Belitung plant in early November together with representatives from GIZ and NREEC and conducted several measurements to assess the micronutrient status of the biogas plant. The on-site assessment confirmed prior laboratory test in Germany that the bio-digester suffers from significant lack of cobalt, nickel, molybdenum and phosphor. The consultant will further conduct laboratory test in Germany and to suggest the appropriate micro-nutrient mixture for further on-site testing in early 2015. The biogas yield may increase 20% if suitable nutrients are identified and added into the bio-digester.



*Dr. Friedmann discusses with the Operation Manager of the AANE biogas plant*

This is the first biogas optimisation project in Indonesia and LCORE-INDO hopes to replicate this lighthouse project in other bio-digester plants nationwide.

Consultant	Task	Output
Dr. Hans Friedmann, Independent Consultant (Germany)	On-site assesment and lab tests	Biological Optimisation Strategy at AANE Belitung Biogas ( <i>expected mid 2015</i> )

## 2.3 Biogas / POME Sludge Pelletizing Project in Bangka

LCORE-INDO investigated possible utilisation of POME in this typical 60 t/hr mill located in Tempilang, Bangka owned by a cooperation partner, PT. Kencana Agri. The company is in the midst of replacing their 2 boilers and 5MWe power plant with a new 15MWe power plant went into operation in the last quarter of 2014. As one of the first Independent Power Producer (IPPs) in Indonesia, the company is looking to further increase their power supply capabilities.

At the onset of the project, LCORE-INDO was looking at pelletizing the POME sludge by extraction and drying process in order to get pelletized boiler fuel with high calorific value. The company has received a quotation on the engineering cost for pelletizing the sludge from a German technology provider. At the same time, the company was also considering building a biogas plant as classic route in utilising the POME although under the prevailing current tariff, it was not economically attractive at the time. Nevertheless, the company also received a quotation for a biogas unit, also from a German company.

The sludge pelletizing project would have been a first in Indonesia but compare to a biogas project, further testings and processing of the POME needed to be taken before the feasibility of the project can be determined. With the newly revised bioenergy feed-in-tariff launched by the government in end of 2014 (up to 60% higher price offered compare to the old price specifically for Bangka and Belitung area), the company has decided instead to pursue the biogas option since under the new tariff, the project would be feasible and the company is already familiar with the technology. Installation of the new biogas plant is expected to take place in the second quarter of 2015.



*The open-lagoon POME at Kencana Agri palm oil mill*

Consultant	Task	Output
Chris Kwintkiewicz, ANNIES Export NZ Ltd. (New Zealand)	Pre-feasibility study	AQUEX POME drying report ( <i>internal document</i> )

## 2.4 Solar PV rooftop Project and Passive House Standard in Alam Sutera



3D rendering of Makna School currently under construction in Alam Sutera, Jakarta

The construction of Makna school owned by Yayasan Dharma Bermakna (YDB) is currently underway in Alam Sutera, Jakarta. The school which aims to become Indonesia's first "net zero energy" building, will house a 500 kW grid-connected PV system on its rooftop which will produce electricity under a net metering scheme. LCOE-INDO has entered into an MOU agreement with YDB to support a reliable implementation of the PV system by defining the technical quality standard. A tender for the PV system has been completed and the winning bidder has been announced. Work on the PV system is set to commence in March 2015 with the first solar kWh is expected to be produced in May 2015.

In addition to providing support in the tender process, LCOE-INDO also supports the project owner in getting the building certified under the "PassivHaus Darmstadt" standard which is the world's most rigorous and most advanced building performance standard. The certification scheme will be done under a PPP agreement as a showcase of high quality energy efficiency in real-estate development. At present, the certifier have checked all thermal bridging details following the completion of façade installation in end of 2014. Relevant documents will be submitted in January 2015 to the Passivhaus Institute (PHI) in Darmstadt, Germany which issues the label for revision and control. Further construction documentation and pressure tests are expected to be completed within the first quarter 2015. This is the first building construction project in Indonesia which combines both PV grid-connected net metering scheme and Passive House standard certification in a single structure, making it an exemplary showcase for other real estate developers.

Consultant	Task	Output
Dr. Matthias Eichelbröner, E-Quadrat HmbH (Germany)	PV Technical Specification	Passivhaus certification document ( <i>expected</i> )
Umowlai (Australia) / Passivhaus Institut Darmstadt (Germany)	Documentation, testing and certification	



## 2.5 Solar PV-driven Ice Making in Maluku

The fishery sector holds high potential for diesel substitution. Inadequate energy supply and lack of ice production and cooling facilities has resulted in the poor quality of fish catches in Indonesia, often affecting both local and export markets. In remote areas in the eastern part of Indonesia, lack of power supply and high energy production costs using diesel generators make renewable energies already competitive to conventional energy production. PV applications as new and innovative systems could be beneficial to increase catch value by improved ice supply.



*The ice-making workshop of PT. Harta Samudra*

With access provided by a local foundation called Masyarakat dan Perikanan Indonesia (MDPI), LCORE-INDO assessed eight different ice making workshops and fishermen communities to seek for a suitable site and partner for a pilot project. PT. Harta Samudra in Nuru island, Maluku was in the end selected since its energy supply from the grid is particularly unreliable which forced them to spend more on diesel fuel compare to other factories.

Together with the management of PT. Harta Samudra and the Institut fuer Luft- und Kaeltetechnik (ILK) in Dresden, Germany, LCORE-INDO supported research for a solar PV-driven ice-making machine to investigate its technical and financial feasibility. The research was done on a scientific level and delivered a detailed simulation model to investigate energy saving and renewable energy potential, adaptable to unique environmental and economic conditions.

Based on measurements conducted by a local consultant, ILK Dresden developed a detailed simulation model of the ice making progress. The observed scenario of 1 ton block ice per day showed high energy saving potential up to 30% by adjusting the refrigeration unit and additional 10% using reduced block ice cross section. As smaller ice machines in Indonesia are often self-made, this showcase promises high upscaling potential in regard to energy saving measures in the fishery sector.

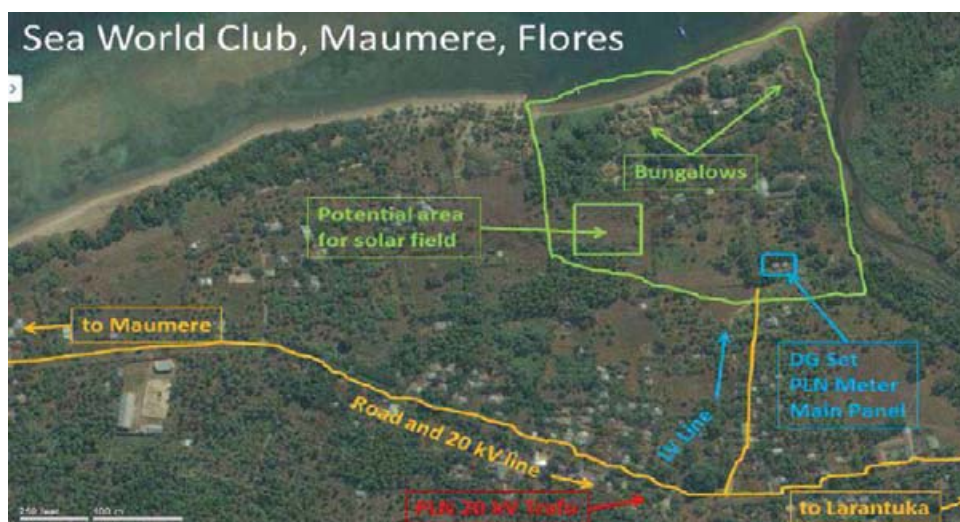
The study revealed that a 20 kWp off-grid system can ensure the annual block ice production with a solar fraction of 90% for a thermally optimized ice machine. During time of low solar irradiation, a backup generator will ensure reliable power supply. The resulting backup energy reduces to 10% of the diesel fuel usage under conventional driven systems. Especially in remote areas with 100% diesel fuel usage or the exploitation of new fishing grounds, a payback period of 5 years can be achieved. The project revealed a highly feasible potential for remote areas in Indonesia and would enable the local fishery sector to exploit new and existing catch areas efficiently. The work will be continued with interested partners and an implementation is expected in 2015.

Consultant	Task	Output
Institut für Luft - und Kaeltetechnik (Germany)	Ice machine and solar PV simulation	Comprehensive Concept of Photovoltaic-powered Block Ice Machines on Buru Island ( <i>internal document</i> )
AE Engineering (Indonesia)	Energy audit	Pulau Buru Ice Machine Measurements ( <i>internal document</i> )

## 2.6 Grid-Connected Solar PV Project in Maumere

The 100 kWp grid-connected Solar PV system at Sea World Club in Maumere, Flores, is a pilot project which LCOE-INDO pursued in 2012. The project initially aimed to sell the produced electricity from the PV plant through a power purchase agreement with PLN. However, in 2012 when the project was being developed, the feed-in tariff (FiT) regulation for solar energy was too low. Following negotiations between investor and PLN facilitated by GIZ, the pilot project was eventually halted as the price per kWh offered by PLN was too low for the project to be attractive for investors.

With the net-metering regulation for Solar PV systems recently enacted by PLN, LCOE-INDO intends to investigate another project implementation approach. First calculations on the economic feasibility under net-metering were conducted. The resort's annual energy demand of 150.000 kWh can be covered by installing 100 kWp Solar PV. Under the current PLN B-2 tariff, a payback of 9 years can be expected.



Site plan of Sea World Club, Maumere, Flores

LCOE-INDO will discuss the new approach with the local PLN and the project partner, including possible in-kind contribution from German technology providers who are interested to support this lighthouse project.

Consultant	Task	Output
Host Kruse, PT. Kaltimex Energy (Indonesia)	Business model formulation	Business Concept Sea World Club Maumere (public document)
PT. Guna Elektro (Indonesia)	Energy audit	Technical data survey and Energy Audit report (public document)

## 2.7 Solar PV Hybrid System at Misool Eco Resort in Raja Ampat



*The Misool Eco Resort in Raja Ampat, Papua*

Misool Eco Resort (MER) is an exclusive dive resort and conservation centre located in remote southern Raja Ampat archipelago of Papua in Indonesia. LCORE-INDO project has identified MER as a promising case to hybrid conventional diesel generator using photovoltaic technology. The project has initiated a cooperation agreement with the resort to identify possible technical specifications and investigate the financial feasibility.

Currently MER is depending on diesel generators for its electricity and want to replace the expensive and polluting fossil fuel - based electricity generation with clean and affordable renewable energy sources. Based on MER latest records, annually the resort uses up to 70,000 liter of diesel fuel with a total cost of USD 75,000 and consumes 240,000 kWh of electricity.

LCORE-INDO has assigned a team of local and international consultant to conduct an energy audit of the resort. The Energy Audit Report completed in end of 2014 will be used to generate a baseline needed to design the PV hybrid plant using available renewable energy sources for generating electricity. In the next step, the consultants will develop a business and economic model for third party investors. Results will be presented in the first quarter of 2015.

Consultant	Task	Output
Peter Konings, Asia Pacific Energy Group (APEG)	Energy audit	Misool Eco Resort Energy Audit and Energy Outlook I ( <i>internal document</i> )

## 3 Capacity Building

**Chapter Outline** *This chapter gives an overview of the various capacity building measures conducted by LCORE-INDO to different local and national stakeholders important to accelerate the development of renewable energy in Indonesia in the year of 2014.*

No.	Event	Date	Location
3.1	PUSDIKLAT Trainers Study Trip	15 December 2014	AANE Biogas plant, Belitung
3.2	Bioenergy Project Development Financing Roundtable	24 November 2014	Jakarta
3.3	Presentation at RED Resource Efficiency Workshop	20 November 2014	Senggigi, Lombok
3.4	German Business Delegation Field Trip to a Biogas Plant	20 -21 November 2014	Pekanbaru, Sumatra
3.5	Presentation at 12th Economix International Seminar	17 November 2014	University of Indonesia, Jakarta
3.6	German - Indonesian Business Forum on Indonesia's Bioenergy Potentials	17 November 2014	Jakarta
3.7	Presentation at Swiss German University	10 October 2014	Swiss German University, Jakarta
3.8	German Ambassador Visit to Adolina Palm Oil Mill	18 September 2014	Serdang, Sumatra
3.9	Presentation at PEP Seminar and Study Tour	11-12 September 2014	Berlin
3.10	RENAC Green Summer School and Study Tour	18 - 28 August 2014	Berlin and various cities in Germany
3.11	Solar PV Training for DG NREEC New Staffs	11 - 16 August 2014	DG NREEC Building, Jakarta
3.12	PT. Pembangkit Jawa Bali (PJB) Study Tour	16 - 17 June 2014	Baden-Württemberg state, Germany
3.13	Advanced Training in Solar PV	9 - 13 June 2014	PLN RE Academy, Makassar
3.14	Parallel seminars in PV and Bioenergy	6 June 2014	EBTKE ConEx 2014, Jakarta
3.15	Presentation at Ministry of Forestry and Environment Seminar	27 May 2014	Jakarta
3.16	UPLIFT Indonesia Awareness Forum	13 May 2014	Medan
3.17	Biomass Introduction Course	7 May 2014	DG NREEC Building, Jakarta
3.18	Masterplan Presentation for PLN REA development	2 May 2014	PLN RE Academy, Makassar
3.19	FGD on Capacity Building Needs of RE stakeholders	29-Apr-14	Jakarta
3.20	FGD on Barriers to Financing of Biogas Project	10-Apr-14	Jakarta
3.21	Advanced Training in Solar PV and Bioenergy	4 - 8 March 2014	Pusdiklat KEBTKE, Jakarta
3.22	Monitoring and Performance Control of PV Systems Workshop	5 February 2014	DG NREEC Building, Jakarta



### 3.1 PUSDIKLAT Trainers Study Trip

Within the context of further strengthening strategic training institutions in Indonesia in the field of renewable energy, LCORE-INDO accompanied a delegation of trainers from Pusdiklat KEBTKE to visit a biogas plant in the island of Belitung. The biogas plant which is owned by PT. Austindo Aufwind New Energy (AANE) is also the site of an on-going LCORE-INDO biogas optimisation pilot project which aims to increase the plant's generation capacity.

The delegation was welcomed by the plant's Operation Manager who gave a detailed briefing and tour of the biogas plant, explaining about the electricity production process from the palm oil mill effluent (POME) and the plant's general operation and maintenance. The delegation also learnt about the economics of the plant and the technical challenges posed by frequent PLN grid outages.

The study trip was found to be very useful for the trainers who intend to develop a training module on POME-based biogas power plant in 2015.



*The study trip to PT. AANE's biogas plant in Belitung island*

### 3.2 Bioenergy Project Development Financing Roundtable

The new bioenergy feed-in-tariff (FiT) which was issued through Ministerial Regulation No. 27/2014 is a marked improvement from the older FiT with the new tariff set at 10% to 60% higher depending on the project location. While this provides a solid starting point for potential project developers and investors who have interests in developing bioenergy power plant in Indonesia, there are still financial hurdles that need to be addressed to get potential projects get off the ground.

In light of this situation, DG NREEC in collaboration with LCORE-INDO organize a half-day roundtable discussion on the critical steps needed to secure project financing, considering successful stories in the context of bioenergy development in Germany and also experiences and perspectives from Indonesian financial institutions.

The discussion was attended by wide range of stakeholders which included private companies, project developers, financial/banking institutions, government representatives and development agencies that are working in the field of renewable energy especially bioenergy development. The discussion identified several challenges that would need to be addressed in order for potential projects to materialise and secure financing. These include the provision of grid infrastructure which is currently still under PLN's responsibility and also climate financing which must be increased and further elaborated in the bioenergy development as it could bridge potential projects to obtain commercial project financing.



*Diverse stakeholders as well as national and international expert speakers took part in the roundtable discussion*

### 3.3 Presentation at RED Resource Efficiency Workshop



In cooperation with the Regional Economic Development (RED) project of GIZ which runs a green tourism initiative in Lombok, LCORE-INDO contributed a presentation at a workshop on resource efficiency for stakeholders in the tourism industry. The presentation entitled “Solar Application in the Tourism Sector” was delivered in front of a packed audience of hotel and resort owners.



*RED Resource efficiency workshop for hotel and resort owners in Lombok*

The presentation demonstrated typical PV system configurations of an on and off-grid application for a hotel or resort and their associated economic feasibility under the prevailing macro-economic conditions. The presentation built up on RED project activities which focus on implementing energy, water and material efficiency. The idea was that once a hotel or resort operation runs efficiently, it is worth looking at investing in a PV system which will bring about further green credentials and at the same time provide reliable power supply during electricity outages which happens frequently in the Lombok area.

### 3.4 German Business Delegation Field Trip to a Biogas Plant



*German business delegation takes time to visit the Tandun biogas plant and discuss with the local staff*

A delegation of German companies traveling under the German Foreign Chamber (AHK) mission, took part in a two-day field trip to visit a biogas plant in Pekanbaru and meet representatives from the PLN regional office. The trip was organised by LCORE-INDO within the framework of Project Development Programme (PEP) Indonesia which is supported by the German Federal Ministry for Economic Affairs and Energy.

The delegation visited the Tandun Biogas Power Plant which was established under a joint-cooperation between PT. Perkebunan Nusantara V (PTPN V) and PT. Karya Mas Energy (KME) through a Build-Operate-Transfer (BOT) scheme. Its operation has allowed PTPN V to substitute costly diesel fuel but since it only provides 68% of the total energy demand, the company is looking into other alternatives to fully replace their diesel fuel consumption. To this end, PT. PTPN V plans to hold a BOT tender for new biogas power projects by early 2015.

A visit to PLN regional office in Pekanbaru took place on the following day. PLN representatives communicated their determination in increasing renewable energy shares in the province's power generation and highly welcomed new initiatives. A possible opportunity to jointly develop a renewable energy project in Natuna island was communicated and a delegation member requested a further meeting to discuss about possible cooperation.

### 3.5 Presentation at 12th Economix International Seminar

LCORE-INDO represented by Programme Director Dr. Rudolf Rauch was invited to speak at the 12th Economix International Seminar located at the University of Indonesia campus in Depok. The seminar aims to discuss, explain, and evaluate the prediction of the collapse of industrial civilization and how to prevent the predicted outcome. Dr. Rauch was specifically requested to speak on the topic of over-consumption of natural resources and how it affects Asian economy.

The topic was a perfect platform to highlight the world's over-reliance on finite fossil fuels and the need to limit their exploitation in order to honor the global commitment of keeping a maximum 2C of



temperature rise. Dr. Rauch stressed that renewable energies have the potentials to help the world's transition to low carbon economy which will prevent the worst effect of climate change.



*Dr. Rudolf Rauch speaks at the 12th Economix International Seminar at the University of Indonesia*

### 3.6 German – Indonesian Business Forum on Indonesia's Bioenergy Potentials



*Dr. Ir. Dadan Kusdiana, Director for Bioenergy Division of Directorate General of Renewable Energy and Energy Conservation posed with representatives of German institutions in Indonesia during a press conference (top) at the sideline of the German – Indonesia Business Forum (below)*

The “Innovative Technology to tap Indonesia’s Bioenergy Potential” business forum made possible with funding from The German Federal Ministry for Economic Affairs and Energy (BMWi), was successfully implemented by GIZ Renewable Energy Programme Indonesia/ASEAN of which LCOE-INDO is a part of and the German–Indonesia Chamber of Industry and Commerce (EKONID).

The forum facilitated business-to-business (B2B) partnerships between companies in Indonesia and Germany and provided a platform for knowledge and information exchange in order to tap Indonesia’s bioenergy potential. The forum which took place after the issuance of the new bioenergy feed-in tariff (MEMR regulation no. 27/2014), was meant to seize the positive momentum in the bioenergy sector as the revised feed-in tariff opens up new opportunities for international technology and service providers to partner with Indonesian companies to better serve the Indonesian bioenergy market.



### 3.7 Presentation at Swiss German University

The Swiss German University in Jakarta has developed a new major called Sustainable Energy and Environment under its Life Sciences faculty as part of their new focus on sustainability issues. The university had previously enlisted the help of GIZ Indonesia which has in turn placed an integrated expert from Germany to act as a lecturer and to further improve the curriculum.

Contributing to this goal, LCORE-INDO represented by RE Programme Director Dr. Rudolf Rauch gave a presentation to the first year students of the new major on the potential and technical solutions for waste to energy in the Indonesian agro industries. Specifically looking at the palm oil, wood, rice husk and tapioca starch industry, the presentation touched topics on the existing waste situation in these industries, the realistic potentials that can be converted into energy and electricity, and the available technologies. By also giving a brief overview on the experiences and current situations in Germany in similar field, the students are enlightened of the potentials and challenges in implementing waste to energy projects in Indonesia.

### 3.8 German Ambassador Visit to Adolina Palm Oil Mill



*The German Ambassador to Indonesia Dr. Georg Witschel (center) and GIZ Indonesia Country Director Mr. Ulrich Mohr (right behind) during their visit to the Adolina palm oil mill*

Dr. Georg Witschel, the German Ambassador to Indonesia visited a palm oil mill in Medan belonging to PT. PTPN IV to learn about the process of converting waste to energy, an area where Germany is actively helping Indonesia with. The visit was organised by LCORE-INDO based on request from the Germany Embassy in Jakarta. The access to the Adolina palm oil mill in Serdang was granted through the project developer PT. Bumi Raya Abadi which is an MOU partner of the LCORE-INDO project which also has an on-going cooperation with the state-owned plantation company.

The palm oil mill visit of the German Ambassador whose delegation also included representatives of German companies and institutions, was led by Mr. Bjoern Heidrich of PT. Bumi Raya Abadi who gave a tour of the plantation and an explanation on how to utilise waste from palm oil mills for electricity generation. Mr. Ulrich Mohr, the GIZ Country Director for Indonesia who was also part of the visiting delegation emphasised that waste-to-energy is a clear win-win situation of economical attractiveness and climate change mitigation.

### 3.9 Presentation at PEP Seminar and Study Tour

A seminar on “Bioenergy market potential in Indonesia” took place in Berlin under the framework of Project Development Indonesia (PDP-Indonesia) of the German Ministry of Economics. LCORE-INDO collaborated with PDP-Indonesia to make possible Mr. Zulfan Zul from DG NREEC to give an introduction on business opportunities under the new FiT regulation and for an Indonesian independent consultant talk about the status quo of the biogas sector in Indonesia at the event. Dr. Rudolf Rauch, GIZ RE Programme Director who was also a speaker, highlighted the different biomass potentials in Indonesia. Around 80 participants from German technology suppliers and project developers attended this one-day conference. Subsequently, the Indonesian speakers made a study tour to visit a nearby biomass cogeneration plant and an energy self-sufficient village. The networking reception after the PEP workshop led to a business relation between one of the German suppliers with a cooperation partner of LCORE-INDO.

### 3.10 RENAC Green Summer School and Study Tour



*Participants of RENAC Green Summer School in Berlin*

As part of the cooperation agreement between GIZ and NREEC on capacity building, two staffs from LCORE-INDO and 4 staffs from NREEC under the Directorate General of Bioenergy and Various Energy flew to Berlin in August 2014 to participate in the 5-day RENAC Green Summer School.

The summer school blends three weeks of trainings with various site visits, practical exercises plus international networking in Berlin. GIZ and NREEC opted to join the first week of training which was on the topic of renewable energy introduction.

Following the completion of the week-long course, the team took a custom-tailored study tour to several RE power plants in Germany in order to experience first-hand their operational stage. Some of the plants that were visited includes the solar park in Troisdorf, an organic food waste biogas plant in Alteno, and combined heat and power plant in Leppe.

Through the training and study tour, the group discovered that the share of power production from renewable energies has reached 30% of the national power production, despite Germany not having abundant biomass feedstock and strong solar irradiation as Indonesia. The group also learnt that a thorough technical and financial planning are keys for a successful RE power generation business scheme.



*Visit to Schradenbiogas plant in Alteno (left) and view of the combined heat and power (CHP) plant in Leppe*

### 3.11 Solar PV Training for DG NREEC New Staffs

DG NREEC and PLN have together already built more than 300 on-grid and off-grid solar power plants with varying scale across the Indonesian archipelago. Unfortunately, some of these plants are poorly designed and maintained due to lack of knowledge in the area of design, operation and maintenance of solar power plants.

With 18 new staffs joining the Directorate of Various Energy responsible for administering solar energy projects in early 2014, LCORE-INDO facilitated an intensive 5-day training on photovoltaics to provide the basic knowledge and give understanding of the core concepts necessary to work with solar energy applications. Enlisting an international expert in the field, the strategic training helped to bring the knowledge of the newly-hired staff to a level where they can contribute to DG NREEC in performing its role as both policy maker and project developer.



*Michael Wollny of Wollny Consulting posed with the training participants (left). The participants also observed a PV system located at the rooftop of Pusdiklat KEBTKE building (right).*



### 3.12 PT. Pembangkit Jawa Bali (PT. PJB) Study Tour

In further enhancing local capacity on grid-connected renewable energy systems, LCORE-INDO facilitated a study tour for PT. Pembangkit Jawa Bali (PJB) in Germany on 16-17 June 2014. Nine delegates from the management team of PT. PJB including the key decision maker on its renewable energy division took part in the study tour which was led by representatives of E.Quadrat, an international renewable energy consulting firm.



*The PJB participants at the PV power plant in Heidelberg (left) and at the municipal waste-to-energy incineration plant in Mannheim (right)*

The two-day study tour took the participants to see different renewable energy plants around the state of Baden-Württemberg. On the first day, they visited a wood-fired biomass power plant and a photovoltaic power plant in Heidelberg which were owned by the city municipality. The following day, they visited the municipal waste-to-energy and waste-wood to energy biomass power plant in Mannheim as well as a wind power plant in Framersheim.

### 3.13 Advanced Training on Solar PV



*The solar PV plant at Kodingraeng island*

Following participation at the Advanced Training on Solar PV and Bioenergy, PLN REA requested LCORE-INDO to provide similar training focusing solely on Solar PV for the company's training instructors. The knowledge is deemed to be crucial for the company's present and future development needs.

Taking place at the Renewable Academy of PLN in Makassar, the 5-days was attended by a total of 16 participants consisting of PLN instructors, would-be instructors and selected company executives. Conducted by an international expert in tandem with an experienced national trainer, the training focused on installation, operation and maintenance of off-grid PV Systems & PV Mini Grids.

The training which was designed to be hands-on included group exercise on designing a PV system and a site visit to a 400 kWp Solar PV plant in Kodingraeng island which was followed up with group presentations on detailed analysis, investigation, understanding of the installed systems and components of the Kodingraeng plant.



*Scene from the classroom at PLN Renewable Academy in Makassar (bottom left) and the site visit to inspect the PV system at Kodingraeng (bottom right)*

### 3.14 Parallel Seminars in PV and Bioenergy



*(left to right) Mr. Alihuddin Sitompul, Director of Various Energy at DG NREEC, Mr. Thomas Strobel of LCORE-INDO, Mr. Peter Konings of APEG and Mr. Todo Simarmata of Pusdiklat KEBTKE as speakers of the seminar*

LCORE-INDO organised two parallel seminars in Solar PV and Bioenergy at the sideline of EBTKE ConEx 2014. This annual event held at Jakarta Convention Center provides an opportunity for renewable energy stakeholders to discuss current government policies and to network with key players in the sector.

Fitting with the exhibition theme of "Time to Deliver Clean Energy for the Nation", the parallel seminars targeted broad range of relevant stakeholders and aimed to highlight important things to consider when building a biomass / biogas or a PV plant.

Led by respective bioenergy / PV international expert in tandem with a national expert, the one day seminars covered the full project development cycle and touched on basic design, performance analysis, operation and maintenance and gave examples of best practices. In total more than 250 participants consisting of project developers, consultants, investors, academics and bankers attended the two parallel seminars.



### 3.15 Presentation at Ministry of Forestry and Environment Seminar



*Dr. Rudolf Rauch talks about wood biomass technology at the Ministry of Forestry and Environment seminar*

On invitation from the Ministry of Forestry, LCORE-INDO represented by Dr. Rudolf Rauch contributed a presentation at a workshop on biomass-based renewable energy development which was organised together with the Forest and Climate Change Programme (FORCLIME) of GIZ Indonesia. The project aims to reform the Indonesian forestry sector through policy interventions, development of Forest Management Units (FMU) and green economy, sustainable forest management and capacity building.

During the seminar, Dr. Rauch delivered a presentation on wood biomass technology which highlighted among other the potentials to convert forestry waste into biomass and biofuels. Dr. Rauch also presented the idea of power-producing palm oil mills as they are also identified as important stakeholders in the sustainable management of forestry in Indonesia.

### 3.16 UPLIFT Indonesia Awareness Forum



*Scenes from the UPLIFT Indonesia Awareness Forum in Medan*



Global calls to reduce GHG emissions prompted the Indonesian government to develop several energy management programs but with lack of capacity to implement them. TÜV Nord Indonesia runs UPLIFT project which addresses the problem by up-scaling and developing local pools of well-trained and accredited energy professionals who can efficiently implement these programs in industries and enterprises through training offers in partnership with private training institutions and the academia.

LCORE-INDO was invited to speak at one of UPLIFT awareness campaigns taking place in Medan which was mostly attended by palm oil mill owners. Programme Director Dr. Rudolf Rauch which represented LCORE-INDO in this event, explained about the concept of power-producing palm oil mills (or power POM) which converts waste into electricity. The presentation also highlighted the then expected new bioenergy feed-in tariff which would make investing in power projects worth the time and money for palm oil mills, despite it lies outside their main core business.

### 3.17 Biomass Introduction Course



*Biomass Introduction course at DG NREEC*

LCORE-INDO enlisted ANNIES Export Ltd, a biomass consultancy firm from New Zealand to provide an introductory course on biomass to NREEC staff, especially those new recruits that are working under the Directorate General of Bioenergy. A total of 22 staffs participated in this training which gave an overview of the various biomass feedstock and available technologies.

Taking the knowledge further, LCOE-INDO will sponsor four NREEC staff to a 5-days renewable energy training in Berlin, Germany in August 2014 which will be followed up with a study tour to biogas and biomass plants.

### 3.18 Master Plan Presentation for PLN REA Development

Based on an agreement signed in 2013, LCOE-INDO assigned RENAC to develop a 'Master Plan 2014-2015 for the further development of PLN Renewable Energy Academy. The final draft of the Master Plan was submitted to PLN on the 14 of March 2014 and a presentation to the Board of PLN by GIZ and RENAC on the Masterplan took place in May at the PLN Corporate University headquarter in Jakarta.

The Masterplan focuses on developing the capacity of PLN Renewable Energy Academy in delivering training in the field of PV mini grids and grid-tied PV. It describes step-by-step plan on how build up the needed curriculum, human resources, and infrastructure (training facilities and equipments) in order to achieve the objective. Fast track option is also suggested in the Master Plan in order to quickly achieve concrete result within 12 to 16 months and shorter.

A more detailed technical and financial proposal for implementing the Master Plan was submitted by RENAC to PLN in June 2014. Follow up discussions on implementing the plan were ongoing in second half of 2014.

### 3.19 FGD on Capacity Building Needs of RE Stakeholders

In support of the launching of CapREG program in Indonesia which is implemented by Renewables Academy AG (RENAC) of Berlin, LCOE-INDO organised a Focus Group Discussion (FGD) with national stakeholders in Jakarta to discuss the specific needs for capacity building among the stakeholders in Indonesia that the program tries to address. The 3-year capacity building program, CapREG aims to strengthen skills and competencies of professionals working in the emerging renewable energy markets, not just in Indonesia but also in 5 other countries (Philippines, Vietnam, Thailand, Mexico, Ecuador and Peru).



*Working group during the focus group discussion*



*FGD participants pose at the end of the session*

The half-day FGD brought together diverse stakeholders such as project developers, financial institutions, governments and development agencies to agree on the specific capacity building measures that different stakeholders need in order for Indonesia to accelerate its renewable energy development. Inputs from the FGD has been used by RENAC for its first tailored training in Indonesia which took place in December 2014.

### 3.20 FGD on Barriers to Financing of Biogas Project

Palm oil mills in Indonesia only utilize solid waste e.g. palm kernel shell and fibers for boiler feedstock in production of Crude Palm Oil (CPO). Other wastes such as empty fruit bunch (EFB) and effluents are still left unused or minimally used for example in a composting process. Prior to the issuance of the new bioenergy feed-in tariff through Ministerial Regulation no. 27/2014, there were only two mills that had successfully implemented on-grid biogas power plant from POME under the old bioenergy feed-in tariff enacted in 2012. Project developers still foresee high risks, high investment cost and high difficulty in accessing project financing from banks to develop such projects.

An FGD on assessing barriers in the biogas power project development from financing and fiscal point a view was therefore organized by LCOE-INDO project in cooperation with GIZ Paklim program and Badan Kebijakan Fiskal / BKF (Fiscal Policy Agency) of Ministry of Finance. The event was attended by representatives of Ministry of Finance, Ministry of Energy and Mineral Resources, Ministry of Industry, Ministry of Environment, and palm oil association.





*The FGD session on barriers to financing biogas project*

During FGD, detailed challenges were elaborated by experienced project developers and were also confirmed through a presentation of barrier analysis study from interviews with key stakeholders. The FGD was closed with formulation of an action plan for BKF to further analyze and review feed-in-tariff scheme, standardise the Power Purchase Agreement (PPA), provide incentive for GHGs mitigation and financing facility for project development.

### 3.21 Advanced Training on Bioenergy and Solar PV



*Participants posed at the opening ceremony of the training in Ciracas*

The 2013 survey conducted by GIZ and Berlin-based training provider RENAC AG resulted in the shortlisting of four training institutions that were prioritised to receive capacity building due to their unique and strategic roles in the renewable energy sector in the country. The four identified institutions are: 1) PUSDIKLAT KEBTKE, 2) PLN Renewable Energy Academy (PLN REA), 3) Academy for Clean Energy and Sustainability (ACES) of Surya University, and 4) STT-PLN University.

As a follow up to the survey, an intensive training on grid-connected PV and Bioenergy was organised for these selected institutions. To this end, LCOE-INDO and RENAC AG conducted stringent selection procedure to shortlist proposed representatives from the four institutions. Out of 40 proposed candidates, 20 participants were selected to attend a 5-days advanced training on Solar PV and Bioenergy in Pusdiklat KEBTKE premise in Ciracas.

Two highly international expert trainers were enlisted by LCOE-INDO to deliver the practical-oriented trainings covering diverse modules including the fundamentals, grid-connected system design ,



operation and maintenance, as well as practical exercises on designing a PV and biogas system and economic assessment.

Apart from a detailed handbook which each participant receive at the start of the training, their corresponding institution also received a softcopy of the training materials in both Bahasa Indonesia and English version which will allow them to further develop and adapt the training materials to suit the unique country situation and their targeted training beneficiaries.



*Scenes from the training showing group exercise and trainer presentation aided by equipment display*

### 3.22 Monitoring and Performance Control of PV Systems Workshop

A one day training on Monitoring and Performance Control of PV Systems was organised by LCORE-INDO on 5 February 2014 for staffs of Directorate General of Various Energy and Renewable Energy. The presentation was led by a representative of SMA Technology AG, a German solar energy equipment supplier and one of the world's largest manufacturer of inverters for solar photovoltaic modules.

The training which was attended by more than 30 participants, covered introduction about the SMA company and product portfolios, different inverter concepts, sample of worldwide projects on grid-connected and off-grid solutions and system monitoring with practical data analysis.

## 4 Action Plan and Best Practice Guidelines

**Chapter Outline** This chapter contains description of initiatives that LCORE-INDO jointly developed with public and private stakeholders

### 4.1 Launching and Revision of RE Guidelines



*LCORE-INDO Senior Advisor, Rafael Wiese symbolically handed over a copy of the RE Guidelines to Mr. Rida Mulyana, Director General of New, Renewable Energy and Energy Conservation during EBTKE ConEx 2014*

At the sideline of Indonesia EBTKE ConEx 2014 on 5 June 2014, GIZ Renewable Energy Programme Indonesia/ASEAN, in Cooperation with DG NREEC launched the first edition of Renewable Energy Guidelines on Biomass/Biogas Power Project Development in Indonesia.

The RE Guidelines<sup>1</sup> describe the procedures for developing a biomass/biogas power plant in Indonesia and highlight administrative procedures including requirements for project developers and investors, legal and regulatory provisions as well as necessary permits. The RE Guidelines also identify country-specific challenges for project development, and provide information on

how to obtain financial closure. It is designed for use by project developers, investors and other actors involved in the development of RE power projects as independent power producers (IPP).

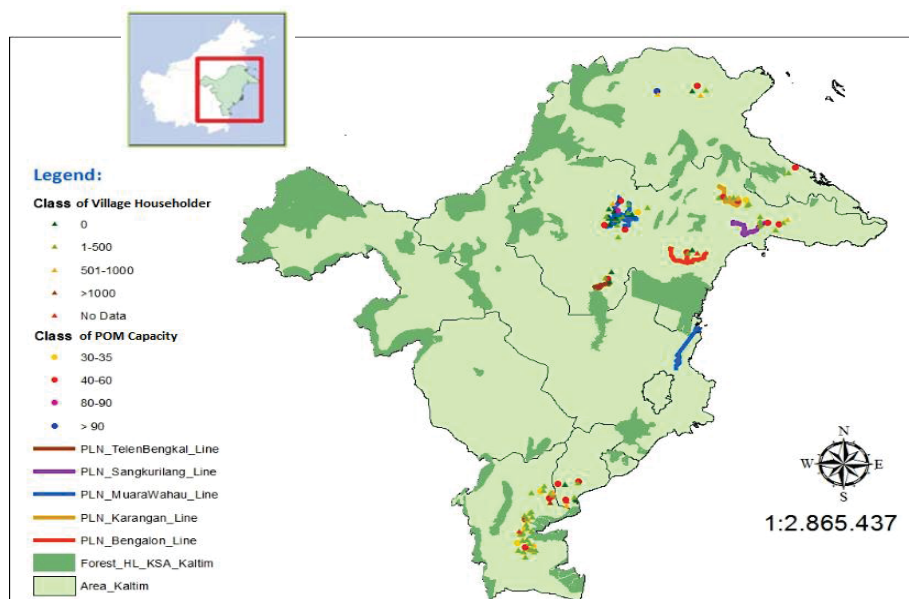
Its launching is expected to further support renewable energy development in Indonesia by shedding light on permitting procedures and administrative processes for the development of grid-connected power projects in the bioenergy sector.

With the recent issuance of PERMEN (ESDM) No. 27/2014, a new feed-in tariff for biomass/biogas project and permit application procedures were introduced. GIZ was requested by NREEC to revise the guidebook to reflect the new changes. GIZ has been conducting a comprehensive desk study to incorporate some of the new changes into the guidebook. Further consultations with NREEC and PLN are scheduled to finalise and confirm the new changes. The revised guidebook is planned to be launched in early 2015.

Consultant	Task	Output
Thachatat Kuravakul, Arne Schweinfurth, Lisa Conrads, ASEAN-RESP / LCORE-INDO	Mapping of procedures and regulations, peer review	Renewable Energy Guidelines on Biomass and Biogas Power Project Development in Indonesia ( <i>public document</i> )

<sup>1</sup> <http://www.re-guidelines.info/>

## 4.2 POM Mapping Study in East Kalimantan



*Present Landscape of East Kalimantan POM – Villages – Forest – PLN Grid*

Indonesia is the biggest exporter of crude palm oil (CPO) worldwide, with a total processing capacity of around 22 million tons of CPO per year. There are around 620 POMs in Indonesia with its technical waste potential as bioenergy predicted at around 46 Gwe.

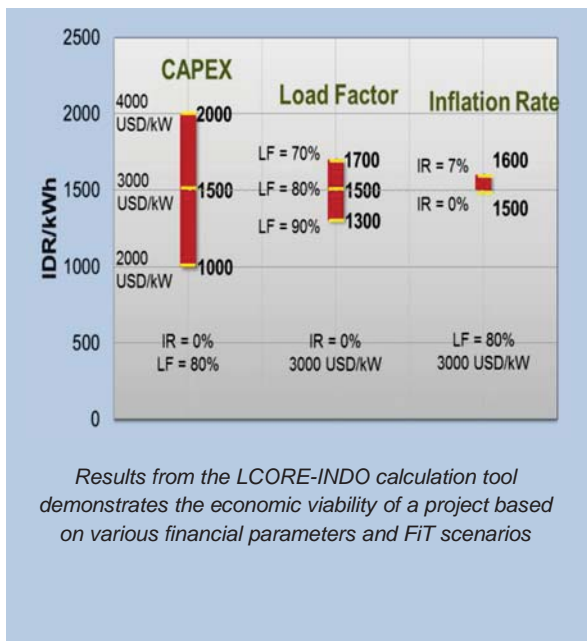
LCORE-INDO project which was conceived primarily to address the underutilization of waste potential in the palm oil industry, joined a partnership with the East Kalimantan provincial government to encourage biogas power plan development in cooperation with other GIZ climate change projects active in the province (PAKLIM and GE-LAMA-I). The partnership which was officiated on 22 April 2014 supports the province's goal of having 30 MW biogas plant development by 2018 as stipulated in the East Kalimantan GHGs Local Action Plan (RAD GRK).

A key activity in the partnership is a POM mapping study implemented by LCORE-INDO in order to have a clear and detailed overview of potential POMs in the province that are suitable for further pilot project implementation. The six months study concluded the waste to energy potential and prescribed an action plan on how to integrate CO<sub>2</sub> emission reduction from the POMs into a regional climate plan.

The study consisted of desk research and site-visit evaluation of agreed parameters in order to develop POM mapping with Geographic Information System (GIS) application. The result is analyzed with spatial analysis and multi-layered maps and complemented with a final report which shortlisted the top five POMs as pilot project for further implementation.

Consultant	Task	Output
Rizky Fauzianto, LCORE-INDO	POM mapping using GIS software and analysis	Palm Oil Mapping in East Kalimantan Report ( <i>internal document</i> )

### 4.3 Biogas and Biomass Feed-in-Tariff Revision



LCORE contributed intensively to the revision and recalculation of the FIT for biogas and biomass power projects. In close collaboration with DG NREEC, the implications of various technical and economic parameters were identified and the findings were put into a new developed calculation tool for bioenergy power projects. The input values considered experiences from LCORE-INDO pilot projects and were benchmarked against values from other international studies. Special emphasis was given on finding an appropriate FIT structure that would stimulate the market by covering project risk but also contributing to the country's objective in reducing dependency on diesel-fuelled electricity generation.

Taking into account inputs from DG NREEC, PLN and private developers on the proposed FIT scheme, a final assesment report on the FiT was finalized and submitted to DG NREEC in end of June 2014. The new bioenergy feed-in-tariff was finally launched by the Ministry of Energy and Mineral Resources in October 2014, stipulating higher electricity purchase price and more transparent procedures that are expected to spur development of bioenergy projects in Indonesia.

Consultant	Task	Output
Matthias Eichelbroenner, E.Quadrat GmbH (Germany)	Financial modelling	Assessment Report on Feed-in Tariff (FIT) for Biogas and Biomass in Indonesia ( <i>internal document</i> )



## 5 Monitoring & Evaluation

**Chapter Outline** *This chapter describes the efforts of LCORE-INDO to establish a monitoring and evaluation system that would contribute to the national MRV scheme*

### 5.1 PV Monitoring Project at Asean Centre for Energy Building



*The PV system on the rooftop of Asean Centre for Energy building in Jakarta*

In support of the recently enacted PLN regulation which allows rooftop PV system to be interconnected to PLN grid under a net metering scheme, LCORE-INDO commenced a project to monitor and analyse performance of an existing PV rooftop system in Jakarta. The PV system is located on the rooftop of the Directorate General for Electricity building in Jakarta, comprises of both polycrystalline modules and thin-film modules and offers an attractive showcase for comparison of different technologies and their respective performance under a typical big city setting in Indonesia.

At present, due to the given weather conditions leading to high diffuse irradiation especially in cities like Jakarta, it is not yet clear which technology is best adopted by potential project owners as their economics and profitability are not yet measured. The PV monitoring and performance analysis project will therefore offer reliable studies on results and comparison for future PV rooftop system development that is set to take off with the new regulation.

LCORE-INDO has hired a national consultant to evaluate the performance of the systems. The consultant will specify and install a monitoring system to record both electrical and environmental data. In order to improve the visibility of the project, the consultant will specify and install a technically suitable display to present real-time data at the lobby of ASEAN Centre for Energy.

Consultant	Task	Output
PT. Azet Surya Lestari (Indonesia)	Data measurement and system refurbishment	Monitoring display at ACE building Factsheet on PV yield comparison at ACE building ( <i>expected</i> )

## 5.2 Bioenergy Monitoring and Evaluation System

A bioenergy monitoring and evaluation (M&E) system is currently being developed by LCORE-INDO for DG NREEC to monitor the impacts of bioenergy policies. The system which will record and monitor data on bioenergy and electricity production, allows emissions from methane and electricity from existing and future bioenergy power projects to be properly calculated. This will lead to measurable share of bioenergy production and greenhouse gas emission reductions.

In the proposed design of the M&E system which has been presented to DG NREEC for further inputs, an interactive map showing bioenergy power plants in each province will be included with project developers responsible for providing the respective bioenergy and electricity data. This will allow DG NREEC to measure the impacts of government policies governing the bioenergy sector and can in the future, be expanded to include other renewable energies.

Consultant	Task	Output
Southpole Carbon (Indonesia)	Data and process flow determination and M&E design proposal	Design Concept for A Monitoring and Evaluation System for Bioenergy Power Generation in Indonesia ( <i>internal document</i> )

# APPENDICES

## I. List of Cooperation Partners and Consultants

No.	Partner (in alphabetical order)	Activity	Content	Status	Consultant	Article in Annual Report	
1	Austindo Aufwind New Energy, PT. (Indonesia)	<b>Pilot Project</b>	POME and EFB to energy and energy efficiency	Optimization of biogas plant in Belitung	On-site assessment <b>completed</b> , testing <b>ongoing</b>	Dr. Hans Friedmann (Germany)	2.2, pg. 13
2	Dharma Bermakna Foundation (Indonesia)		PPP contract on PV system and Passive House Standard on building	Technical specifications, certification process	Specification completed, PV tendering and Certification <b>ongoing</b>	E-Quadrat GmbH (Germany) Umowlai, (Australia)	2.4, pg. 15
3	Harta Samudra, PT. (Indonesia)		Solar PV application on ice making	Energy audit, PV design, economic analysis	<b>delivered</b>	AE Consult, (Indonesia) ILK (Germany)	2.5, pg. 16
4	Kencana Agri, PT. (Indonesia)		POME sludge pelletizing and biogas to energy	Site assessments, technical recommendations, economic analysis	<b>completed</b>	ANNIES Export NZ Ltd., (New Zealand)	2.3, pg. 14
5	Masyarakat dan Perikanan Indonesia (Indonesia)		Social impact of PV applications in fishery sector	Site visits and identification of location	<b>completed</b>	GIZ HQ (Germany)	2.7, pg. 18
6	Misool Eco Resort*, PT (Indonesia)		Solar PV Hybrid System	Energy audit, PV design, economic analysis	Energy audit <b>completed</b> , PV design and economic analysis <b>ongoing</b>	Asia Pacific Energy Group (Guam)	
7	PLN, PT. (Indonesia)	<b>Studies</b>	Grid impact study	Grid impact of renewable energy applications	<b>in preparation</b>	<i>to be appointed</i>	1.1, pg. 9
8	PLN, PT. (Indonesia) & RENAC AG (Germany)	<b>Capacity Building</b>	Masterplan for the development of PLN RE academy in Makassar	Gaps and needs assesment, strategy formulation	<b>delivered</b>	RENAC AG (Germany)	3.16, pg. 29
9	Sea World Club, PT (Indonesia)	<b>Pilot Project</b>	Grid-connected PV project	Business model formulation and energy audit	<b>completed</b>	PT. Kaltimex Energy (Indonesia) PT. Guna Elektro (Indonesia)	2.6, pg. 17
10	Sinar Pematang Mulia, PT. (Indonesia)		Tapioca starch and POME biogas to energy and energy efficiency	Site assessments, demand analysis, technical recommendations, economic analysis, identification of technology supplier	Detailed engineering <b>ongoing</b>	ANNIES Export NZ Ltd., (New Zealand)	2.1, pg. 12

\* The cooperation agreement with Misool Eco Resort is being processed



## II. List of LCOE-INDO Outputs 2014

Activity	No.	Title	Author	Company / Institution	Partner / Client	Status	Publication
STUDIES	1	Potential Analysis for Grid-Connected PV Systems in Indonesia	Thomas Strobel	LCOE-INDO (GIZ)	n/a	Public	July 2014
	2	Overview of Biomass Waste-To-Energy Potential for Grid-Connected Electricity Generation (solid Biomass and Biogas) in Indonesia	Lisa conrads Ikke Prasetyaning	LCOE-INDO (GIZ)	n/a	Public	March 2014
PILOT PROJECTS	3	Aquex POME Drying Report	Christoph Kwintkiewicz	ANNIES Export NZ. Ltd.	PT. Kencana Agri	Internal	November 2014
	4	Pulau Buru Ice Machine Measurements	Andre Susanto	PT. Anekatek Consults	PT. Harta Samudra	Internal	November 2014
	5	MER Energy Audit and Energy Outlook	Peter Konings	APEG	PT. Misool Eco Resort	Internal	November 2014
	6	Comprehensive Concept of Photovoltaic-powered Block Ice Machines on Buru Island	Joerg Waschull	Institut für Luft und Kaelteteknik (ILK)	PT. Harta Samudra	Internal	October 2014
	7	Power PKS Power Generation Options for the Palm Oil Industry	Christoph Kwintkiewicz	ANNIES Export NZ. Ltd.	PT. Austindo Aufwind New Energy	Internal	July 2014
	8	PT. ANJAP Saga Drying & Power Generation Options	Christoph Kwintkiewicz	ANNIES Export NZ. Ltd.	PT. Austindo Aufwind New Energy	Internal	April 2014
	9	SPM Lampung Coal Saving & Power Generation Options	Christoph Kwintkiewicz	ANNIES Export NZ. Ltd.	PT. Sinar Pematang Mulia	Internal	March 2014
	10	Binanga PKS Power Generation Options	Christoph Kwintkiewicz	ANNIES Export NZ. Ltd.	PT. Austindo Aufwind New Energy	Internal	January 2014
CAPACITY BUILDING	11	Masterplan 2014 - 2015 for the further development of PLN Renewable Energy Academy	Jens Altevogt	RENAC AG	PLN Renewable Energy Academy	Internal	March 2014
	12	Handbook: Advanced Training for Trainers in PV and Bioenergy	Peter Konings, Frank Schillig, Jens Altevogt	RENAC AG	LCOE-INDO	Public	February 2014
ACTION PLAN	13	Palm Oil Mapping in East Kalimantan	Rizky Fauzianto	LCOE-INDO (GIZ)	n/a	Public	November 2014
	14	Debottlenecking Project Finance for Least-Cost Renewables in Indonesia	Rafael Wiese	LCOE-INDO (GIZ)	DG NREEC	Internal	September 2014
	15	Assessment Report: A Feed-in Tariff (FIT) for Biogas and Biomass in Indonesia	Matthias Eichelbroenner	E. Quadrat GmbH	DG NREEC	Internal	June 2014
	16	RE Guidelines on Biomass and Biogas Power Project Development in Indonesia	Thachatat Kuravakul, Arne Schweinfurth, Lisa Conrads	ASEAN-RESP / LCOE-INDO (GIZ)	DG NREEC	Public	May 2014
MONITORING & EVALUATION	17	Design Concept for a Monitoring and Evaluation System for Bioenergy Power Generation in Indonesia	Paul Butar-Butar	Southpole Carbon Indonesia	DG NREEC	Internal	December 2014
MISCELLANEOUS	18	Facsheet: Rural Electrification from Waste to Energy	Rizky Fauzianto	LCOE-INDO (GIZ)	n/a	Public	December 2014
	19	Facsheet: Solar Ice Making	Thomas Strobel Hasintya Saraswati	LCOE-INDO (GIZ)	n/a	Public	December 2014
	20	Factsheet: Using Solar PV in Indonesian Tourism Sector	Thomas Strobel, Adnan Tripradipta	LCOE-INDO (GIZ)	n/a	Public	December 2014
	21	Factsheet: LCOE - INDO Bioenergy Activities	Alin Pratidina, Adnan Tripradipta, Ikke Prasetyaning	LCOE-INDO (GIZ)	n/a	Public	October 2014
	22	Factsheet: Fuel Savings Through Heat Recovery in the Tapioca Industry	Ikke Prasetyaning Adnan Tripradipta	LCOE-INDO (GIZ)	n/a	Public	October 2014
	23	Video "RE Guidelines Launching Event"	Hasintya Saraswati Masri Vani	ASEAN-RESP / LCOE-INDO (GIZ)	n/a	Public	August 2014
	24	Indonesien - Agrarindustrie verfüegt uebervielversprechendes Biogaspotential	Dr. Rudolf Rauch	GIZ RE Programme	n/a	Public	January 2014

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Annual Report 2014:  
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