Annex 3.2. Project ideas for energy sector

Annex 3.2.1. PV technology

Annex 3.2.1.1. Construction of PV cell industry

A. Introduction/background

As a tropical country, Indonesia has considerable potential for solar energy. Based on the solar radiation data collected from 18 locations in Indonesia, the Indonesia solar radiation differs between eastern and western Indonesia. The distribution of radiation in the Western Region of Indonesia (KBI) approximately 4.5 kWh/m2/day with a monthly variation of about 10% and in Eastern of Indonesia (KTI) about 5.1 kWh/m2/day with a monthly variation of about 9%. Thus, the potential average of Indonesian solar energy is about 4.8 kWh/m2/day with a monthly variation of about 9%.

The potential use of solar power that is promising is followed by the fact that the ratio of the national electrification by 2010 only around 67% which means that many households still had no electricity nationwide, especially in areas difficult to reach by the grid. Therefore, in order to meet the national target of electrification ratio by 72% in 2011, the government relies on program PLTS, both as SHS, PV hybrid, as well as off-grid PV as a means for providing electric power, especially in remote areas in Indonesia. In the year 2011 is expected to have about 30,000 new customers based PV on the 100 national remote island. Crash program on a remote island will be forwarded to reach 1,000 islands.

The high level of PV requirement is not followed by improvement of national capabilities in providing the PV cell. During this time, the national PV industry just as the industrial fabricators throughout the PV module PV cell is an import component. PV module industry nationwide conducted by the state and private industry. Ironically, many imported PV cell is produced from the processing of quartz sand derived from Indonesia. As it is known that Indonesia has the potential of quartz sand in the year 2010 reached 18.3 billion tons with production levels in 2009 as many as 29.2 million tons. Quartz sand of the largest reserves are in West Sumatra, another potential found in West Kalimantan, West Java, South Sumatra, South Kalimantan, and the island of Bangka and Billiton.

B. Purpose and objectives

The purpose of this activity is to develop a national industry-based crystalline PV cell with a minimum capacity of 50 MWp. PV cell industry can be built on the PT LEN Industry (Persero) which is a state enterprise which is engaged in laminating and packaging PLTS system. The company is located in Bandung West Java Province.

The objectives and the development of national PV cell industry is to lower the cost of PV investments and strengthen the resilience of the national PV industry. With the PV cell industry is expected to encourage the growth needs of PLTS and gradually the capacity of the PV cell industry will be increased according to his needs.

C. Relationship to the country's sustainable development

Development of national PV cell industry will encourage the use of PV that in turn supports the national sustainable development. President of the Republic of Indonesia has committed to reduce greenhouse gas emissions by 2020 by 26% in his own abilities and can be increased to 41% if it gets state aid donors. One of the mitigation technologies that encouraged its use to achieve the GHG reduction target is through the use of PLTS for various purposes.

D. Project deliverables

Development of national PV cell industry is very strategic because it would reduce imports and increase PV cell industry supporting national PV cell. Until 2011, the entire requirement of PV cells supplied from abroad while Indonesia has the potential resources are abundant quartz sand. Imports of PV cells will continue to increase as the mainstay of government in accelerating the electrification ratio is through the utilization of PV, both as SHS, hybrid, and off-grid. To that end, the government plans to build a national PV industry and the support through activities / program will accelerate the achievement of the plan.

E. Project scope and possible implementation

Seeing the need for PLTS high enough, then the development of national PV cell industry is highly prospective because no one in Indonesia. It is just that this industry needs to be protected because the PV cell import price of about $ 1.8 / Wp is not subject to import tax. Protection can be done by reducing the VAT and tax the various components of the PV cell supporting industries, including industrial solar grade silicon, ingots, and wafers.

F. Project Activities

Time lines

PV cell industry development can begin as soon as possible.

G. Budget/Resource requirements

Industrial development includes industrial PV solar cell grade silicon, ingots, wafers, PV cells and PV modules. PV cell import price is currently around 1.8 $ / Wp, and if construction of the national PV cell industry uses these figures, the total costs required for industrial development capacity of 50 MWp of PV cells about 90 million USD. The cost of this investment does not include the investment costs for PV module manufacturing.

It is hoped this industry is built in Indonesia with the help of soft loans from donor countries with a maximum co-funding by 30%. Partnership in the development of the PV cell industry is PT LEN Industry.

H. Responsibilities and coordination

Industrial development of national PV cell can last for the cooperation between the ministries of industry owned by the ministry. This is necessary because the PT LEN Industry is a state enterprise under the coordination of the Ministry of SOEs, while the PV cell industry is under the authority of the Ministry of Industry. To carry out this activity can first contact PT LEN Industry as state enterprises engaged in the national assembly of PV modules

Annex 3.2.1.2. Capacity building system testing laboratory PLTS

A. Introduction/background

Increased use of PLTS requires a reliable support system so that its utilization required meeting various criteria. Currently, Indonesia has had a testing laboratory PLTS system. This laboratory is the only laboratory in Indonesia that has been accredited with ISO / IEC 17025. This laboratory is located in the Energy Technology Center (B2TE), which is a unit under the Agency for the Assessment and Application of Technology (BPPT), located in Tangerang, Banten province. Various B2TE-owned facilities such BPPT includes Components PV Modules, Components Batteries, Components Battery Charge Regulator (BCR), and the DC component of the inverter lights. Component PLTS test equipment and components in B2TE relatively limited the sun simulator, cycle test equipment, and electronic equipment. PLTS test equipment and components need to be improved so that the testing laboratory in B2TE-BPPT can comply with international standards for photovoltaic modules IEC 61215, plus the addition of other components of equipment such as testing batteries, inverters, and others.

Table A-38 Types of equipment and parameters measured at B2TE-BPPT

	Equipment	Measurement Parameter
Module Photovoltaic	Sun simulator	IV characteristic curve on the standard test condition (STC)
Battery	Cycle Test equipment	Test cycles and knowing battery capacity
BCR	Electronic equipment (power supply, electronic dummy load etc)	Function Test, power consumption, functionality and efficiency control
Inverter DC lamp	Electronic equipment (power supply, electronic dummy load etc) Ball integrator	Function Test, power consumption and efficiency, lumen

In fiscal year 2011, PTKKE-BPPT will conduct design studies and laboratory testing of system components and power electronics PLTS which comply to IEC 61215, expected outputs of this study will generate the output layout of the building design, necessary equipment, laboratory organization, number and qualifications of personnel. To that end, the expansion of PLTS testing laboratory building will be built in 2012 to support PLTS laboratory facilities to international standards.

B. Purpose and objectives

The purpose of this activity is to conduct laboratory testing equipment and power electronics PLTS system in accordance with IEC 61215 standard. Procurement of laboratory equipment PLTS system is provided to B2TE-BPPT because the institution is the only institution that has obtained the ISO / IEC 17025. B2TE-BPPT located in Tangerang, Banten province.

The purpose of the procurement of laboratory testing equipment and power electronics PLTS system is to support the growing use of PLTS. With the PLTS system testing laboratory equipment and power electronics is expected to improve the quality of the PLTS system so it does not harm consumers nationwide.

C. Relationship to the country's sustainable development

Procurement of laboratory testing equipment and power electronics PLTS system as a means to support the increased use of PLTS in Indonesia that is being promoted by the government. So far, many components of PLTS circulating in Indonesia and has not fully pass the test at a local laboratory. Expected with increased testing capabilities in B2TE then all of the outstanding components can be given that SNI consumers are protected.

D. Project deliverables

Deliverables of this activity is the availability of laboratory testing equipment and power electronics PLTS system that includes the following components:

Table A-39 PV test laboratory supplies equipment and power electronics

Item	Unit	USD Price	Total
a) IV Checker (outdoor measurement)	1	9861	9861
b) IV Checker set (indoor mearurement)	1	38656	38656
1. Module cable, 10 m	10	30	300
2. T-type Thermocouple, 10 m	4	205	820
3. PV module Selector, 12 channel	1	10729	10729
4. Pyranometer Selector, 5 channel	1	8678	8678
5. TC Selector, 12 channel	1	10098	10098
6. High Precision Pyranometer	1	4181	4181
7. Pyranometer	1	2200	2200
c) Spi-Sun Simulator	1	233333	233333
d) UV Exposure Chamber for PV Modules	1	227778	227778
e) Continuous Solar Simulator & Light Soaking Chamber for PV Modules	1	227778	227778
f) Climate Chamber	1	227778	227778
			1002190

E. Time lines

Procurement of laboratory testing equipment and power electronics PLTS system can be started as soon as possible because B2TE building expansion will be done in 2012, so that laboratory equipment can be performed simultaneously, i.e. by the end of 2012. With this equipment, then the module PLTS test results may be requested certification to the international or national certification body (if it exists).

F. Budget/resource requirements

The costs of laboratory testing equipment and power electronics PLTS system is estimated about 1 million USD. Cost does not include tax and benefits suppliers. The costs of laboratory testing equipment and power electronics PLTS system is expected in the form of grants from donor countries.

G. Responsibilities and coordination

Procurement of laboratory testing equipment and power electronics PLTS system can take place in cooperation with the Agency for the Assessment and Application of Technology (BPPT), which is the parent organization of B2TE. To carry out this activity can first contact B2TE as a unit under BPPT laboratory engaged in testing PLTS system.

Annex 3.2.1.3. Manufacturing capacity laboratory cell PV

A. Introduction/Background

Increased use of PLTS requires laboratory support PV cell manufacture of reliable and economic efficiency in order to obtain an effective PV cell. Currently, Indonesia has had a laboratory type crystalline PV cell manufacture. But still very simple laboratory facilities and some equipment is still an equipment loan from PT LEN Industry (Persero). Manufacture of laboratory type crystalline PV cell is contained in the laboratory of Electronics and Telecommunications Research Centre (PPET) - Indonesian Institute of Sciences (LIPI) in Bandung, West Java Province. The ability of PV cells laboratories PPET-LIPI for polycrystalline solar cells / multi-crystalline new maximum efficiency of 8% -10% for the dimensions of 5x5 cm2 and 5% -6% for the dimensions of 10x10 cm2. The low efficiency is due to the limited facilities available and the tools that have been aged between 20-25 years, performed in a laboratory cell processes that are not "clean-room", as well as some equipment status as a loan. Silicon wafers (Si) used are imported from Germany with dimensions of 10x10 cm2 and a minimum of 270 microns thick. Currently thick Si wafers on the market of about 200 microns so that the facilities available equipment is no longer sufficient. As for human resources in the laboratory PPIT-LIPI as many as 8 people and partially retire.

Table A-40 List of equipment preparation cell (crystalline) in the laboratory of PPET-LIPI

No.	Description	Tools	Power (kw)	Capacity	Process
1.	Texturing	- Wet bench	1	25 waf. / 15 min	B
	Rinse	- DI H2O System	2,2	25 waf. / 3 min	
2.	Dry	Dryer *		100 waf. / 2 min	B
3.	Spray Phosphor	Sprayer	0,5	2 waf. / min	C
4.	Diffusion	Conveyor furnace – 1	30	20 waf. / jam	C
5.	Measurement ?S	4 - point probe *		20 waf. / jam	
6.	Deglazing	- Wet bench	1	20 waf. / 5 min	B
	Rinse	- DI H2O System	2,2	25 waf. / 3 min	
7.	Dry	Dryer *	2	100 waf. / 2 min	B
8.	Screen printing ARC	Screen printer *	2,2	5 waf. / min	C
	- **Drying**	Oven	3,1	60 waf. / 10 min	B
	- Firing	Conveyor furnace -2*	10	2 waf. / 5 min	C
9.	Screen printing AgAl	Screen printer *	2.,2	5 waf. / min	C
	- **Drying**	Dryer conveyor *	9	5 waf. / min	C
10.	Screen printing Al	Screen printer *	2,2	5 waf. / min	C
	- **Drying**	Dryer conveyor *	9	5 waf. / min	C
11.	Screen printing Ag	Screen printer *	2,2	5 waf. / min	C
	- **Drying**	Dryer conveyor *	9	5 waf. / min	C
	- **Co-firing**	Conveyor furnace– 2*	10	5 waf. / min	C
12.	Testing	Sun simulator *	2,5	4 waf. / min	C
		Cell tester			

Note: B = Batch, C = Continuous, * = equipment on loan from PT. Len Industries, which can extend every year

B. Purpose and objectives

The purpose of this activity is to conduct laboratory equipment manufacture PV cells from infection until the incoming wafer testing & sorting. Procurement of laboratory equipment was delivered to the PV cell-LIPI PPIT because the institution is the only institution engaged in the

type of PV cell testing crystalline. The purpose of the procurement of laboratory equipment manufacture PV cells is to support industrial development of the National PV Cell.

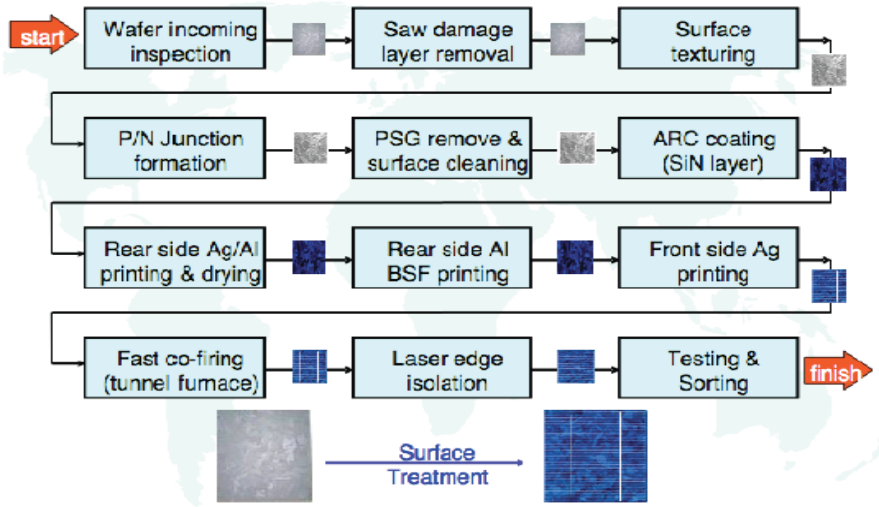

Figure A-25 PV cells is to support industrial development of the national PV Cell

C. Relationship to the country's sustainable development

Procurement of laboratory equipment manufacture PV cells as a means to support the development of the national PV industry which has an open outlook in line with demand and raw material potential is great. Expected to increase PV cell testing capabilities in PPIT LIPI PV cells then developed an efficient and economical.

D. Project deliverables

Estimated PV cell laboratory facilities with a capacity of about 2 MWp / yr, which can be used for laboratory facilities, as well as the pilot plan, and also for small-scale production. Currently, the capacity of the solar cell industry in the world's most minimum is 50 MWp / yr. To obtain the facility equipment 2 MWp / yr may be difficult if they get it from 1 (one) supplier (based on turn-key), but can be obtained from several suppliers and incorporate their own machines as needed. This is because the supplier of machines for industrial solar cells today are no longer designing small-scale inefficient since.

Table A-41 Machines for industrial solar cells

Process Tool	Quantity	Sourcing	Throughput/EA
Saw Damage remove and Alkaline Texturing	1	BR	300
N Type formation (diffusion furnace)	1	BR	300
PSG remove and surface clean (main frame share with saw damage remove)	1	TW	300
ARC Coating furnace (controller share with diffusion furnace)	1	BR	300
Printer	3	TW	240
Dryer (for Printing use)	1	TW	900
Fast Firing furnace	1	US	300
Laser isolation (semi-automation)	1	TW	300
Solar Cell efficiency Tester	1	DE	300

Capacity design of the laboratory are the design throughput :> 300pcs/hr, assumption: 125x125mm mono-Si cells using alkaline process, Eta = 16.0% (2.37W/cell) and utilization = 75%, the working time/day = 12 hrs, If line yield is 90%, the capacity Will be larger than 2.10MW/yr.

- POCl3 phosphorous doping is adopted for the drive-in. Licence of using POCl3 is required due to it's a controlled specialty gases
- Process tools are all in the manual type tools except for laser isolation is a semi-auto
- The overall throughput of all the tools are Greater Than 300pcs/hr except for the printer. (it needs more working time)

E. Time lines

Procurement of laboratory equipment manufacture PV cells can be started as soon as possible in line with national PV cell industry development.

F. Budget/resource requirements

One complete set of manual tools for mini solar cell line (main cell process including tools, metrology tools and facility tools) cost is € 3,000,000. The cost includes the basic solar cell efficiency (15.0%) offer at the beginning of tool installation (the design efficiency of the tool is 16.0%). All materials (e.g. solar wafers and all consumer materials etc) should be prepared by the customer, and should which meet the specified specifications provided seller. One-week training course is optional. During the installation tool and process tuning period, the local boarding / lodging and transportation fees and expenses will be covered by the customer.

G. Responsibilities and coordination

Procurement of laboratory equipment lab PV cell manufacturing can take place in cooperation with the Indonesian Institute of Sciences (LIPI), which is the parent organization of PPIT. To carry out this activity can first contact PPIT as a unit under LIPI laboratory engaged in testing of the PV cell.

Annex 3.2.2. RBCS technology

A. Introduction/Background

The steel industry is energy-intensive industries. Saving energy consumption in the steel industry is one of the GHG mitigation efforts that can be done in order to encourage the use of clean technology in the steel industry. As it is known that the national steel industry has not been effective and efficient because of national steel production capacity has not been sufficient so that most steel demand is still in the import and consumption of energy to produce steel is still wasteful. This is because the addition of a relatively limited production capacity amid the rapid demand for steel and lifetime national steel industry generally has been a long time.

B. Purpose and Objectives

The purpose of this activity is the installation of regenerative burner combustion system technology (RBCs) in the steel industry was selected. The purpose of mounting technology selected RBCs in the steel industry is to reduce energy consumption while increasing the production of steel in the steel industry was selected.

C. Relationship to the country's sustainable development

Installation of regenerative burner combustion system technology (RBCs) in the steel industry was selected as a means to support the reduction of GHG emissions that are being promoted by the government. As it is known that the current Indonesian government is conducting a program reduction of GHG emissions by 26% in 2020 in his own abilities and can be increased to 41% if they received aid from donor countries. GHG emission reductions of 26% is including the reduction of GHG emissions in the industrial sector. On the other hand, the installation of technology RBCs in selected industries to increase production of steel in the industry concerned.

D. Project deliverables

Deliverables of this activity is the installation of one unit of RBCs including control room technology on selected steel industry. The steel industry was selected may be determined jointly by the Ministry of Industry, taking into account the advice of Steel and Iron Industry Association of Indonesia or other steel association

E. Time lines

Installation of RBCs and control room technology on selected steel industry can be started in the medium term (1-5) years.

F. Budget/Resource requirements

The costs of installation of RBCs in the reheating furnace technology in the steel industry with a production capacity of 300,000 tons per year is about 6.5 million USD. The fee includes the cost of development and loss of income due to installation of equipment around 2.5 million USD and the cost of procurement of equipment and control room RBCs around 4 million USD. All fees are proposed to be borne by the donor countries with grants or soft loans, but if not possible then the procurement of RBCs and control room technologies borne by donor countries in the form of grants or soft loans.

G. Responsibilities and coordination

Procurement and installation of RBCs and control room technologies may be accomplished in cooperation with the Ministry of Industry.

B2 TRAINING DESIGN AND CONTROL ROOM RBCs

A. Introduction/Background

RBCS is one of the technological options for reducing energy consumption in the steel industry and some other industries. Given the importance of the role of technology RBCs, then BPPT in fiscal year 2011 trying to create a prototype technology RBCs. RBCs prototype design is done simply by the researchers / engineers at the Directorate of Energy Conversion and Conservation BPPT to understand the performance of these technologies. In fact, as is well known that the use of RBCs is controlled in the control room so that the utilization of flue gas can be arranged in such a way as to be able to reduce fuel consumption to the maximum.

B. Purpose and Objectives

The purpose of this activity is the training and control room design RBCs. The purpose of the training and control room design RBCs is to enhance the ability of researchers / engineers BPPT

or other institutions that are interested in RBCs and control room design. Expected to increase the ability of researchers / engineers BPPT, then the use of RBCs in Indonesia in the future can be designed by Indonesia itself by force, to accelerate the development and utilization of RBCs, while reducing investment costs RBCs.

C. Project deliverables

Deliverables of this activity is the increased Traffic to the researchers / engineers in particular and BPPT researchers / engineers from other institutions in general and in making RBCS and control room design for different capacities and different types of industries that have the potential to use RBCS.

D. Time lines

Training RBCs and control room design can be initiated in the medium term (1-5) years.

E. Budget/Resource requirements

The cost of training and control room design RBCs fully expected from donor countries. Place of training can be done in Jakarta or elsewhere are desired by the donor countries.

F. Responsibilities and coordination

Training of control room design and room RBCs may be accomplished in cooperation with the Center for Conversion and Conservation Technology, Agency for the Assessment and Application of Technology

Annex 3.3. Project ideas for waste sector

A. Technology Transfer

Increasingly difficult to find land for landfill and meet the obligations of Act no. 18/2008, then the application of technology for intermediate treatment plant (ITP) becomes very relevant. The basic idea is to make the MBT plant at a typology of cities are where the biological process in which there is a low-solid anaerobic digestion or others. Some equipment in the MBT can be made in Indonesia, but as a technological system still needs to transfer technology from countries that have experienced operating MBT. Form of transfer of knowledge may include training of researchers and users from Indonesia to the producing countries and also sending experts to Indonesia in order to practice directly in the plant is built. Interactive learning, involving experts from the maker countries with the users MBT will minimize some of the problems that usually arise in the application of advanced technologies to developing countries. In this model of cooperation, the innovations MBT that may arise should be set in the agreement, especially related Intellectual Property Rights (IPR).

B. Capacity Building

In order for the application of MBT to be sustainable in its operations, the ability of local engineers and the operators must be improved. Capacity building should be part of the transfer of technology. In the case in Indonesia, ITP in the form of MBT should collaborate with the institution of city cleaning services and local community groups including scavengers. In order for the application of MBT successful, would be better if it sought ITP plant that is already running and a high level of community participation so that the human resources and