

Capacity Building Towards Improvement of Energy, Environment, and Community Development Compliance in Indonesia: A Case Study of Pesanggaran Power Generation

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Abstract

Gas Fired Power Plant of Pesanggaran is one of power generation unit that currently operated by PT. Indonesia Power – Generation and Service Unit of Bali. Having vision to become World Class Services Company, Pesanggaran Power Plant contributes to Environmental Compliance (PROPER) Awards by Ministry of Environment. PROPER clustered into compliance and beyond compliance assessment this represents quality of periodical environmental management. Previous period showing that Pesanggaran reach compliance step, and systematically improved for this year in order to reach beyond compliance awards.

Preliminary assessment indicates that Pesanggaran has a bright potential to improve its quality of environmental compliance. An essential step to accelerate the improvement is to assist the capacity building, not only restricted to environment itself, but also to energy and community development aspects as it assessed on PROPER. Capacity building covered several basic programs such as individual assessment of PROPER team, focus group discussion on excellent program of each aspects, workshop and internal coaching for reporting skill, and assistance on PROPER document viability.

About 20 in charge employee have been assessed on this program which is expected to increase PROPER results up to 15% of total score for Pesanggaran from compliance to beyond on energy sector. It is important to progressively improve the capacity building program for at least four years sustainable program as this paper will about to discuss. Supports from top management to all employees have a huge deal on this strategic capacity building program.

Keywords: Gas Fired Power Plant of Pesanggaran, Environmental Compliance, Capacity Building.

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Assessment, that is nationally known as PROPER (Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan Hidup), annually assessed and awarded by Ministry of Environment.

Previous year shown that GSU of Bali has reached compliance step, and continuously improved to elevate its compliance to beyond compliance awards. Each of GSU of Bali which is Pesanggaran, Gilimanuk, and Pamaran Gas-Fired Power Plant, participated to PROPER in energy sector. Since previous PROPER document has not shown fatality on environmental program and main business process, it probably has technical problem, for instance lack of understanding or reporting skill. According to this case, both in charge leaders and all employees, have the same opinion to conduct responsible team with capacity building through educative program.

Since PROPER is not only limited to environment perspective but also consider other essential perspective policy of the system, resource utilization, and social responsibility. Several basic programs has been planned consist of individual assessment of PROPER team, focus group discussion to determine program of this year and its sustainability, internal coaching to improve reporting skill, and weekly assistance on PROPER document with underlined on its viability.

Materials and Methods

A. Materials

Capacity building that mainly discussed in this paper is strategic program based planning for supporting environmental conservation in Indonesia. Preliminary step has begun with site visit assessment, and continued to ongoing program over this year. This program is substantially required a guideline contains coaching module and strategic plan towards continuous improvement within goals of Excellency.

B. Methods

An imperative method on this program is regular coaching through integrated assistance. During this year, program that has been successfully held consist of preliminary assessment within site visit method. It contains individual assessment for PROPER in charge employee to re-assess each job description PROPER criteria. Following preliminary program, management decided to accommodate focus group discussion (FGD) directly after individual assessment. FGD mainly discussed about best practice program, preparation, and implementation on each PROPER aspects. Other program with continuing status is internal coaching with condition of simulation and practice on data processing and creating reliable document to be more structured. Moreover, coaching has to be monitored with regular assistance to avoid obstacles possibility prior to be assessed by Ministry of Environment.

Overview of Environmental Compliance Assessment (PROPER) in Indonesia

A. Regulatory Framework

Population growth has increased recently with impact on energy security, food security, and human security considered as global issue. This situation drives energy sector plays important role to secure energy supply. Government in Indonesia, through Ministry of Environment, contributes to this global issue by bringing together industries and its stakeholder. As part of energy industries that generates electricity,

PT. Indonesia Power – GSU of Bali participated to this environment preservation program annually.

Annual assessment program hosted by Ministry of Environment, underlined Environmental Compliance Assessment (PROPER), regulated under Minister of Environment Regulation No. 06/2013 [2] that has been updated recently as Minister of Environment Regulation No. 03/2014 [3]. Overall industries that caused significant impact to the environment and social attention, neither regional nor global, have obligation to participate to PROPER. For energy sector, company that run power plant as core business within minimum installed capacity 55 MWe are welcome to participate.

B. Assessment Step

Previous publication [2] has described about assessment step of PROPER, which particularly divided into three main steps. According to updated regulation of PROPER, there are no changing steps on PROPER assessment which consists of:

- Preparation of periodical database, lesson learned review, and best practice program.
- Compliance assessment, a second step that evaluate compliance on basic environment aspects, such as water usage and its treatment of wastewater, air pollution reduction, hazardous waste management, and environmental permit (EIA, etc.). Each of energy industries have to fulfill periodical database that supported with accurate evidence. This step delivers results into comply (**Blue Category**) and not comply (**Red and Black Category**).
- Beyond compliance assessment, is the most difficult step due to very tight selection process. This step is optional, industries with Blue Category whether can choose to continue to this step or not. This step particularly assessed 9 (nine) aspects such as Environmental Compliance Executive Summary, Environmental Management System, Energy Efficiency, Hazardous Waste Management, Solid Waste Management, Emission Reduction, Water Efficiency, Wastewater Treatment to Minimize Stream Degradation, Biodiversity Protection, and Community Development. This step then delivers results into “just comply” (**back in Blue Category**), “beyond comply” (**Green Category**), and for those company that passed the minimum standard score, will be promoted to the “**Gold Candidate**” (**Beyond Comply with Excellency**) and continue to the next site verification process.

C. Environmental Goals and Improvements

Gas Fired Power Plant commonly known as non-renewable energy sector with business as usual way of thinking. GSU of Bali committed to change this paradigm to be non-renewable energy that concerns the most on environmental preservation and sustainability. We generate electricity for society within sustainable energy, environment, and social responsibility awareness. This motivation is reflection of top management commitment, supported by overall employee, as it shown on continuous environmental compliance improvement “from comply to beyond”.

Results and Discussions

This paper discuss about educative basic programs such as individual assessment of PROPER team, focus group discussion to arrange excellent program of each aspects, workshop and internal coaching for reporting skill, and assistance on preparation of PROPER document. These educative programs are implemented to every aspects assessed on PROPER, particularly strategic program as we discussed below.

A. Capacity Building General Program

- Preliminary Assessment

Preliminary site assessment play important role to determine baseline of current condition and routine program. It has been assessed for at least 20 in charge employee with each specific in charge aspects [7]. Assessment consists of four days; begin with general assessment, continued to site assessment, document collection, and discussion for specific site condition of each generation unit (Pesanggaran, Pemaron, and then Gilimanuk). Preliminary site assessment situation is the depicted in Figure 2.



Figure 2: Preliminary Assessment on Gilimanuk (left) and Pemaron (right) Generation Site

- Internal Workshop

As part of capacity building, internal training has been given for more than 25 employees per day. It was held in Pesanggaran main office during weekday in five days. Workshop has begun with basic knowledge of environment and lesson learned on previous results of PROPER in order to calibrate each in charge person perspective [8], as depicted in Figure 3. It was then continued to main topic, which was mainly discussed about:

- Environmental Management System
- Energy Efficiency
- Hazardous Waste Management
- Solid Waste Management
- Emission Reduction
- Water Efficiency and Wastewater Treatment
- Biodiversity Protection
- Community Development



Figure 3: Internal Workshop for Environmental Compliance – Capacity Building for Knowledge and Skill Improvement

Since environmental compliance assessment required evidence for assessment document and its harmony to the site condition, output of this workshop was aimed for improvement of knowledge and reporting skill of each in charge employee. Workshop methods contain two ways of discussion with interactive situation during all sessions. At the end of session, there was always simulation to create a viable document based on current criteria of Minister of Environment regulation.

B. Energy Efficiency for Better Future of Energy Security

Preliminary assessment was held at the beginning of this year, it has continued directly to focus group discussion (FGD) for more than 20 in charge employee. FGD mainly discussed about strategic program for beyond compliance achievement of PROPER this year. Strategic program will be continuously improved as five years period.

- Reduction of Internal Consumption Electricity with Solar Cell Program

Our company generates electricity by using fossil fuel (High Speed Diesel) as primary energy. Although our core business focused on non-renewable sector, we always committed to contribute in energy efficiency through sustainable solar cell utilization. Solar energy is one of renewable energy which has a very high sustainability in tropical country, such as Indonesia. Solar cell effectiveness is depending upon a climate condition; it contributes 21% at windy and 30% at sunny weather.



Figure 4: Installation of Solar Cell Panel with Consideration Health and Safety Behaviors

Figure 4 described the installation of solar cell on administration building of GSU Bali without ignoring health and safety aspects. For the last four years, solar cell has significantly reduced electricity consumption for administration building for more than 36,000 kWh per year [9]. This condition is equals to 13,000 liter of fossil fuel consumption or economically feasible for saving up to 130,000,000 IDR.

C. Resources Utilization for Sustainable Environment Protection

This part mainly discussed about strategic program that has been implemented both in power plant area and environmental program based community development. Environmental aspects reported refer to the environmental beyond compliance criteria [3].

- Hazardous Waste Management: Replacement of Tubular Lamp (TL) with Light Emitting Diode (LED) Lamp

This program has begun over three years, and still on going to replace partially (see Fig. 5). There were 492 spots of Tubular Lamp and Halogen Lamp installed, consist of office building, library, laboratory, warehouse, power house, control room, and risk management room [9]. Currently, LED lamp has replacing TL and Halogen usage as 100% by the end of last year (as per December 2014).



Figure 5: 100 Watt Tubular Lamp (left) Replacement to 9 Watt Light Emitting Diode Lamp (right) Around Main and Supporting Building

Since LED lamp has more lifetime than neither TL nor Halogen lamp, this program can reduce hazardous waste generation in the future up to 50 kg per year. Based on

hazardous waste regulation from Government of Indonesia 101/2014 (Peraturan Pemerintah No 101 Tahun 2014), TL lamp waste categorized as hazardous waste from non-specific source with waste code is **B107d** [4].

- Solid Waste Management: Integrated Domestic Waste through Bank Sampah
Bank Sampah (Bank of Domestic Waste) is an integrated program to manage domestic waste in economical perspective. Bank Sampah has initiated at the beginning of this year (January 2015) together with essential stakeholders as integrated partnership program. I Wayan Patut is a local coordinator within 30 members community of Serangan, Bali Province. One of recycle product that made from paper waste is depicted in Figure 6.



Figure 6: Handicraft and Souvenir as Recycle Paper Product

Waste generation in Bank Sampah is around 4,000 kg per day of organic waste and 300 kg per day of in-organic waste [10]. Several activities under this program consist of organic waste (such as composting) and in-organic waste management (such as handicraft, etc.). Main purpose of this program is to develop skill of local community based on sustainable environmental education and economical consideration as discussed above. Bank Sampah also has other advantages, such as increasing mainly income for community up to 40% and possibly bringing Bank Sampah as tourism object in Bali Province.

- Emission Reduction: Biogas Utilization Based Local Community Development

As part of emission reduction program, our company volunteered at biogas utilization in order to reduce domestic fuel consumption. This program was initiated in 2013, underlined for local community empowerment around Bali (see Fig. 7 and Fig. 8). Currently there are two local coordinator of biogas program, consist of Ni Wayan in Klungkung, and I Wayan Kayun in Gianyar [11]. Their main utilization of biogas product emphasized on reducing internal fuel consumption.



Figure 7: Animal Waste Collection System Based Community Empowerment



Figure 8: Biogas Installation System (left) and Biogas Product for Daily Usage in Community (right)

Raw material used mainly from animal farm that consists of three cows, with average animal waste generation around 6 kg/day. This biogas program effectively can reduce Liquefied Petroleum Gas (LPG) demand for daily activities, most likely for cooking. An additionality of this program is to build a new paradigm of non-renewable energy demand into renewable energy utilization.

- Emission Reduction: Energy Efficiency Program
Currently there are numerous energy efficiency programs that have been implemented around power plant area. One of program discussed in this paper is replacement of Tubular Lamp to Light Emitting Diode Lamp, as described previously [9]. It covered hazardous waste management aspect and also emission reduction aspect as a direct impact of energy efficiency. As per March 2015, it has been recorded that lamp replacement program contributed to reduce emission about 72,414 kg CO₂ per year, which equivalent to 19,769 kg of Carbon.
- Water Conservation through Biopori Program
Biopori (or Bio-Porous) is common practice as part of natural water conservation. This program was initiated since year of 2013 and still on going in this year with 25 unit of Biopori installed around Power Plant area per year (see Fig. 9). As part of continuous improvement, we consider that infiltration rate of each Biopori unit has to be calculated and monitored in the future.



Figure 9: Biopori Installation in Local Community (left) and Around Power Generation Area (right)

Besides having water conservation program internally, we also built partnership with Environmental Agency of Bali Province (BLH Propinsi Bali) and Military District Command of Denpasar City (Kodam Denpasar). Nevertheless, local communities are always being part of environmental planning and monitoring program [12].

- Wastewater Treatment to Minimize Environmental Degradation: The Best Practice of Gilimanuk Wastewater Garden

Wastewater Garden is a paradigm based on water conservation that integrated to pollution prevention to the environment. It has been implemented in Gilimanuk Power Plant Unit by using wastewater effluent to watering plants around green area as depicted in Figure 10. Although wastewater effluent has been treated in Wastewater Treatment Plant (WWTP), effluent still contain rich organic nutrient that essential to either crops or plants.



Figure 10: Crops around Gilimanuk Unit, Watered by Treated Effluent Wastewater

This program has several advantages, such as reducing domestic water consumption for plants watering which connected to reduce wastewater contamination load to the stream. As part of water efficiency, this program contributed to reduce water consumption around 2.4 m³ per year [13]. Besides, effluent wastewater quality also plays important factor to minimize stream degradation that will be discussed to the further study.

- Environmental Awareness Campaign in Jembrana District: Preserving Environment Through Educative Action

Having capacity building as strategic program is underlined to achieve better environmental compliance and beyond. Boundary of this integrated program does not only focus on employee capacity improvement, but also to community around our power generation area. One of socio-environment program that has been successfully implemented continuously is Environmental Awareness Campaign.

Awareness to the environment is a learning process, which has not come instantly. It plays important role, particularly for children as foundation knowledge since in early age. Main goals of this program intended to improve awareness in the future as sustainable responsibility. Environmental Awareness Campaign initiated in Gilimanuk Village - Jembrana District for over three years periodically. Education topic consists of Reboisation towards Supporting Tourism Village in Gilimanuk, Domestic Waste Management, etc. In addition, simulation after indoor education also became non-separated part at the end of campaign as shown in Figure 11.



Figure 11: Indoor Simulation of Environmental Awareness Campaign

At least 100 early age pupils have been educated in this campaign since the beginning of year of 2013. Education was held in Early Age Integrated Education of Aisyiyah (PAUD Terpadu Aisyiyah), Elementary School of Gilimanuk 3 (Sekolah Menengah Pertama Negeri 3 Gilimanuk), Junior Islamic High School of Gilimanuk (Madrasah Tsanawiyah Gilimanuk), and Junior High School of Melaya 3 (Sekolah Menengah Pertama Negeri 3 Melaya). Collaborative action has also involving The National Park of Western Bali (Taman Nasional Bali Barat), local community, and environmental team of PT Indonesia Power Gilimanuk [13].

D. Biodiversity Protection – Conservation Based Community Development

Power generation is one of energy sector that commonly require extensive areas. It has magnitude impact on degradation of biodiversity abundance. As part of socio-environment responsibility, we are committed to conserve natural biodiversity. Several best practice programs discussed as follows.

- Coral Reefs Protection

This program initiated since 2010, collaborated with Kelompok Nelayan Segara Gunung, Pemaron Village. It has not only socio-environment impact, but also economic aspects for local community. Social and environmental positive impact can improve coastal environment knowledge to society that simultaneously preserving the environment. On the economics point of view, this program can improve local community's welfare up to 82 percent of regional standard income.

Another point of view in this program is cultural and tourism aspect, whereas Coral Reefs has a beauty of nature, mainly in marine environment. Since Coral

Reefs associated with various marine biodiversity, this program has become interesting tourism object for diving and exploring aquatic ecosystems as shown in Figure 12 and Figure 13.



Figure 12: Coral Reefs Conservation within Bali Cultural and Heritage (left) and Growth Coral Reefs as Part of Conservation in 2010 (right)



Figure 13: Underwater Scenery of Coral Reefs – Diving Tourism Object (left) and Bali’s Cultural Heritage with Coral Reefs Growing Around

This initiative program has brought our company to achieve the first prestigious achievement on socio-environment aspect. It has awarded under Corporate Social Responsibility (CSR) Awards of Indonesia in 2011 as Platinum Award Position [10].

○ Sea-Horse Conservation

Sea Horse (*Hippocampus* spp.) commonly discovered at narrow territory associated with Coral Reefs and Mangrove Root. Based on Ministry of Forestry Regulation 57/2008, Sea Horse classified as High Priority Marine Species that become the national environmental issue [5]. According to this situation, significant contribution required in order to conserve marine environment around Bali Island.

We initiate this program since the beginning of year of 2011 and periodically monitored until present. We also collaborate with local community in Serangan, coordinated by I Wayan Patut. It has two monitoring groups with total of local community involvement about 35 members. This program also enhancing tourism objects around Bali Province which increasing people’s welfare. It has calculated that involved community can increase their routine income for more than 65 percent of regional standard. Sea Horse Conservation Program is then depicted in Figure 14.



Figure 14: Release of Sea Horse in Serangan as Tourism Object (left) and Conserved Sea Horse (right)

This program recognized as best practice implementation of natural conservation. In 2014, this program became the best innovative action in Corporate Social Responsibility (CSR) Award in Indonesia, also considered as the second achievement on socio-economic-environment responsibility. Sea Horse conservation program has an iconic characteristic that achieved the most prestigious results as Platinum position [10]. Moreover, this program is still maintained periodically with local community in Serangan.

- Mangrove Preservation

Mangrove is part of integrated marine ecosystem that also associated with Sea Horse and Coral Reefs, plays important role in the coastal environment. Mangrove has an ability to prevent coastal erosion and to control environmental degradation. At previous year, 1,000 Mangrove has been planted in the Mertasari Beach - Sanur, Southern Denpasar [14]. This program supported by PT Indonesia Power – GSU of Bali and Udayana University. It also collaborated with local and regional government, local community and education institution, from early age community to university student. Mangrove preservative action is then depicted in Figure 15.



Figure 15: Coastal Preservation with Emphasis on Mangrove Plantation

E. Community Development

As part of Corporate Social Responsibility (CSR), Community Development plays a new paradigm in this sector. Corporate has endorsed to be less charity and more focused on sustainable community empowerment. Successful CSR program measured as transformed local community to independent or self-powered at its exit goals. At this point, PT Indonesia Power – GSU of Bali has successfully developed a small community to manage their own program through economic institutional as subsequently discussed below.

- Economic Institutional Cooperation for Local Community “Koperasi Bangkung Sari”

In year of 1990, this program initiated with a small local community in Banjar Ambengan, Bali Province. It was known as Kelompok Pembina Kesejahteraan Keluarga Pesanggaran (PKK Pesanggaran). PKK Pesanggaran has main activities on cultural and heritage, taken into account Balinese religious activities.

Since 2006, PT Indonesia Power – GSU of Bali have taken actions to empower them as part of community development and successfully transformed to an independent community in 2009. This was also transformed PKK Pesanggaran into Bangkung Sari Community. Bangkung is a Balinese Language that means “female pig” and Sari means “product”. This fundamental principle became a community paradigm to run saving and loan activities with underline of cooperative union system. Koperasi Bangkung Sari administrator and activities then depicted in Figure 16.



Figure 16: Koperasi Bangkung Sari Administrators and Activities

Koperasi Bangkung Sari has own tradition which consistently different with regular cooperative union system. Common cooperative union has net income at the end of year, which generally distributed to all community members. At Koperasi Bangkung Sari, end year net income given to member or their family that passed over in order to do Ngaben Ceremony [10].

Bangkung Sari managed by I Nyoman Karbinawa as general coordinator with six administration officer. At least this self-powered community has average revenue 150% than regional standard income. As per 2015 total members of Koperasi Bangkung Sari is 1,000 people that equals to people in Banjar Ambengan.

Conclusions

Every step of capacity building begun with teamwork either as top-down or bottom-up mechanism supported by all essential stakeholder. Practical perspective require strategic program to support environmental and social responsibility as part of small step to achieve environmental compliance and beyond. However, it has to be monitored and substantially innovative not only in power generation area, but also for living environment around.

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