PART 1
PRELIMINARY

1.1. BACKGROUND

In tune with the development of electricity demand by customers, the electric power system in Riau developed also following the rhythm of the development of electric power consumption serves. Power Plant PLTG in Riau today comes from hydropower Koto Panjang, Power Plant PLTG/MG Duri, Power Plant PLTG Teluk Lembu, and some diesel spread is then transported through the transmission line after it first raised its voltage by the transformer step-up the voltage available at the centers of electricity.

In order to overcome the energy crisis of electricity in Riau, PT. PLN (Persero) accelerate the development of non-fuel Power Plant PLTG oils, which use renewable energy, such as coal and gas. Demand for electricity continues to increase along with economic growth in the future.

To meet the needs of electric energy in the province of Riau, the current electric energy production in Riau include: Koto Panjang Hydroelectric amounted to 114 MW, diesel Power Plant PLTG of 125 MW, the Power Plant PLTG of 133 MW, PLTMG by 27 MW. Total capacity of the plant was yet meet the electricity needs of Riau province at the time of peak load of 450 MW, which is currently supported from Central Sumatra interconnection system of 160 MW.

To address the electricity needs Riau currently reaching 450 MW, then the PT. PLN (Persero) will build several new plants that could increase the supply of electricity to the area of Riau, including an increase in generating capacity of the Power Plant PLTG/MG spines of 200 MW and 2x110 MW Power Plant PLTG at Riau.

Gas Power Plant PLTG/MG is one of the power plants using gas turbines as prime movers (prime muver), while the gas as working fluid, and a generator for generating electrical energy, namely the change from mechanical energy which seporos by the turbine into electrical energy. Gas Power Plant PLTG/MG consists of four main components: a compressor, combustor, gas turbine and generator.

Activity power generation capacity additions Power Plant PLTG /MG Duri based on the Bengkalis Regency Decree No.97/KPTS/III/2011 dated March 10, 2013 on Granting Location For Purposes Gas Power (Power Plant PLTG) Cq.PT. Perusahaan Listrik Negara (Persero) in Pingir District, Bengkalis Regency; A decree Bengkalis Number :44/KPTS/I/2013 dated January 18, 2013 on Environmental Permit Building a Power Plant PLTG/MG thorn in the Balai Pungut Village, Pinggir District, Bengkalis Regency, Riau Province and the Decree of the Regent of Bengkalis Number: 496/KPTS/ XII/2012 dated December 11, 2012 on Environmental Feasibility Environmental Impact Analysis (EIA), Environmental Monitoring Plan (RKL) and Environmental Monitoring Plan (RPL) Building a Power Plant PLTG/MG Duri by PT.PLN (Persero) in the Balai Pungut Village, Pinggir District, Bengkalis Regency, Riau Province.

PT.PLN (Persero) realize that the activities of electricity generation capacity additions Power Plant PLTG /MG Duri from 160 MW to 360 MW that will do of course have

an impact on the environment in the broad sense. Therefore in accordance with Law No. 32 year 2009 on the Protection and Environmental Management, that every action plan is expected to have a significant impact on the environment must be equipped with Enviroment Impact Assessment (EIA). Furthermore, based on the Minister of Environment No.5 year 2012 on type and business plans and/or Events That Must Have Environmental Impact Assessment, the planned development activities of over 100 MW gas Power Plant PLTG to be equipped with EIA document.

1.2. Objectives and benefits of planned activities

1.2.1. Objectivite planned activities

The objective of the generating capacity additions Power Plant PLTG/MG spines of 200 MW in the Balai Pungut Village District Pinggir of Bengkalis Regency Riau Province are :

1. To increase the availability of electricity in meeting electricity demand in Bengkalis in Riau Province in particular and in general, so that the electric power deficit can be overcome and avoid blackouts in rotation.
2. Using gas fuel is a manifestation of the government's program to support the diversification and conservation of energy through utilization of gas as a primary energy source.
3. Reducing fuel subsidies are used for electricity generation (diesel) and a reduction in production costs per kwh of electricity her.

1.2.2. Benefits Planned Activities

The benefits of adding generating capacity of the Power Plant PLTG/MG spines of 200 MW in the Village Balai Pungut Rand Regency of Bengkalis Riau province is as follows :

a). To meet demand for electricity, increasing the reliability of the electricity system Riau province and improve the infrastructure around the area Bengkalis and Riau Province.
b). Enhance the attractiveness of investors to invest in Bengkalis and Riau Province, due to the availability of electrical energy in sufficient quantities, which will accelerate economic growth
c). Creating jobs, both during construction and during operation, so as to Increase revenue surrounding communities
d). Reducing the use of fuel in significant numbers, thus reducing fuel subsidies for the power sector
e). Utilization of alternative energy (gas), which is currently available pretty much in Riau.
f). Improve the reliability and quality of electrical power, which eventually also beneficial to the community
k). Generated electricity is cheaper than oil-fired power.

1.3. Implementation Study

1.3.1. Proponent Activity

Identity proponent EIA study Power Plant PLTG/MG Duri Capacity of 160 MW 360 MW Being in the Balai Pungut Village, Pingir Districts, Bengkalis Regency , Riau Province are as follows ::

Name of Proponent	: PT. PLN (Persero) Unit Induk Pembangunan I
Legal Entity Type	: Limited Liability Company
Address	: Jl. Kasuari No. 8 Medan Sunggal Sumatera Utara
phone	: (061) 847 4059 – 847 4050
Facsimile	: (061) 847 4120
Field	: Capacity Power Plant PLTG/MG Duri from 160 MW to 360 MW
Person in charge	: **Ahmad Rofik**
Position	: General Manager

1.3.2. Implementing the EIA Study

Formulation Study Amdal Power Plant PLTG/MG Duri Capacity of 160 MW Being 360 MW in the Village Balai Pungut, Pingir Districts, Bengkalis Regency, Riau Province this, the initiators have recourse to the provider agency document preparation EIA in accordance with Article 10 paragraph (2) of Government Regulation number 27 Year 2012.

Drafting Terms of Reference document Environmental Impact Analysis (Reference Framework -EIA) Increasing the capacity of the Power Plant PLTG/MG spines of 160 MW Being 360 MW Being in the Balai Pungut Village, Districts Pinggir, Bengkalis Regency, Riau Province is derived from :

Compiler consultant	: **KSO Riau University Research Institute-Center for Environmental Research Universitas Brawijaya (LPUR- PPLHUB)**
Registration Certificate of composer EIA	: Environmental Research Center University Brawijaya No. Registration Competence :0075/LPJ/EIA-1/LRK/KLH
Tim Leader	: **Budi Surya Bukit, S.Pi** *Certificate of Competence Chairman of the Drafting Team EIA No.001299/SKPA-P1/LSK-INTAKINDO/X/2014(attached)*
Field of Physical-Chemical	: Ir. Suwasono Heddy,MS
biology	: Karuniawan Puji Wicaksono, SP, MP, PhD
Field Electrical / Mechanical	: Suwitno, MT
Field of Environmental	: Ir. Sri Utami, MT *Certificate of Competence Chairman of the Drafting Team No. 001217/SKPA-P1/LSK-INTAKINDO/IV/2014 (attached)*
Social and Cultural Economy	: Ir. Hamdi Hamid, SU
Field of Public Health	: Daryono, SKM, M.Si Certificate of Competence Members of the Drafting Team EIA No.001201/SKPA-P1/LSK-INTAKINDO/IV/ 2014

1.4. Description of Business and / or Event Which Will Assessed

1.4.1. EIA Study Status

EIA document preparation activities increased capacity of 160 MW Being 360 MW Power Plant PLTG/MG Duri Balai Punggut Village, Pinggir Districts, Bengkalis Regency, Riau Province carried out after the technical and economic feasibility study completed by PT. PLN (Persero).

1.4.2. Conformity Location Business and/or Activity Plans Riau Provincial Spatial

location of the Power Plant PLTG/MG Duri is located in the Balai Pungut Village, Pingir Districts, Bengkalis Regency, Riau Province. By virtue of Development Planning Agency at Sub-National Level Bengkalis Plan Number 050/Bappeda-SP/247/2015 dated March 19, 2015, concerning Compliance Activity Power Plant PLTG / MG Peaker Duri with the Spatial Bengkalis explained that the Regional Regulation Bengkalis Regency No. 19 year 2004 on Spatial Bengkalis the location of activities located in Production Forest, while based on the draft revision of the RTRW Bengkalis Year 2014-2034, the location of activities are also in Production Forest (HP) Appendix 1. while based Map PIBBIP 2014 revision 7 (Decree of the Minister of Forestry Republic of Indonesia No.SK.3706/Menhut-VII-IPSDH/2014), are not included in the moratorium area of licensing delays .

1.4.2.1. Description of Business and/or Event

The activity plan is an increase in plant capacity/MG Duri from 160 MW to 360 MW in the Balai Punggut Village Uptown Regency of Bengkalis. The area of the whole stay (no expansion), which is of ± 20.60 Ha , where the vast vacant area is available for additional Power Plant PLTG capacity/MG spines of ± 9.87 ha. Energy sources such as gas came from the PT. Trans Gas Indonesia (PT.TGI). The details of the business scale as follows :

- Eksiting plant installed power : 160 MW
- Power capacity : 200 MW
- Power is able to : 360 MW
- Land status : Certificate Properties
- The source of water used : Water refills
- Type of fuel used : Gas and HSD
- The need for lubricating oil : 40 drum/year
- liquid waste handling systems : WWTP
- Cooling systems are used : Water circulation (Circulation Closed)
- High chimney : Range from 40-60 meters
- Chimney Diameter : Lower: 2.5 m ; top : 2.0 m
- Age Action Plan Power Plant PLTG/MG : 15 years

Based on the simulation of air dispersion No.Kep.205/07/BAPEDAL/1996 Appendix III (about chimney Requirements). The minimum chimney height requirements of 2-2.5 times the height of surrounding buildings so that the environment around the chimney is not affected by turbulence. EIA document preparation activities to increase plant capacity PLTG/MG Duri as an effort to comply with the development of environmentally sound, because this development is expected to have an impact that affects the environment, both the physical environment, socio-economic and cultural. EIA Study was conducted after the feasibility study conducted by the proponent

The land area Power Plant PLTG/MG Duri not increased or remained before and after the increase in the same capacity, which amounted to 20.60 Ha. The land prior to an increase in capacity has been utilized for generating room, control room, switch yard, cooling tower, warehouses, workshops, fuel tanks, offices, car parking area, motorcycle parking area, security post and a garden. Only an area of 9.87 hectares which is still vacant land to be used as a generating capacity additions Power Plant PLTG/MG. Details of the land use Power Plant PLTG/MG spines can be seen in Table 1.1

Tabel 1. 1.
Land Use Power Plant PLTG/MG Duri

No.	Land Use	Activities / Facilities	Large (Ha)
1.	Space Power	Main	3.33
2.	Control Room	Main	0.16
3.	Switch Yard	Main	2.80
4.	Cooling Tower	support	0.91
5.	Warehouse	support	0.12
6.	Workshop	support	0.12
7.	Fuel Tank	support	0.68
8.	Office	support	0.09
9.	Car parking area , Motorcycle Parking area	support	0.75
10.	Pos Guards and Garden	support	0.40
11.	Street	support	1.37
12.	Land plans plant capacity additions / MG	Main	9,87
Total			**20,60**

Source : PT. PLN (Persero)

Power Plant PLTG/MG is an electric energy generation using equipment/gas turbine engine as a generator drive. The gas turbine is designed and made with a simple working principle where the thermal energy generated from the combustion process fuel is transformed into mechanical energy and then converted into electrical energy or other energy according to his needs.

Components of the plan activities to increase plant capacity PLTG/MG spines of 200 MW to be explored and estimated potential to produce significant impacts on the environment, both at the pre-construction, construction, post-construction, operation and post- operation is as follows:

1.4.3.1. Pre-Construction Phase

The activities in the pre-construction generating capacity Power Plant PLTG/MG Duri consists of licensing, public consultation and acceptance of manpower to carry out construction activities

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1.4.3.1.1. Licensing Management

As the law states that activities carried everything must comply with applicable law, including in terms of increasing plant capacity PLTG/MG These spines. As the implementation of environmentally sound development, then this event is also supported by a number of licensing and implementation of the Environmental Impact Assessment (EIA) is currently being implemented. For it has been and is being done by the management of various forms of license required by applicable law. For the legality of activities to increase plant capacity/MG Duri, it would require a permit from the government or from the relevant agencies or departments concerned.

Licensing is also required for certainty and tranquility in operations Power Plant PLTG /MG Duri later. For the smooth running of this activity it has gained some support, letters of recommendation and permits required. Some of the recommendations and permits already acquired PT. PLN (Persero) through Reference Framework -EIA document preparation are :

1. Notary PT. Perusahaan Listrik Negara(Persero) No.169 dated July 30, 1994 created and delivered by Sutjipto SH.
2. Letter of Recommendation Permit Area construction Power Plant PLTG /PLTMG spines of Regent Bengkalis.

For more details, each letter licenses already held by PT. PLN (Persero) in Annex Licensing Letter.

1.4.3.1.2. Public Consultation

As the implementation of environmentally sound development, the plant capacity building activities PLTG/MG Duri is also supported by the implementation of the Environmental Impact Assessment Study (EIA) as an instrument of environmental management. The public consultation carried out to affected communities, in accordance with the Regulation of the Minister of Environment of the Republic of Indonesia No.17 Year 2012 on Guidelines for Community Involvement in the Process of Environmental Impact Assessment and Environmental Permit.

Public consultation is intended to provide insight and understanding from the proponent to the people who live around the action plan. In this case will be explained the intent, purpose and usefulness of activities, and the impact of possible effects. Ensuring transparency in the overall process of the EIA of the planned activities; and creating an equal partnership between all interested parties. Public consultations not only provide more extensive information on the planned activities of the community, but also the proponent can obtain information about the condition of riel in the field, such as problems arising from the existence of the project as well as advice and expectations of the public to the existence of the project.

Public consultation relating to the plan to increase plant capacity PLTG/MG Duri was held on Wednesday 16 April 2014 at the Aula Pungut Central Office. The Minutes of the public consultation exercise, the attendance list and suggestions opinions can be seen in Annex 2.

The material presented in the form of public consultation:

a. Provide information about the purpose of increasing plant capacity PLTG/MG Duri.
b. Provides information about planned activities that will include time, implementing organizational structure, technical execution, used equipment, handling equipment and other materials used and the effects of positive and negative short-term and long term.
c. Providing employment information includes, labor required specifications, and regulations as well as the selection process working labor and duration of activity.

The results of the public consultation concludes that the community Balai Pungut village support planned activities, provided that the proponent meet some of the demands of society such as the use of local labor, repairs of damaged roads, repair damaged rivers and foster good communication and harmonious with the surrounding community. If this can not be implemented by the proponent, the people will reject these action plans. Party people also asked prior to the implementation of development do so made MOU or letter of agreement between the PT. PLN (Persero) with the community.

1.4.3.1.3. Acceptance of Labor

Labor requirements for activities to increase plant capacity PLTG/MG Duri relatively large. Labor consists of non- labor skill and skill with various levels of education. The activities of the construction works carried out by the contractor. Most workers are local workers, except for workers with special skills (skills). The use of local labor will also impact on the efficiency of the process of mobilization. The impact is opening up new employment opportunities for the community as well as increased revenu.

Recruitment will be done by the contractors. The contractor will be required prioritize local labor, but if not available then the contractor will recruit from outside Bengkalis even outside the province of Riau. Implementation of the construction Power Plant PLTG/MG 200 MW is expected to take ± 12 months to the operation of the Power Plant PLTG/MG Duri.

Recruitment is done in stages according to the stages that have been planned. The need for labor is composed of two groups of work, namely the civil work and installation work and commissioning. Civilian workers needed mainly in the mobilization of equipment and material, site preparation and foundation work turbines or generators. Mechanical works include gas filters, scrubbers, piping and air compressor. While the electrical work done primarily on the installation work of transformers, switch yard, LV switch yard, protection and metering. Labor requirements based on the number and skill level of workers can be seen in Table 1.2.

Tabel 1. 2.
Manpower Utilization Plan In Phase Construction

No.	Position	Qualification	Amount (Person)	Experience (Years)	Origin
1.	Project Direktur	S2	1	20	Nationall
2.	Chief Design	S2	1	20	Riau Province
3.	Mechanical Engineer	S1	1	15	Riau Province
4.	Electrical Engineer	S1	1	15	Riau Province
5.	Civil Engineer	S1	1	15	Riau Province
6.	Chief Contruction	S1	1	10	Riau Province
7.	Mechanical Contruction	S1	1	10	Riau Province
8.	Electrical Contruction	S1	1	10	Riau Province
9.	Civil Contruction	S1	1	8	Riau Province
10.	Logistic	S1	1	5	Districts Pinggir
11.	Design Drafter	S1	1	5	Riau Province
12.	Surveyor	S1	1	5	Riau Province
13.	handyman	SD	20	5	Local
14.	Blue-collar workers	SD	30	1	Local
	Jumlah		**62**		

Source : PT. PLN (Persero)

Given the construction work Power Plant PLTG/MG Duri is a job that is not labor-intensive, but requires special skills, then there are many workers who will be accepted. Workers who will be employed mostly skilled workers. Thus the later portion of the workforce will come from outside the Regency of Uptown. However, for tasks that can be done by local people, then community around would be an advantage in recruitment. If bringing in labor from abroad, then preferably workers coming from the region and the province of Riau Bengkalis. The organizational structure consists of a project manager, assisted by the Director of Finance & Administration, cheif Design, Construction and Logistics Chief, artisan and laborer.

1.4.3.2. Construction phase

Activity in the construction phase consists of the mobilization of equipment and materials; Land clearing; construction of the foundation; installation of generators, turbines and compressors; switch construction yard as well as testing and trials.

1.4.3.2.1. Mobility Equipment and Material

Mobilization of equipment and material are activities to include equipment and materials used in building power plants and support facilities. Equipment and material imported or transported from a location outside the action plan by truck. The equipment will be mobilized in the form of equipment for foundation work site plant, construction yard switch, Power Plant PLTG (generator, turbine and compressor) and other equipment.

Power Plant PLTG construction activity is an activity of civil construction, mechanical and electrical, so that the smooth development activities require equipment that can facilitate and ease the work (heavy equipment). All equipment and materials needed to build the Power Plant PLTG/MG Duri imported from outside the region through the mobilization of equipment and material.

Mobilization of equipment machinery Power Plant PLTG/MG Duri will be done through Mandau River then transported through the village streets to the location of the Power Plant PLTG/MG Duri. This activity will have an impact in the form of damage to the Mandau River and the road to be traversed in view of the weight of the engine Power Plant PLTG/MG is quite large. Equipment and material from outside the area to the location of the action plan to ship towards River Kulim adjacent to the location of the planned activities. From Kulim River will be transported by truck to the location of the Power Plant PLTG/MG Duri.

Table 1. 3.
Estimates of Type and Amount Equipment Needed

No.	Types of Devices	Number (units)	No.	Types of Devices	Number (units)
1.	Crowler Cranes (70 – 300 tons)	2	20.	Forklifts	2
2.	Truck Cranes (50 – 250 tons)	3	21.	Rotari blast hole drills	3
3.	Hydraulic Cranes (15 – 150 tons)	2	22.	Crushers	
4.	Rail Mounted Gantry Crane (u[tp 600 tons)	1	23.	Transit mixer	1
5.	Tower Cranes (up to 120 tons)	1	24.	Concrete pumps	3
6.	Pedestal Mounted Cranes (15 – 90 tons)	1	25.	Concrete mixing plants	1
7.	Guyed Derricks	1	26.	Concrete buggies	2
8.	Stiff Leg Derricks	1	27.	Hydraulic submersible pumps	1
9.	Pickup Truck	2	28.	Asphalt payer	1
10.	Flatbed Truck	3	29.	Barge mounted drPingirrs	1
11.	Traillers	2	30.	Compressors	2
12.	Utility Wagon (Jeeps)	2	31.	Welding mechines	10
13.	Tracktors	2	32.	Generator	4
14.	Dump Trucks	10	33.	Misc motor	10
15.	Cherry Pickers	2	34.	Scraper	1
16.	Bulldozers	2	35.	Pile driver/hammer	4
17.	Trenchers/Backhoe	2	36.	Whell loader	4
18.	Compactors/Motor Graders	2	37.	Slip from and aux. Equitment (unit/m3)	500
19.	Hydraulic Shovels	1			

Source : PT. PLN (Persero)

1.4.3.2.2. Maturation Land

The location of the construction plans Power Plant PLTG /MG Duri is an area of land planning in PT. PLN (Persero), which is a stretch vegetated low. In order to do the logging and land clearance, use several types of heavy equipment such as bulldozers and escavator and light equipment such as chain saw machines, machetes and hoes. Shrub land that has a tree with a diameter of more than 10 cm, was cut by the use of chain saw, while small plants cut down with machetes and sickles. Wood and shrubs perishable removed with a escavator or pushed to the Pingir by using a bulldozer.

After the cleaning process is done by using land hoarding hoard acquired from the area of the Balai Pungut Village and from other regions. Given the project's land that will be used as a Power Plant PLTG construction site is 1 to 5 m below the height of the road, then the average height of the pile soil around 1-5 meters and then coated with gravel for hardening as thick as 10 -15 cm.

To hoarding area of ± 9.87 hectares with a height of 1-5 meters, it will take soil and gravel piled around 98 700 s/d 493 500 m3. When the average freight car ground has a capacity of 20 ton/truck, it is necessary 4935-24675 truck piled soil. Timbun soil will be taken from nearby locations with a distance of ± 3-5 km.

Basically the manufacture of the drainage channel is intended to avoid the location of the Power Plant PLTG from the puddle. Drainage on the need for channeling water runoff on projects that appear on a rainy day, including water used by employees in performing activities of daily routine. In other words, the drainage channel was built not to handle the liquid waste processing engine cooling. Therefore, the primary drainage development is built around the building and then the secondary channel surround the entire project heading to Kulim River.

1.4.3.2.3 . Development Foundation

The foundation is the bottom as a solid foundation for the establishment of a building that will be done. The development activities are working foundation excavation and foundation casting for generating position and switch yard. Before carrying out the activities of the foundation, it is necessary to lay out from plants and other utility. General lay out of the construction of the Power Plant PLTG/MG 200 MW can be seen in Figure 1.3.

The stages of construction of the foundation are as follows :

a. Excavation, undertaken after location prepared so done making the holes to make the concrete cast as a good foundation for a Power Plant PLTG/MG and footprint for switch yard. The results of the excavation of compacted soil around the location of the planned activities.

b. Casting, is a series of drafting the framework of the stirrup iron or steel pipe , then make a mold for casting. Cast concrete is done by concrete Mollen. Cast concrete foundation designed according to the technical standard plant, which is able to withstand gravity and vibration equipment / machinery plant and order a switch yard.

Construction of foundations for plant footprint and the footprint switch yard is civil works, mechanical and electrical, which includes the following work:

1. Civil Works
   a. Peg (Bouwplank)
   b. Stripping and stockpiling
   c. Drains
   d. Making notch equipment (*Trafo, Circuit breakers, Switches disconecting, lightning arresters, curent transformers, potential transformers, relay panels, control panels, etc.).*
   e. Manufacture got cable
   f. Making the control room panel and battery space
   g. Trech cable manufacture of Power Plant PLTG/MG to the location of the switch yard
   h. Foundation construction fence around the plant

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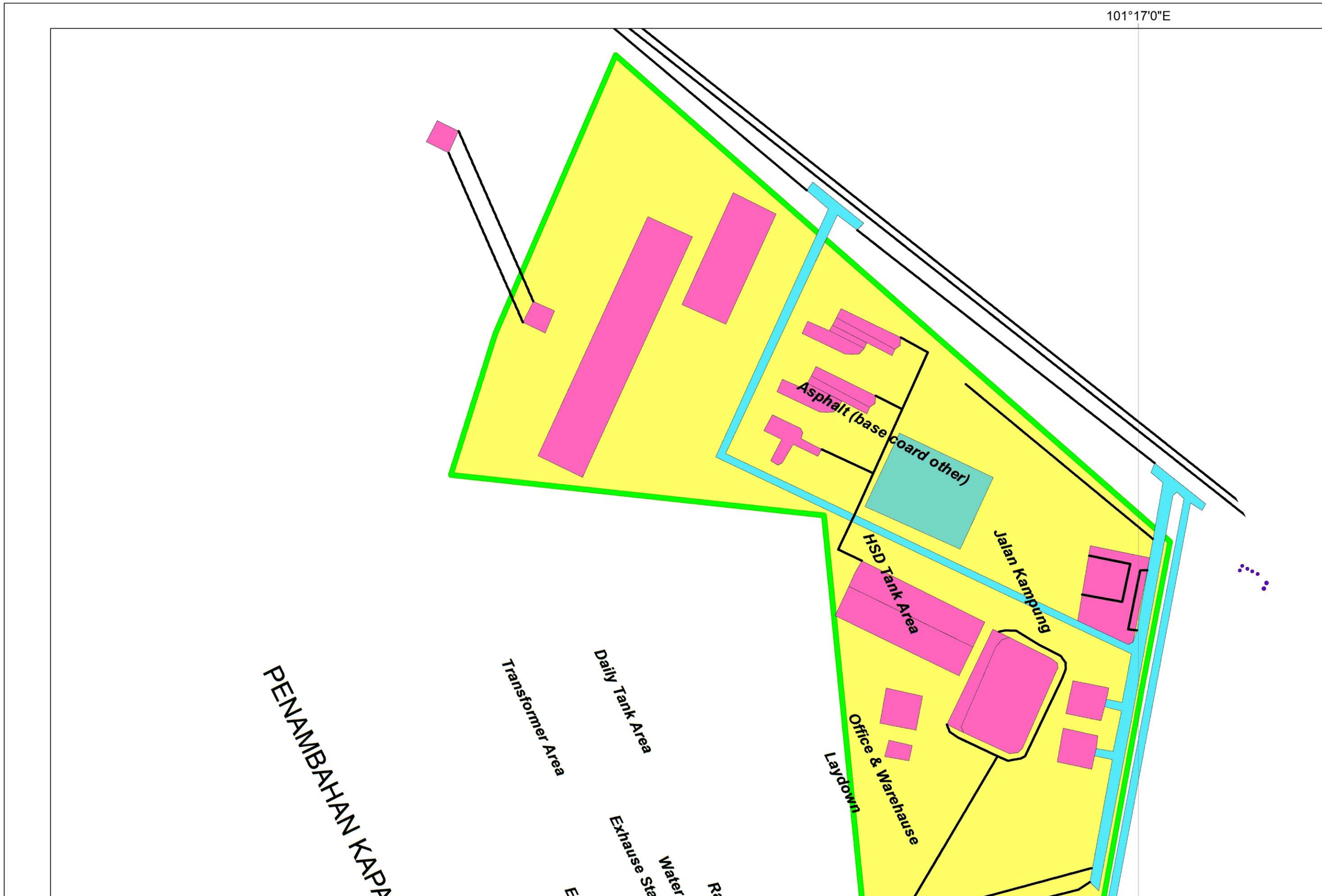


2. Mechanical and Electrical Works
   a. manufacture and installation of equipment (CB,DS,CVT,LA,and PT)
   b. Manufacture and installation of serandang post (support)
   c. Manufacture and installation of serandang beam (gantry) and
   d. Manufacture and installation of cable shelves plate borders, close the drain wires.

3. Installation of Generator, Turbine and Compressor

   Gas turbine, generator and compressor is the main equipment in building the Power Plant PLTG/MG Duri. This equipment was installed after the house's position and generating equipment (Generators, Turbines and Compressors) is completed, then proceed with the installation work and installation of generators, turbines, compressors and other ancillary equipment, as well as utility equipment. Mounting job generator, turbine and compressor along with utility equipment, is in the construction and installation packages PLTG/MG.

After the installation of a gas turbine, compressor and generator mechanically continued to work on the electrical generator and utility equipment. The electrical jobs include:

1. Installation of transformers and other transformer equipment

   a. Conservator
   b. Radiator fins
   c. Tap changer
   d. The pipes
   e. Meters
   f. Bushing - bushing and connecting
   g. Internal and external wiring power transformer
   h. Filtering of transformer oil
   i. Disconnecting switch
   j. Circuit break
   k. Neutral current transformer
   l. Current transformers
   m. Lightning arresters
   n. Capacitor voltage transformers
   o. Neutral current resistance
   p. Cubicle
   q. Panels
   r. Power cable
   s. Busbar and insulator strings and fittings
   t. Head towards the power transformer
   u. Grounding equipment
   v. Grounding wire
   w. Conductor to terminal equipment
   x. Wiring between equipment

2. Installation of control equipment

a. Transmission line control panel
b. Transformator control panel
c. Fault recorder control
d. Kwh meter
e Bus couple control panel
f. AC/DC control panel
g. Sycronizing control panel

3. Installation of equipment in the room battery

a. Mounting panel AC/DC and battery
b. Panels top of the stand that has been determined
c. The panel fastening bolt and nut or welded
d. Stringing battery and install a series arrangement of panels DC connecting cable to the positive pole and negative
e. Charging the battery with an electrolyte solution
f . Charging the battery using a battery charger
g. Connecting body electrical panels inside the building with the installation of the grounding.

Construction switch yard is the mechanical work in the form of coupling steel for equipment mounting electrical switch yard and as a pillar equipment current transformer (TA), voltage transformer (TT), switch the separator/disconnenting switch (PMS), circuit breaker/circuit breaker (PMT) and etc.

Switch yard section of the substation where the laying of the main components of the substation. Switch yard is a collection of electrical energy from the Power Plant PLTG and to raise the voltage through the transformer to be channeled into the substation or to connect the main components to the rails (busbar). All generators in power stations channeling energy into electrical center (busbar). Likewise, all channels are taking or sending energy connected to these rails

1.4.3.2.4 Installation Generators, Turbines and Compressors

Gas turbine, generator and compressor is the main equipment in the construction of the Power Plant PLTG. This equipment was installed after the cradle and home to plant equipment (generators, turbines and compressors) is completed, then proceed with the installation work and installation of generators, turbines, compressors and other ancillary equipment and utility equitment. Installation of generators, turbines, compressors and other ancillary equipment and utility equitment is in the construction and installation packages PLTG.

The gas turbine is used to drive a variety of mechanical equipment, for example a pump and compressor or an electric generator. The gas turbine is a machine suitable energy conversion as an alternative because it produces electricity with considerable power and high efficiency. For the same needs gas turbines have advantages over other

similar installations, such as the size, mass and power output unit, gas turbines can achieve peak load in a relatively short time.

At the time of start the gas turbine mechanical power required to rotate the turbine shaft and the shaft of the compressor in order to get the pressurized air is mixed with fuel in the combustion chamber which can then be ignited to produce combustion gases drive the turbine so that the turbine akbhirnya move. Mechanical power to start the turbine comes from the generator as a motor start.

1.4.3.2.5. Konstruksi Switch Yard

Construction switch yard is the work of a mechanical form of the concatenation of the steel frame for mounting equipment elektrical switch yard and as a pillar equipment current transformer (TA), voltage transformer (TT), scalar separating or *disconnecting switch* (PMS), *circuit breaker / circuit breaker* (PMS) etc.

Switch yard is part of the substation where the laying of the main components of the substation. Switch yard (switchyard) is a collection of electrical energy from the Power Plant PLTG and to raise the voltage through the transformer to be channeled into the substation or to connect the main components to the rails (busbar). All generators in power stations channeling energy into electrical center (busbar). Likewise, all channels are taking or sending energy by connecting to these rails.

1.4.3.2.6. Testing and Trials

Activity testing is a process or way to test something and trials are testing something before use or prior to full operation. Before the system PLTG/MG is ready for operation, first performed inspection or testing, proving the performance of the equipment/unit to contract terms, security, and reliability of operation which aims to bring plants from non-active to active state. Testing standards and testing are as follows :

a. Testing the power, Efficiency and Performance/Characteristics more gas turbines imposed standard ISO 2314 (1973) completely.

b. Applied testing equipment testing standards that apply within the PT. PLN (Persero) or other standards approved by the coordinator of examiners and contractors

Testing activities consist of several periods, including the following :

1. Installation Period

   Tests on the installation period is to determine a state which indicates that the main parts are mounted and ready to be tested in a way that although there are some who have not installed equipment will not reduce the safety and reliability of operation.

2. Testing Period Prior Street

   This event was held for the accuracy of equipment installation, completeness of equipment based on the specifications of the contract, in accordance with common technical and completeness of equipment for testing, including :

a. Testing Individual

Activity testing equipment individually separated subsystems, to prove the individual equipment is functioning well, in this case the generator, transformers, breakers high voltage (PMT), reinforcement, separation of high voltage (PMS), cable and Busduct medium voltage, PHB medium voltage, motors medium voltage meter electric meters, relays testing characteristics, battery and charging the battery, voltage transformers, current transformers, inverters, manometers, switches and appliances bookmark, recording automatically, the windpipe and gas, pipeline controllers pneumatic systems, tanks and the safety valve.

b. Testing Subsystem

Activity tests on subsystems to prove that the subsystems are integrated to function well, in this case the load testing of the pump (motor, earthing, flow measurement, temperature measurement pads and the pump house, the measurement of vibration and looseness), testing all the work of all the equipment, performance testing, test the working order and locking system, a motor protection system testing, testing tools pointing electrical/pneumatic meter-meter control systems and simulation testing.

c. Testing Systems

Activity testing of the system to prove that the subsystem/equipment is integrated to function properly, making it possible to startup, in this case the testing of gas turbine system (Ignition, phasing the increase in rotation, protection turbines), testing the performance of unit Power Plant PLTG/MG (southwest the resulting, kalir user specifications and thermal efficiency)

3. Testing Introduction

This testing activity includes startup (First ignition combustion that indicates the unit undergoing a process of energy, safety device test, parallel (when the first generator is connected to a network that signifies the generating unit is whole produce electrical energy), the test load and off load testing.

4. Testing Ready

This testing activity includes the testing is ready to, performance testing and reliability testing (600 hours continuously without disconnection) subsequent admission (transfer of responsibility for the unit from the contractor to PT. PLN (Persero).

After the construction and installation of PLTG/MG is complete it will do the commissioning. The commissioning of the Power Plant PLTG/MG is a series of some of the activities of inspection and testing of several subsystems, namely :

a. The commissioning of the Gas Turbine
b. The commissioning of Generators and Excitation
c. The commissioning of the Bay Transformer Generator
d. Commissioning Performance
e. Building Electrical Installation commissioning more

The general implementation of the commissioning of generating units divided into several stages following activities :

a. Preliminary examination
b. The individual test
c. Test sub-system, including :
d. Sequential test interlock
e. Test protection
f. Test control electrical/pneumatic
g. Road test system
h. Test the system, including :
i. Test equipment safety/road test without load
j . Lalan test load
k. Test off load
l. Inspection
m. Test reliability
n . Performance test

In assessing/evaluating the test results in the commissioning, it can not be determined only one-sided, given the many variables. Thus it must be taken several agreements among others :

a. All parties must agree on how the settlement will be reached in the event of a difference of opinion regarding the accuracy of observers, conditions and methods of operation and the results of the end of each test.
b. All parties need to agree on a formula that will be used to calculate the error factor to evaluate the data and the possible maximum error that can be tolerated without having to repeat the test. This agreement wherever possible include a decimal number that is used in the calculation as well as a decimal rounding criteria.
c. All parties must agree on matters that may invalidate the test.
d. In terms of inspection activities, it is necessary to achieve an agreement on the extent to which the results of the joint inspection can allow kontraktqr to be able to carry out the next phase of work.
e. All parties must agree on the quantities or limits used to determine that the equipment will perform well in testing commissioning.
f. All parties must agree on the current standard used yarig related to commissioning, or refer to the user guide mill (instruction manual).

Documents to be prepared by the contractor and supplier/factory equipment in order commissioning is :

a. Contract documents, particularly those concerning technical specifications and warranty
b. List of material/equipment (material lists), descriptions and test certificates for parts or major components.
c. Installation engineering drawings and installation data

d. Logic diagrams, single line diagram, schematic diagram
e. Performance curve and the curve correction
f. Instruction or manual operation, inspection and maintenance
g. Instuctions assembly or disassembly of the equipment or parts of equipment
h. Instructions about safety.
i. List of original spare parts, as mentioned in the contract
j. Standard books relating to the installation/equipment being tested.
k. Book manufacturer's instructions, tables or curves for correction calculations.
l. Commissioning schedule
m. Testing procedure
n. Factory test report
o. The results of the inspection, testing and measurements made by the contractors and manufacturers who poured in blank or appropriate forms and their evaluation.
p. Other data required for the operation and maintenance of the unit such as: data and characteristics of the equipment; description of the various fuel system; cooling system; lubrication system; temperature limit values; pressure limit values.

These documents must be available before / during commissioning implemented

The commissioning of the Gas Turbine

Is a series of continuous, starting when the installation is complete (Construction Essentially complete) until " handover " (taking over) with the aim of bringing the system from the inactive to the active condition to conduct the inspection, cleaning, individual test, test subsystem and test systems for proof of contract requirements or the safety and reliability of operation.

Komisioning Generator dan Eksitasi

Generator and excitation is part of the electrical system that is vital from an electric power generation system. This tool which converts mechanical energy into electrical power. The operational state of a generator set ranging from good planning, including the selection of the design specifications, installation, testing, operation and maintenance. Testing is a sequence of process steps of the process, from development through to handover an installation.

Komisioning Bay Trafo Generator

Bay transformer generator part of a power system that serves to raise the generator voltage before electrical power is transmitted. Thus it is also necessary testing.

Commissioning Performance

Once all of the individual testing, subsystem or system is done, the final test is test performance. In past testing has not been tested with regard to performance. It is not enough. The equipment is run not only the origin operates, but how the generating units can produce maximum efficiency.

This test procedure is used in order to handover from the manufacturer to the customer required in the handover is a procedure to determine the technical efficiency, by

taking measurements directly comparing the heat energy required to energy produced, and number loss-losses contained in the combustion process and remnants of combustion.

In the case of inconclusive do direct measurements of the thermal energy is needed or the energy generated by the expected accuracy, it is provided guidelines for evaluating the efficiency of the method of heat measurements.

The commissioning of the Electrical Installation Other Building

Electrical installation in question is the installation of electricity for lighting and power installations to support the activities of generation. This installation is attached to the main building power plants and other buildings that exist in plants such as buildings for offices, workshops, warehouses, etc. Supporting electrical installation must also be safe and reliable in order not to disrupt the process of generation. To anticipate this, the truth of the installation need to be checked in accordance with applicable regulations .

1.4.3.3. Post-Construction Phase

Post-construction phase activities such as demobilization of equipment used during the construction phase and termination of employment (FLE) to local contractors and labor used during the construction phase.

1.4.3.3.1. Demobilization of Equipment

Equipment used during the construction of the Power Plant PLTG/MG Duri will be returned or demobilization. To that end, ahead of operations Power Plant PLTG/MG then heavy equipment including tools supporting mechanical and electrical construction must be removed from the location of the plants. Given the construction work carried out by contractors (third-party), then the heavy equipment and other equipment will be moved to a warehouse or storage area belonging to the contractors.

1.4.3.3.2. Work termination

Labor used during the construction of the physical plant is a civilian power and mechanic and some of them are unskilled workers who are paid daily (day laborers). Qualification of civil and mechanical work force is largely in accordance with the classification of the manpower needed for the operation of power plants. Therefore, there will be layoffs of Power Plant PLTG construction contractor. Most of these workers were expected to meet the requirements and qualifications of labor allows the plant to be employed as employees of the Power Plant PLTG at the time of operational gas power plants.

1.4.3.4. Operation phase

Activity in the operational phase consists of the recruitment, the production of electrical energy, maintenance of generators, waste management (including waste Hazardous and Toxic Materials), greening and corporate social responsibility (CSR).

1.4.3.4.1. Acceptance of Labor

Labor needed for the operation of the Power Plant PLTG/MG Duri form of labor skills, security and cleanliness. The number of workers who will be hired as needed. Expected to employment security (security) and hygiene come from the local labor force.

The number of workers needed at this stage of the operation is estimated as many as ±27 people. Recruitment activities will be pursued to use local workers, especially those who live in Pingir District . Learn amount of labor needed at this stage of the operation can be seen in Table 1.4 .

Table 1. 4.
Estimated Total Workforce power plant PLTG/MG Duri in Phase Operation

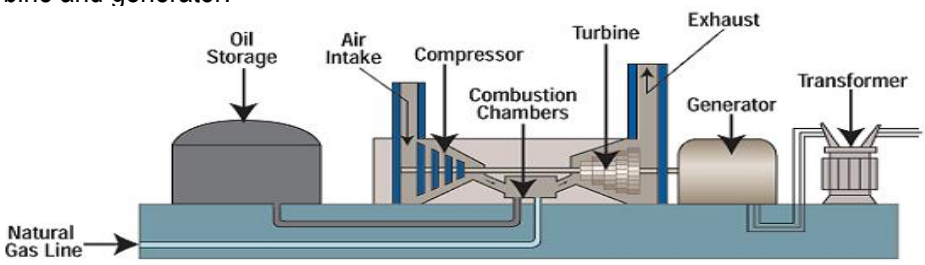
No	Classification	Amount	Origin
1.	Manager	1	Nasional
2.	Supervisor	6	Riau Province
3.	Enginer Mesin	2	Riau Province
4.	Enginer Listrik	2	Riau Province
5.	Enginer Kontrol/Instrumen	2	Riau Province
6.	Enginer Gas Handling	2	Riau Province
7.	Power Assistant / Implementer	5	Riau Province/ Regency Bengkalis
8.	Operator	10	Riau Province/ Regency Bengkalis
9.	Security	15	Pinggir Districts / Village Balai Pungut
	Total	***45***	

Source : PT. PLN (Persero)

1.4.3.4.2. Electrical Energy Production

A. Gas Power (PLTG)

The Power Plant PLTG is one kind of power plants that use a turbine driving the generator with gas as the working fluid. Compared to other power plants, gas turbine is a simple plant that consists of four main components, namely compressor, combustor, gas turbine and generator.

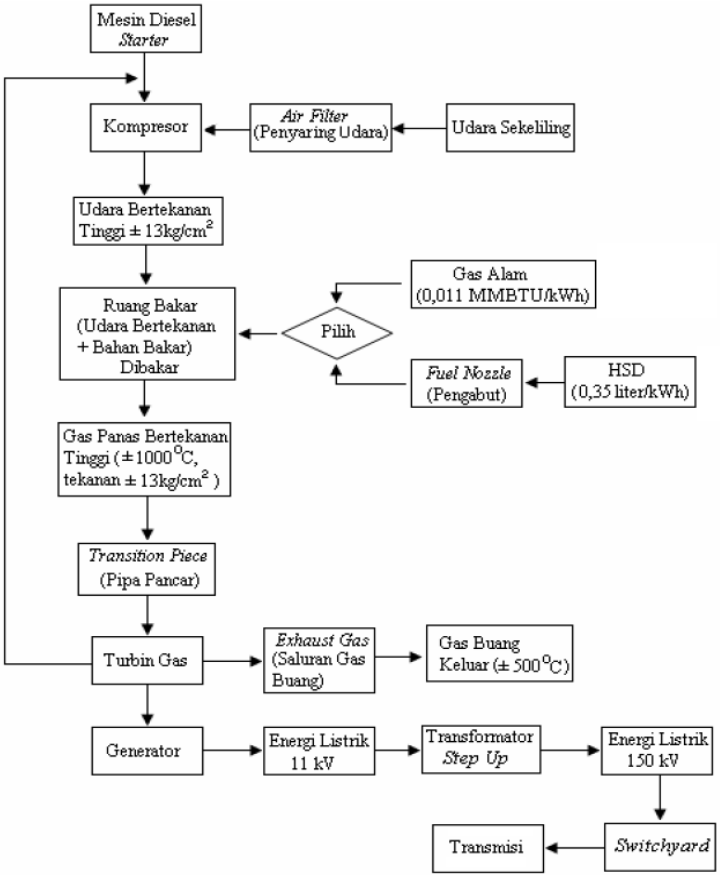


Picture 1. 6.
Working Principle Gas Power Plant PLTG (PLTG)

The Power Plant PLTG is vibration-free engine, there are no moving parts of the machine translation (back and forth). The temperature of the gas turbine (900-1300 °C) is much higher than at other types of turbines. Thermal conversion efficiency reaches 20% -30%. Peak load Power Plant PLTG shoulder function because it requires a very large fuel at a high cost (low investment costs but high operating costs). In the picture above, are shown the basic concept of generation by Power Plant PLTG system. Air into the compressor to the pressure increased to approximately 13 kg/cm^2 and then the compressed air supplied to the combustion chamber. When used Fuel Gas, the gas can be directly mixed with compressed air had to be burned. But when used in fuel oil, then the fuel must be used first and mist mixed with compressed air for the next burn. Mechanical mixing fuel with air in the combustion chamber is very influential in the combustion efficiency. In this Power Plant PLTG fuels used are not always gas (natural gas) but could use fuels such as diesel oil/HSD (High Speed Diesel Oil). For PLTMG in this plant unit using natural gas fuel and HSD. Here is a flow chart of the process PLTMG work itself is as follows:

Picture 1. 7.
Plant Process Flow Chart Generator PLTG

The working principle of the Power Plant PLTG that is starting to run the compressor shaft and a gas turbine to rotate, for that we need a mechanical power to mengkopel so that the shaft rotates so that the diesel engine is used as a starter to start the turbine and compressor. In this diesel engine uses direct current motor with a battery as a media dphmenggunakan starter. After that decision ambient air using a compressor through a water filter (air filter) that allows the dust particles did not enter into the compressor. Inside the air compressor is processed so that the air pressure be increased to pressure 13kg/cm^2.



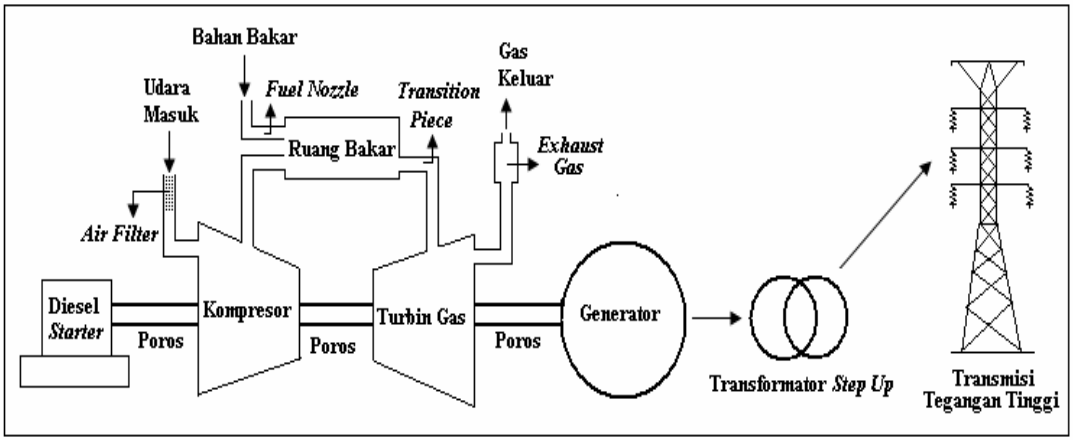
Picture 1. 8
Flow Chart Proses Kerja PLTMG

Of the heat energy produced is then used to turn a turbine where the blades in motion and stationary blades of the turbine, the hot gas temperature and pressure has decreased and the process is commonly called the expansion process. Furthermore, the mechanical energy generated by the turbine is used to turn a generator to produce electricity. As for as the central support gas power is used several tools (auxiliary equipments) to assist the process cycle gas turbine goes well.

Furthermore, the high-pressure air supplied to the combustor (combustion chamber). In this combustion chamber, pressurized air is mixed with fuel and burned. For fuel when using gas (natural gas) from gas wells, the gas supplied through pipes can be directly mixed with air to be burned, but when using diesel fuel/HSD then it should be used as fog first. For the fuel diesel/HSD was passed on a fuel nozzle (atomizer), which serves the fuel mengabutkan and pointed to the combustion chamber. After that the fuel mist that has become a new, mixed with air that is subsequently burned. When using natural gas fuel to generate 1 kWh will require fuel by 0,011 MBTU (Million British Thermal Units) and if using solar/HSD will require fuel of 0.35 liters/kWh. Of combustion produces pressurized hot gas (1000°C, pressure 13 kg/cm^{2}). Furthermore, the gas is supplied to the nozzle (transition piece) to the turbine to be sprayed to the blades of the turbine so that the turbine can rotate.

If the gas turbine spins it will drive a generator. Furthermore, from the turning generator generates a potential difference in the magnetic field between the rotor and the stator so that the generator produces electricity. Gas result of all this process in the form of hot gas with a temperature ±500°C going out to the outside air through the exhaust gas. The electrical energy produced by the generator voltage 11 kV,11kV voltage further raised to 150 kV by transformer

Power Plant PLTG equipment consists of equipment that is in such a diesel engine starter, compressor, combustor, turbine, flue gas duct (exhaust gas), generators and equipment outside as the step-up transformer as raising the voltage generated from the generator.



Picture 1. 9
Work Process PLTG

Diesel Engine Starter

To run the compressor shaft and a gas turbine to rotate, we need a mechanical power to mengkopel so that the shaft rotates so that the diesel engine is used as a starter to start the turbine and compressor. In this diesel engine uses direct current motor using the battery as a starter media. This diesel engine stopped working when the gas turbine start working, namely when the high-pressure hot gases drive the turbine at high speed and start to drive a generator.

Kompresor

The function of this compressor is to raise the air pressure that is inside the compressor. In this PLTMG there are two types of komproser used is centrifugal and axial. Mostly used in this PLTMG axial wear this type because it has a higher efficiency than the setrifugal

B. Gas Engine Power Plant PLTG

Gas Engine Power Center/Gas Engine Power Plant PLTG (PLTMG/GEPP) still pretty much operated and built in Indonesia due to several reasons, among others :

- The availability of natural gas fuel (natural gas), which is economically better when compared to fuel oil (HSD/MFO/LFO).
- The capacity of generation units that can be tailored to the needs,
- The execution, operation and maintenance is relatively simple,
- Can be used for a power supply during peak hours (peaker).

In a PLTMG, the system is not too complicated. Consisting of a main part (main equipment), in the form of machinery and complementary (engines and auxiliary), and support systems (balance of plant-BoP).

The main part is the general PLTMG engine package and complement. Part machine coupled with a generator, assisted by the complement system which regulates coolant (lubricant/lube oil, cooling water/cooling water and heat exchanger/radiator-cooling tower-heat exchanger), the system combustion air (charge water), compressed air systems for start the engine and the needs of the instrument, the air system from the combustion, piping systems - the instrument, electrical systems and system instrumentation-control.

In addition consists of the main system, the unit PLTMG also equipped with a support system, which consists of a fuel system (fuel system-gas/HSD/MFO/LFO) systems, raw water (water treatment system), and a protection system against fire (fire protection system).

The main system in PLTMG generally supplied by a major supplier (main vendor) that usually is the producer/manufacturer of gas engines. The rest, all civil works and supporting systems, carried out by the contractor. The main system (main system) from a PLTMG usually supplied by the manufacturer Machine Gas (Gas Engine manufacturer). The main system includes a combination of work makanikal-electrical instruments and controls.

Mechanical work on the main system, can be grouped into several sections, among others, Fuel System,System Lubrication, System Cooling, Air Systems Engineering, System Compressed Air, System Piping, and Gas Engineering unit.

Fuel System

PLTMG Duri use a machine with two fuels, either with a second configuration of fuel into alternating (dual -fuel), or sign in unison (bi -fuel). Because the machine is used generally uses two (2) fuel, therefore the fuel system should also be able to accommodate two fuels. In general, the treatment of both these fuels can not be equated. Therefore , the fuel system itself will usually consist of a gas fuel system (fuel gas system) and the fuel system (fuel oil system). Fuel that is commonly used is natural gas (natural gas) and diesel (HSD/MFO).

Fuel Gas System

Gaseous fuels are generally obtained from the nearest gas station. PT.PLN has teamed up with PT. PGN as a supplier of gas to fuel a Power Plant PLTG/MG. Before getting into the plant area, gas from these sources passed the cleaning area beforehand , or more often we are familiar with the term Scrubber. In this area, the gas is generally

prepared both in terms of hygiene, water content, or compressed, to be able/ready if fed directly into the gas engine unit.

Before it is fed directly into the engine, the gas is filtered again using a filter. Generally, the position of this filter will sit down with a couple of field instruments is incorporated in a gas module, whose main task is to control the volume, security systems and to ensure that gas is fed into the machine ready.

For gas fuel system, usually started since the point of connection of the fuel gas. At the point of connection of gas tapping station, need to see the scope of work there, if only to the extent of grafting tapping of the valve that has been provided, or covering all the work stations connecting gas tapping station including a collector pipe main header pipe and measurement unit (metering station).

The things to keep in mind in the design/design of fuel gas system is a safety system (protection) and measurement (metering). If we refer to the National Fire Protection Asosiation (NFPA), the equipment used for security (protection) and measurement (metering) should be of different instruments. The emphasis how important a quantity to be observed will depend heavily on a large scale and the importance of a process. Therefore, it has become a rule in the design process, drawing the first issue is drawing process. a enjinir process will usually describe the processes in the system into Diagam Flow Process.

Fuel gas system from the connection point (tapping point) to the machine building plant (engine hall) through several stages. Supplies the necessary measurements on these systems include a security system if an emergency where the supply of gas should be stopped (shut-off valve), a safety system to a height of water level in the scrubber, the safety system pressure in the scrubber, as well as safety systems on the water level condensate tank. In gas systems, in addition to the security system, also required the observation of some magnitude, among others : the pressure and temperature of the gas entered into the system, pressure and level in the scrubber, as well as the level of the condensate tank.

The magnitudes of which are quite monitored in the field mounted and there is also a need to be monitored to the main control room (central control room–CCR). All the symbols are already properly is standard symbols. Benchmark that is often used is the standard ANSI/ISA -S5.1-1984, "Instrumentation Symbols and Identification".

Fuel Oil System

Diesel fuel oil typically used for two (2) function, which is to fuel the prefix (pilot fuel) and the main fuel. The function of the main fuel is used if and only if the gas engine is operated using diesel fuel as its primary fuel, or the condition of the engine before the switch-over to the fuel gas system. While functioning as a fuel prefix (pilot fuel) will always be used in any engine operating efforts (starting and engine operation).

Before being fed into the engine, the fuel oil will be filtered first using a filter. Position the filter could be before the machine, or combined in a module at a position close to the feed pump.

Diesel fuel that exists today is generally good, so it does not need further processing using fuel oil processing facility (*advance fuel oil treatment plant*).

Unlike the fuel gas system in PLTMG which generally flow directly (pass through), fuel systems generally need shelter (storage tank).

In Indonesia, the fuel often distributed through the land , with the help of car trucks Therefore, the fuel system is in PLTMG-have generally adapted to those conditions.

To stage unloading oil from the tank, use the help of gravity, where fuel from the trucks will be collected prior to an underground tank Oil from the underground tank is then pumped to a holding tank primary (main storage tank), with the aid of a pump (un-loading pump).

From the main holding tank, fuel oil tanks distributed daily tank, using the help of a transfer pump. From tank daily, with the aid of feed pump, fuel oil will be fed into the machine.

Measurement (monitoring), control and security (protection) of the system is still being done. Measurements were made starting at the first fuel into the system. The hope we will get the actual data of fuel coming into the system.

Because many involving flammable materials, causing the process of measurement and protection would be a concern. Moreover, this system functions quite strategically to make sure the engine gets enough fuel supply, so that it can operate. as a result, the availability should be constantly monitored. The security functions in the form of an alarm signal, the observation will be the amount of the fluid level of the oil, as well as operational monitoring of pumps, will be required.

Touch-based automatic control relay-contactor or PLC control system embedded in existing pumps, hope can improve the reliability of the system. Operator previous fuel must be provided specifically for this job, it can be optimized with working hours to deal with more important matters.

2. Lubrication System

Lubricant is very important for an engine. With the lubricant, the friction can be reduced quite significantly. During the operation, the amount of lubricant in the engine experienced a slight reduction and work in a closed cycle.

Because protects the engine from friction in directly, lubricants have a high enough temperature. To return the temperature to a normal state, used the aid of a heat exchanger, which exchanges the heat of the lubricant to the cooling water. Furthermore, the cooling water that has risen this temeraturnya, cooled with the aid of the radiator.

By the time the engine is having treatment (maintenance), the oil that is still in good condition can be pumped and collected into the tank servicing lubricant. Hopefully, these lubricants can be used again after machining treatment.

Lubricants spilled in the main engine roomand spilled fuel oil (HSD/MFO/LFO) will be collected in the sump (drain pan) in each module and are then pumped to be accommodated in the tank waste materials (sludge tank). Remnants of lubricants and oils are stored in tanks of waste materials will be sent to shelters and processing of hazardous waste materials nearby, using a car transporter truck.

Before being fed into the engine and turbocharger, the oil will be filtered first using a filter. Generally, the position of this filter will sit down with a couple of field instruments is incorporated in a module lubricant.

3. *Cooling System*

The main cooling system at a Gas Engine Power Plant PLTG (PLTMG) is usually in the form of installation of the cooling tower or in the form of a radiator. Both the equipment serves to reduce the temperature of the cooling water that is used to cool the gas engine parts, lubricants and turbocharger.

Both tower cooler or radiator, for process cooling, commonly used propulsion methods forced to a cooling fan option is quite reasonable in order to minimize the initial investment costs, namely by reducing the area of land and construction costs, when compared to using a similar method natural mover

The water source for a PLTMG can be raw water that could come from the sea, rivers and wells in a previously processed through sebuaah water treatment systems, or in the form of processed water from the local water management company.

Although the water in the cooling system is working in a closed cycle, but during surgery remains a small portion of water that evaporates. It remains necessary for the addition of water, to keep the system performance can be maintained.

To improve performance and lifespan of equipment, it is advisable if the operational period, use treated water with good quality, a little addition of chemical inhibitors to prevent mildew and rust, as well as regular maintenance.

4. *Engine Air System*

Air system for a gas engine, can be roughly grouped into two (2) sections, namely: the combustion air system and the rest of the combustion air system

Combustion water system is a system that regulates the amount of air required by the engine, including adjusting the specifications to fit the needs of the machine.

Before entering into the machine, carried out screening of dust and dirt and noise level reduction Furthermore, to improve the efficiency of the engine, the air before it enters the combustion chamber will be increased tekananan and temperature so as close as possible to the pressure and temperature of fuel. For that, use tools called turbocharger.

In combustion processes involving air, of course, will be generated from the combustion air which must also be processed and distributed wisely. Because it occurs as a result of a combustion process, the combustion of the air generally has a temperature high enough. Therefore, generally channel for this type air is always covered with a heat-retaining insulation and equipped with connections capable of expansion and excess pressure relief valve.

The air from the combustion is also used more as player power turbine coupled to the compressor on the turbocharger. burning residual air is then released into the atmosphere at high altitudes refer to regulations. Especially for engines with a unit capacity greater than or equal to 25 MW, are required to use the system monitors exhaust emissions (Continuous Emission Monitoring System-CEMS), in accordance with the Regulation of the Minister of Environment No. 21 year 2008, regarding the Quality Standard Emission Source Fixed For Business or Activity Thermal Power Plant PLTG.The

larger the capacity of a machine, of course, the amount of combustion air and/or air from the combustion needed and/or generated will be many more. This will affect the magnitude of the filter, channel and reducing the noise that will be used.

5. *Compressed Air System*

Compressed air system is the auxiliary system in the main part of the electrical center. Compressed air is used at least for some functions, among others: to start the engine for propulsion purposes and instruments for the purposes of servicing.

To reduce the hours of operation of the compressor unit, used the help of compressed air tube to accommodate the amount of compressed air and a certain pressure.

Especially for air movers instrument, compressed air needs to be treated additionally, that with the addition of air conditioning. The hope, the air used for the driving instrument, such as control valves, is already quite dry and free of moisture, which can damage control equipment, such as a steering valve openings.

6. *Piping System*

The pipes are used as an intermediary between the fluid media so they can support each operation of a gas engine. The pipes are designed and arranged in such a way, hopes to channel the working fluid to its destination with the number and the proper pressure.

Kinds of pipes and pipe fittings will depend heavily on the use of the fluid in question. Such as for gas fluid, pipe used must meet the standards of API 5L, welded by following the standard API 1104 and AWS, as well as conducted testing as required by the employer. Gas pipes will be given the observations.

7. *Gas Engine unit*

Gas engine units to be used according to the required capacity. Planners that define the configuration and specification of the machine to be used, with the support of relevant data from the employer. These criteria include regulating how many units of the machine that will be used, how the capacity of each unit of the machine, its use for base load or peak load, as well as the main fuel that will be used.

Regarding the design of machines and other things that are quite specific to the machine, generally very dependent on the manufacturer of the machine in question. The manufacturer considered to be more aware of the detail of the machine in question, because it is they who conduct research and development process of the machine.

Electrical jobs, can be classified into several types, namely:

1. Electrical Installation Works and Lighting
2. Electrical Works Fuel Systems
3. Work Eletrikal Lubricating System,
4. Cooling System Electrical Works,
5. Electrical Works Air Systems Engineering,
6. Electrical Works Compressed Air Systems,
7. Electrical Works of Fire Protection Systems,
8. Black Start Generator Unit,

9. Unit Auxiliary Transformer (UAT) & Generator Transformer (GT),
10. Engine Generator Unit,
11. System Grounding and Lightning Distributors
12. System DC, and
13. System Protection.

Job-control instrumentation is supporting the work of mechanical and electrical work with the aid of measuring tools and controllers, so that the unit can function properly PLTMG and easier to operate. As if it is classified, job-control instrumentation is as follows:

1. Installation Work Field Instruments and Data Communications
2. Work Instruments Fuel Systems
3. Work Instrument Lubricating System,
4. Work Instrument Cooling System,
5. Work Instrument Air Systems Engineering,
6. Work Instruments Compressed Air Systems,
7. Work Instruments Electrical System,
8. Work Detector Fire (Fire & Gas Detection and Alarm System),
9. Works Closed Circuit Tele Vision (CCTV),
10. Internal Telephone System Works (Plant Internal Telephone System-PABX)
11. Job-Control Instrumentation Engineering Unit Gas, and
12. Control System,

Water Treatment System

Air quality and adequate quantities will be very instrumental in supporting the operation of a PLTMG. How not, the need for a cooling system remains dependent on the availability of water. In fact, because of his role which is quite crucial, sometimes raw water system prerequisite lot of things. Therefore, to as producer-gas engine, raw water system is directly integrated in their handle and major equipment.

Basically, the water in a cooling blanket PLTMG used for gas-engine and the lubricating oil as a cooling medium, typically used the aid of a heat exchanger, and includes a radiator or cooling tower.

Water sources can originate from deep wells. Water is processed to have certain specifications. Water treatment raw water can be carried out through a system of Reverse Osmosis (RO).

Fire Protection System

Protection system against fire is one of the main support at a central facility of electricity, including hydro-power gas engines (PLTMG). Without equipped with a security system against fire, an electrical center certainly will not obtain permission to operate.

A simple analogy is as follows, a power center is a vital facility related to fuel, heat, electricity high voltage, large pressure, etc., which have the potential dangers of burning quite high. Therefore, the facility is the first protection against this potential is a must.

System protection against fire in the electrical center can generally be grouped into two (2) large groups, namely fire extinguishing systems (firefighting system-FF) and fire detection systems (fire alarm system-FA).

Firefighting System

Fire extinguishing system in the power station almost the same as fire extinguishing systems on most other facilities, such as factories and buildings. The main system is the installation of piping prepared with certain pressurized water, which at times can be used to extinguish the fire in case of fire.

The system is supported by the fire-fighting pumps with capacity and pressure. Configuring the pumps are composed of Firefighting Pumps-Electrical, Fire Pumps-Diesel, as well as the Jockey pump. Each pump, drive (electric motor and a diesel engine), as well as the electrical panel must be standardized National Fire Protection Asosiation (NFPA), Underwriters Laboratories Inc. (UL) and Factory Mutual (FM).

For certain parts of a power station, such as PLTMG are additional to the fire extinguishing systems, among others: fire extinguisher/fire extinguisher and foam fluid system

Fire extinguisher are generally placed in certain places are feared if the outage using water, can damage equipment, such as in space, while panels for foam liquid systems are usually placed on the fuel tanks.

Fire extinguishing system will be made to minimize the damage caused by fire to the plant equipment and the building. Fire extinguishing systems include fire detection and reactor shutdown systems using Hydrant and fire extinguisher.

The main fire detection panel is placed in the control room stations and local panels will be placed on each block area. Fire extinguishing systems and unattended areas (example outdor transformers, fuel tanks, etc.) will be activated automatically by the fire alarm signal from the detector.

Each fire extinguishing systems consist of the complete system according to the criteria according to Code National Fire Protection Association (NFPA) and other habits-habits recommended.

Fire Alarm System

Fire detection system in an electric sort PLTMG center will focus on the detection area of machine building plants, panel space, the main control room, administration building, as well as for the unit generator transformers.

Fire detection focused on the detection of thermal, detection of smoke and gas detection, particularly in the area of machine building plants.

C. Handling Fuel Gas

The characteristics and properties of the physical and chemical gas fuel is very different to oil, oil or coal. Due to the use of fuel gas as a fuel has special handling compared to other fuels.

a. Gas Detection Equipment

Natural gas as fuel for the Power Plant PLTG/MG Duri because it is colorless then to detect leaks, then at places convenient gas leak or in a puddle or gas cumulate gas detectors must be installed.

b. Air ventilation

Places where the gas leak or easily stagnate or accumulate or the area around the burner is a dangerous place, the air vents should be installed in these places. Ventilation air serves to transport the gas to the outside air.

c. Flame Detection

Flame detector is used to detect the burner flame. Gas flame does not emit light, and are detected by ultraviolet light, but it is also used flame detection used to detect the infra red rays of flame rays result from water vapor.

d. Fuel Valve and Valve Interception

1. Based on the standard of NPFA (National Fire Protection Association, USA), each Interception Valve to enter the burner should be two. Interception between the two must be installed Gas Valve Vent Valve. Interception Valve closed when the Gas Vent Valve open, otherwise when Interception Valve open, Gas Vent Valve must be closed.
2. Gas Vent Valve is associated with the discharge pipe, where the end of the discharge pipe is directed to a non hazardous area. Because LNG has a specific gravity that is lighter than air, where release is above the boiler.

e. Gas Flow Settings

Gas flow meter is used to adjust the volume flow of fuel gas to the boiler needs, in line with changes in free. Before entering into the boiler, the gas flows with high pressure, where the pressure needs to be lowered before entering into the gas burner. Therefore, in addition mounted Gas Flow Regulation Valve Decompression Gas Valve also installed, which serves to lower the fuel pressure gas, before being discharged to the gas burner.

f. Inactive Gas Pouring Equitment

In the furnace gas pipes or fuel that has been stopped a long time, for security so that no explosion, need to be included inactive gas (nitrogen, etc.), then it needs to be installed. Inactive Gas Pouring Equitment. or in a pipe or a place that will pass the fuel gas must be held air exchange with the gas stream is not active before, after the fuel gas is passed.

g. Furnace Purge dan Minimun Air Flow Rate

Purge Furnace is necessary when the boiler is in operation or when it will stop. The goal is to remove the remaining fuel in the furnace by flowing air from the IDF. Air flow to purge the furnace must exceed 25% of the air flow when the boiler is working on the load when the load operas maksimal. and air flow in the boiler must be controlled in such a way so as not to lower the air flow to Furnace Purge.

h. Fuel Interception Interlock

At the time of the boiler in the operational state, in case things like this, there will be the closing of the gas supply takes place automatically and quickly, namely:

- The pressure drop for the gas fuel supply, wherein the gas pressure is below the minimum tenakan to maintain the stability of the flame.
- The air flow is very low (below 5% Purge flow)
- Cessation of IDF (Induced Draft Fun)
- Overall total gas burner die.
- Most of the dead and the gas burner this condition causes danger for the entire plant, usually resulting in the disruption of air flow system or the fuel supply system. This condition can also occur if the 10 seconds, several burners dead in sequence, can be considered the boiler in case of danger.
- Furnace fuel has increased pressure is very drastic.
- Taken decisions plant/boiler in jeopardy by the operator.

1.4.3.4.3. Maintenance Engineering Plant

Maintenance or care is very important in a system PLTG/MG. Briefly aims to get the condition of the parts of the system are good and ready to use. Equipment on plant systems and other equipment contained in a system requires regular maintenance and good for reducing damage to the engine and support for the production process can run well.

The purpose of maintenance is:

• Keeping the engine can run well and smoothly.
• Extend the life of the machine.
• Keeping the resulting quality is still good.

Provide regular maintenance checks on the machine, preventive repairs within a specified period in accordance with the schedule of daily maintenance beyond schedule. The length of the period of time determined depending on the engine design, intended use and the working conditions. Methods used to do maintenance consists of three kinds, namely:

1. Preventive Maintenance

Preventive Maintenance is done with regular maintenance without waiting for the machine or equipment in question or the other is damaged first. Wide form of Preventive Maintenance, among others:

- Maintain cleanliness of machines and equipment installation of electric power, as well as other equipment that is used every day.
- Replacement of engine lubricating oil for machines that require periodic replacement.
- Giving lubricating oil on the surface of the contact and rub against, for example: gears, hinges and more.
- Check the tanks and pressurized gas line to prevent leakage which could cause a fire and other losses.

2. Corrective Maintenance

Corrective Maintenance is done with the repair of machinery and equipment installation of electric power and other equipment were damaged. Wide form of Corrective

Maintenance, among others:

- Replace damaged parts with existing inventory. If no then it will be the purchase of new parts that should be.
- Replaces while machinery or other equipment damaged with backup equipment, so that the machine or other equipment that is damaged can be repaired in place.
- Bring in specialists to repair the damaged equipment. If not allow the repair work is done, it will be the replacement with new equipment, the first to do repairs at the place where the equipment is made.

3. Improvement Maintenance

Improvement maintenance is done by the rescheduling of the maintenance of an apparatus in order to better get a result and performance of the equipment. Sometimes treatment leads to any changes or modifications to the equipment as well as the design or redesign of existing systems.

For maintenance of the turbines continuously is a process that is passed by several other media such as air, gas and lubricating oil, so some attention will care take precedence, but some checks on the generator is necessary and should be performed.

The treatment is carried out initially in the form of routine inspections are conducted either daily or periodically given, which will be followed by the replacement-replacement of some parts that are deemed necessary in accordance with the requirements established. Inspections are carried out daily or before starting to do them:

- Checking the oil level in the oil tank.
- Vengecekan fuel supply.
- Checking battery.
- Checking the safety panels that are directly related to the plant.
- Checking the air filter.
- Checking exhaust.

Checking and replacing them will do:

- Analyze the performance of the Power Plant PLTG inspections carried out every day.
- Replacement sparkplug.
- Checking the combustion chamber and some components that are around him.
- Checking bleed air valve.
- Replacement of the oil filter.
- The laboratory will grade lubricating oil, if required to do the replacement of the entire lubricating oil on the oil tank.
- Checking the oil cooler.
- Replacement of the fuel filter.
- Checking electric starter.
- Checking the air filter.

- Checking exhaust.
- Checking the battery.
- Checking the liquid fuel tank.
- Checking and recalibration throughout the temperature of the turbine, monitor speed and safety shut down.
- Checking the position between the generator and gear unit.
- The conduct of detergent wash on the turbine.

The type of maintenance is a combustion gas turbine inspection/minor inspection, hot gas patch inspection and overhaul. Combustion inspection/minor inspection carried out every 4000-8000 hours, hotgaspatch inspection carried out every 33,000 hours of operation and major overhaul carried out every 66,000 hours of operation. Determination of the Power Plant PLTG operating hours is not only determined by the time the plant operates, but also must be added by a factor of operation so as to reflect the age of the plant is operating properly. The correction factor is a function of the temperature fluctuations that have occurred in the operating unit caused by tripnya generating units or caused by such high load fluctuations and temperature fluctuations caused by start up the power plant, the quality of fuel used.

Hours of plant operation which is a combination of old plants in operation and correction factors are called equivalent hours of plant operation (Equivalent operating hours, EOH). The accuracy of the determination of plant opersi hours will be decisive once great efficiency of plant operations, the reliability of plant operations as well as the huge costs incurred in the operation of the generating units as a result of setbacks schedule periodic maintenance plants. For the determination of hours opersi plants are the basis of the management of the Power Plant PLTG in order to achieve the expected level of efficiency, operating reliability required and the cost of operating the plant as cheaply as possible.

Warehouse and Workshop

Operational workshop used to perform maintenance of equipment and machines that are allowed to be treated on the spot. This workshop activities can generate waste in the form of solid waste in the form of unused tools, including machines that do not allow it to be used again and liquid waste in the form of used oil.

Warehouse was also used to store inventory and equipment needed by the power station, including temporarily store the remaining ingredients and equipment that are not used anymore. Remnants of used oil (Hazardous and Toxic Materials) due to the change of engine lubricant system of plants will also be stored temporarily in storage pending transport and disposal in accordance with the rules and regulations.

1.4.3.4.4. Waste Management (Including Hazardous and Toxic Materials)

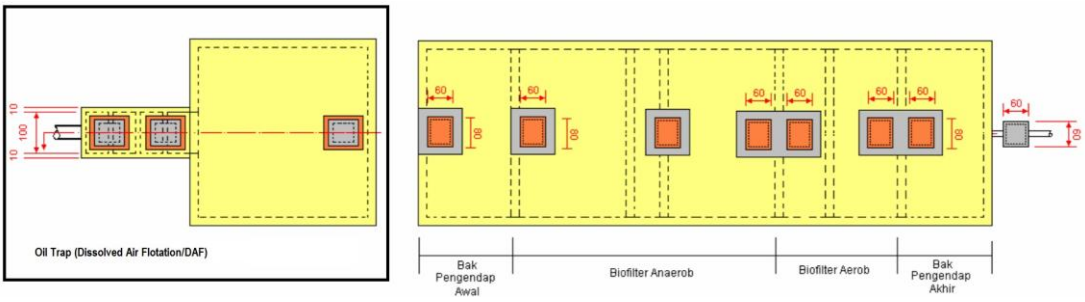
Waste management is an action in the handling of waste generated resulting from PLTG/MG Duri. Waste handling and management, in addition to Hazardous and Toxic Materials, can basically be conducted within the area of the plant (on-site treatment) or a third-party (off-site treatment).

- **Domestic Solid Waste**

  Solid waste processing can be done in various ways which can certainly make the waste is not bad for the environment and health. According to its solid waste management can be divided into two ways of processing solid waste without treatment and solid waste processing with the processing. *Solid waste without treatment: Solids not mengandungunsur chemicals that are toxic and dangerous can be directly discharged to a certain place as TPA (Landfill) solid. Waste generated from domestic activities, where the management is done by making the dustbin and septic tank waste (including domestic waste).

- **Liquid waste**

  The entire wastewater generated from domestic activities, namely, waste water, showers, washing waste water, waste water sink, water runoff from septic tanks and other sewage water, all poured into tubs of fat or oil separator. basin fat separators serve to separate the fat or oil derived from the activities of the power plant, as well as to precipitate dirt sand, soil or solid compounds are not biodegradable. In addition, the wastewater produced by the activity Power Plant PLTG /MG Duri is in the form of scattered oil mixed with water that flowed into the holding pond through the trench with one body system separator. To separate the oil and water system using Oil Trap (DAF). As done of oil with a specific gravity smaller will be separated from the water (floats). Then the oil is taken and put in the drum.



Picture 1. 5 Illustration Installation of Oil Trap

- Hazardous and Toxic Materials waste

Hazardous and Toxic Materials waste management will follow the reference as follows:

1. Build TPS Hazardous and Toxic Materials accordance with the decision of the Head BAPEDAL N0.01 year 1995 and Decree of the Head BAPEDAL No.255 year 1995
2. Symbols and Labels Hazardous and Toxic Materials refer you to the Minister of Environment Regulation No. 14 year 2013
3. Identifying, coding categories and types of waste generated Hazardous and Toxic Materials

4. Waste management Hazardous and Toxic Materials in accordance with government regulations of the Republic of Indonesia Number 101 year 2014

5. Cooperating with third parties who have licensed the transport, collection and utilization of waste Hazardous and Toxic Materials

6. Registering the entry and exit Hazardous and Toxic Materials in Log Book

7. All types of Hazardous and Toxic Materials waste resulting from activities themselves are stored in the TPS Hazardous and Toxic Materials

For waste that includes Hazardous and Toxic Materials as lubricating oils derived from plant equipment and other vehicles, waste is collected in a specific drum to be sent to the Hazardous and Toxic Materials waste management center which has official permission. Everything about Hazardous and Toxic Materials waste management license will be taken care of by the company, namely PT PLN.

a. Greening

Event greening has a function as an effort to minimize the impact of waste gas and noise and dust around the Power Plant PLTG site/MG Duri and maintenance of the surrounding ecosystem. The leaves of the plant serves to absorb pollutants around it. Conversely, the leaves of this plant will release oxygen (O2) to create the conditions surrounding air to be clean and fresh.

When it rains, the soil and the roots of trees will bind rain falling, so that a water reserve. Besides, the arrangement a good greening can also add aesthetic value area of the Power Plant PLTG/MG Duri. Greening will be conducted in the area in the vicinity of the Power Plant PLTG/MG Duri, especially areas adjacent to the site boundary surrounding community as a green belt. Afforestation by planting fast-growing trees, ecological function and have aesthetic value.

The function of greening in the region PTLG/MG Duri emphasized as an absorber of CO2, the oxygen (O2), absorbing pollutants (heavy metals, dust and sulfur), noise cancellation, windbreaks and enhancement of beauty, with the characteristics of the trees with strong roots, twigs not easily broken, do not easily fall leaves, and trees producing flowers/fruit/seeds that have economic value.

The factors that affect potential contaminant reduction and the age of the plant is a type of plant, shade and height of the plant, the amount of carbon emissions, temperature, wind speed, density and height of buildings. Leafy plants will more effectively absorb pollutants in the air than leafy plants rarely. While the leaves without wax coating, hairy or spiny would be more easily absorb the gases in the air.

b. Corporate social responsibility (CSR)

Corporate Social Responsibility, or better known as CSR is an obligation of the company, in accordance with the mandate of Article 74 paragraph 1 and 3 of the Law of the Republic of Indonesia No.40 Year 2007 regarding Limited Liability Company. This activity will not only benefit the community, but is also useful for companies because the effects of the company will add a good image in the community. More CSR is also able to

create a mutually beneficial relationship between the company and communities around the Power Plant PLTG/MG Duri.

CSR is not done independently, but is integrated together with other activities in the PT. PLN (Persero) Power Sector Pekanbaru. CSR is primarily intended for the village community Balai Pungut. The results of interviews with community leaders and villagers of Pungut Center, showed that there had been no attention from the PT. PLN (Persero) and its partners to society Balai Pungut Village, where the Power Plant PLTG of 160 MW capacity Duri has been operating for ±2 years. For such people sincerely hope that the PT. PLN (Persero) and its partners can pay attention to the surrounding community.

Society demands that do perform repair roads and rivers around the location of the Power Plant PLTG/MG spines that have been damaged due to the mobilization of equipment and material Power Plant PLTG Duri earlier, received the local labor force according to the ability of local labor and involve local contractors in the provision of goods and services in the Power Plant PLTG/MG Duri.

In the future it is expected that the PT. PLN (Persero) and its partners involved in the activities of the Power Plant PLTG/MG Duri must pay attention to the potential, needs and wishes of local communities, in consultation with the village and sub-regency, so that CSR is later really helpful and on target, so that the image PT.PLN (Persero) and its partners can revive again in the eyes of the local community. One alternative that can be done in the form deceive the public in building economic independence, between through training and support working capital.

Environmental Patronage Program Objectives:

1. As a form of awareness, improve the image and support the existence of PLN PLN. By providing assistance to communities around the Power Plant PLTG/MG Duri to improve well-being, education, improvement of public facilities and conduct counseling are expected to participate in securing the community around and feel has an asset of the country;
2. Community empowerment is how community members can actualize themselves in environmental management in the surrounding areas, and meet their needs independently without reliance by parties and government companies.

Forms of Community Development Program Activity:

1. Community Empowering: Program aid to provide wider access to the community to support the independence, by based on the development and utilization of local potential which will provide employment, such as educational assistance, training to the community, help the development/strengthening of community based organizations, indigenous communities, professional organizations, and capacity building of local resource-based community effort.
2. Community Services: The aid program for the general public in the form of continuous improvement as a means that does not help religious facilities, aid victims of natural disasters and others.
3. Community Relations: Program development of communication and information activities through the provision of knowl Pingir and outreach to the community related to the installation and the program will be developed by PLN, such as public consultation assistance, counseling about the electric assistance.

CSR program in PT.PLN (Persero) Power Plant PLTG/MG Duri conducted involving community groups, such as residents, hamlet, village, academia, local governments, nongovernmental organizations, and entities of the relevant agencies.

Some of the program of activities that can be implemented include:

1. Community Service
   - Help community purchases for sewage pumps, tower or pole
   - Providing assistance Rehabilitation and Relief Supplies Tabernacle Worship/ Holy Qur'an
   - Rehabilitation assistance Village
   - Providing assistance to orphans
2. Community Empowering
   - Help purchase sewing machines for PKK

In the implementing CSR programs will be adapted to the demands and needs of the community Balai Pungut village, so expect the implementation of this CSR can benefit the local community.

1.4.3.5. Phase Post-Operation

The development of power generation Power Plant PLTG/MG Duri is planned to be operational for 30 years. After a period of 30 years will do a feasibility assessment. Activities to be performed at postoperative phase includes feasibility assessment generation capabilities, such as whether it was suitable operation or not (either because of age or because of rapidly increasing load growth). So we will get the possibility to do that still operate properly, perform capacity or stop operation of the process. If for some reason or another sometime this plant to be dismantled it will be a new relocation, especially for equipment that are still productive, while those who are no longer productive will dikerja equate with scrap metal collectors who have official permission. In this case, including the dismantling / installation to be changed.

1.4.4. Alternatives that would be Studied in the EIA

Environmental Impact Assessments is a feasibility study of the environmental aspects, the components of the action plan should have several alternatives, such as: alternative processes or technology used, inputs or materials used, the layout of the building or means of support, approach control or impact management and scheduling or phasing of activities. As for the functions and benefits of the alternatives in the EIA studies are:

a. Ensure that environmental considerations are integrated into the process of selecting alternative economic and technical factors.
b. Ensuring that the initiators and decision makers have been considering and applying the principles of prevention of pollution (pollution prevention) in the context of environmental management.

c. Provide an opportunity for stakeholders who are not fully involved in the decision making process, to evaluate various aspects of a business plan and activities and how the process of a decision that was finally approved.

d. Provide a framework for decision-making is transparent and based on the scientific considerations.

However, there are times when the EIA began, the proponent no longer consider alternatives but have selected an action plan that will be implemented. Environmental considerations have been made in the selection process of these alternatives, taking into account the technical approach, economically and environmentally, but do not use the instrument EIA. The scoping process also review and summarize all the considerations that have been made proponent.

The choice of location increase plant capacity PLTG/MG Duri which is a strategic location because it is close to a source of fuel gas. Determination of the use of alternative processes based on the latest technologies, particularly in the environmental management approach in terms of wastewater treatment process that uses a similar decomposition of the most effective micro-organisms. Even if there are alternatives that have not been decided then this will have no impact or significant impact on the hypothetical significant impacts that will be studied, thus in this case do not study alternatives.

1.5. Results Community Engagement

Community involvement is part of the scoping process. Community engagement and consultation is done through announcements publik.Dalam scoping process has been carried out engagement / community input through the information on the local newspaper media and through public consultation (Appendix 2). Such activities aim to gather public opinion related to the action plan. Information from these communities is one part of determining the potential impact consideration.

Public consultation, involving the community component whose location has the closest distance to the planned activities. The results of the public consultation are as follows:

- Involve local people as workers in accordance with the needs of the action plan.
- Improving roads damaged by the mobilization of machine tools PLTG/MG Duri.
- Improving river the harbor area of the landing place machine tools PLTG/MG Duri.
- Provide the village street lighting.
- Companies must be committed to the implementation of the CD program in improving the welfare of society and the environment.
- Protecting the environment, especially against impacts of noise and vibration operation of the Power Plant PLTG Duri.

1.6. Important Impact of hypothetical

The process to produce significant impacts hypothetical basically begins with the identification of potential impacts. The essence of the process of identifying the potential impact of this is guessing all impacts could potentially occur if the planned increase in plant capacity PLTG/MG Duri do. This step produces a list of 'potential impact'. At this stage

scoping activities are intended to identify all environmental impacts (primary, secondary, and so on) which will potentially arise as a result of the planned increase in plant capacity PLTG/MG Duri. At this stage only the inventory of potential impacts that may be incurred regardless large/small impact, or whether the impact is important. Thus at this stage there has been no attempt to assess whether the potential impact of such a significant impact or not.

The identification process carried out by using the potential impact matrices and a flow chart, which outputs a list of potential impacts which may arise on their plans to increase plant capacity PLTG/MG Duri. Next to evaluate potential impacts. Evaluation of Potential Impact essence is isolating the impacts that need in-depth study so that it can be concluded into an important impact hypothetical or not

1.6.1. Scoping process

Scoping is an early process to determine the scope of the problem and identify the significant impacts associated with the hypothetical action plans. Scoping is generally done through three phases namely: identification of potential impacts, evaluating the potential impact, and the classification and priority. Activities to increase plant capacity PLTG/PLTMG Duri is expected to have an impact on the components of physical-chemical, biological, social, economic and public health. The impact occurred at every stage of activities ranging from Pre-Construction phase, construction, post-construction, operation and post-operation.

1.6.1.1. Identification of Potential Impact

Identification of the potential impact on scoping activities are intended to identify all environmental impacts (primary, secondary, and so on) which will potentially arise as a result of the planned activities. At this stage only the inventory of potential impacts that may be incurred regardless large / small impact, or whether the impact is important. Thus at this stage there has been no attempt to assess whether the impact is a major and significant impact.

Identification of potential impacts was conducted using analysis matrix through interaction between the description of activity plan with the initial environmental baseline conditions, a series of consultations and discussions with the team of experts, the communities involved and equipped with field observations (observation). Based on this, the potential impact is predicted to occur with the plan of activities to increase plant capacity PLTG/MG Duri is as follows:

A. Pre-Construction Phase

Activity in the pre-construction phase consists of a public consultation and acceptance of the labor for the construction phase. Activities to increase plant capacity PLTG/PLTMG spines of 200 MW is an advanced stage, where PT. PLN (Persero) at the same location have operationalize Power Plant PLTG/PLTMG Duri with a power capacity of 160 MW. During the operation of the Power Plant PLTG/PLTMG the emerging negative perception of the public regarding the impact of noise and vibration. So before undertaken the construction phase, there should be public consultation to the public regarding the plan to reduce the impact of noise and vibration from Power Plant PLTG/PLTMG Duri and explanation of plans to increase power generation Power Plant PLTG/PLTMG of 200 MW. If the company can provide information relating to the

plan properly, it will be able to increase the positive perception of the public, to avoid conflicts and civil unrest against the action plan.

B. Construction Phase

Activity in the construction phase in the form of the mobilization of equipment and materials; Land clearing; construction of the foundation; installation of generators, turbines and compressors; construction yard switch; as well as testing and trials.

Mobilisasi Alat Berat & Material

Power Plant PLTG construction activities/MG Duri require different weight peralataan like bulldozers+Winch, Rock Bucket, Canopy, Excavators, Loaders, and so on. Mobilization of equipment and materials will be performed by land and river. This activity is made possible potential impact on the increase in road traffic density, road damage and damage to the river. This mobilization activities will indirectly contribute to the impact of air quality deterioration, elevated concentrations of dust, noise and an increase in the intensity of public health.

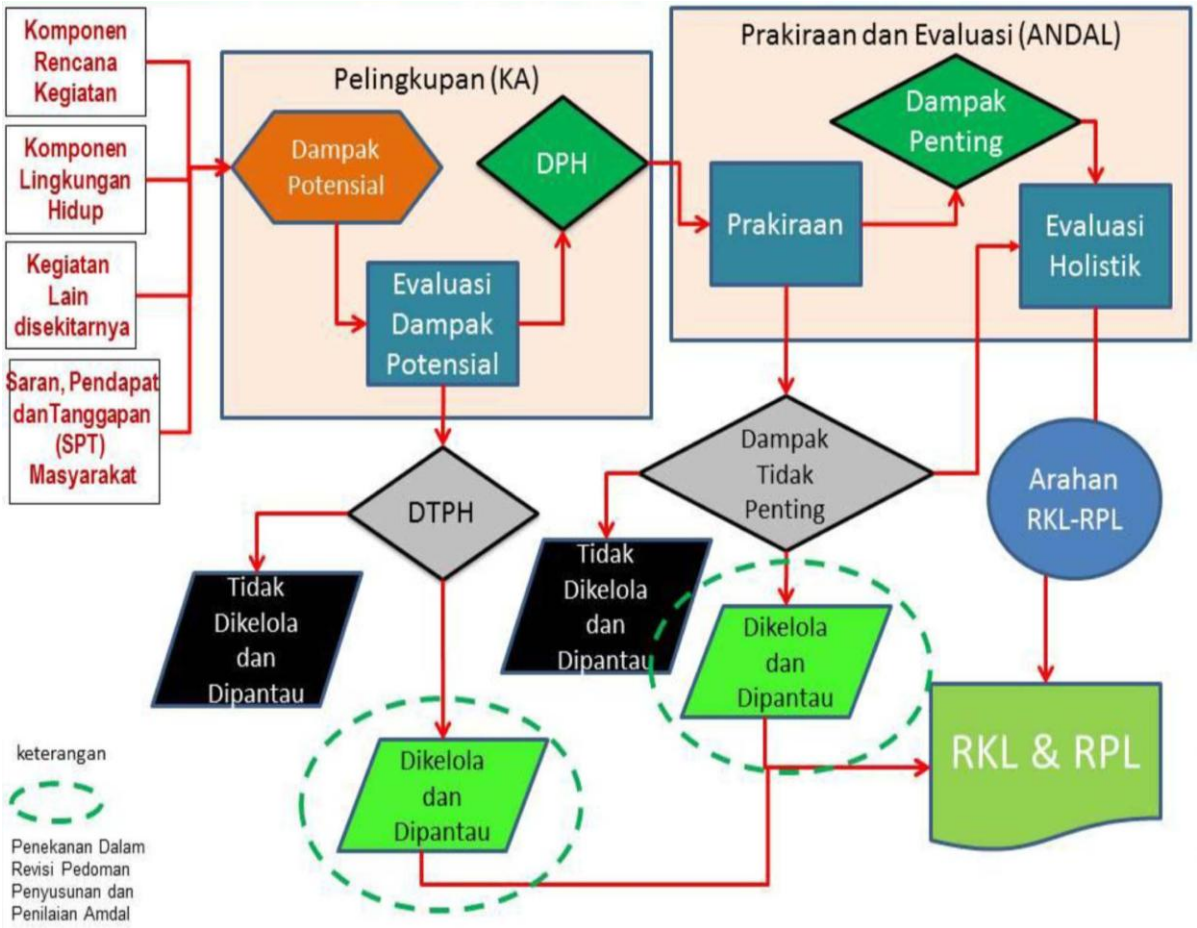


Figure 1. 11

Scoping Process Flow Chart EIA Study Capacity Power Station Power Plant PLTG/PLTMG Duri In the Balai Pungut Village, Districts Pinggir , Bengkalis Regency, Riau Province

Maturation Land

Land clearing activities, stockpiling and manufacture of drainage channel will have an impact on changes in the pattern of water flow which can ultimately increase soil erobilitas, destabilizing the waters as a decrease in water quality due to sediment particles and disruption of aquatic biota. Activity Land clearing, stockpiling and manufacture of drainage channels will be carried out using mechanical equipment and electrical expected to have an impact on air quality deterioration (increased levels of dust), noise, increased runoff, loss of quality of surface water, disturbance of vegetation and land fauna, as well as disruption of water biota.

Laying Foundations

Activities to install foundations for the main building and supporting the Power Plant PLTG/PLTMG Duri will have an impact on air quality deterioration, increased getaram, increase the intensity of noise, increased aliaran surface water and surface water quality degradation.

Installation Generators, Turbines and Compressors

Activities to install the generator, turbine and compressor which is the main unit of the Power Plant PLTG generating Duri will affect surface water quality and aquatic biota.

Construction switchyard

Construction activity switching yard which is a means of supporting the Power Plant PLTG/MG Duri will have an impact on air quality deterioration, increased vibration, increased noise, changes in the quality of the work environment, public health and accidents.

Testing and Trials

Testing and test Plant PLTG/MG Duri will have an impact on air quality deterioration, increased vibration, increased noise, energy availability, changes in the quality of the work environment, attitudes and perceptions, public health and accidents.

C. Post-Construction Phase

Post-construction phase activities such as demobilization of equipment that is not necessary and the termination of employment. Equipment demobilization activities will potentially impact on air quality deterioration, increased noise and increased traffic density land. While the activities of layoffs will have an impact on the loss of job and business opportunities, revenue decline of society and the emergence of attitudes and perceptions.

D. Phase Operation

The activities at this stage of the plant operation Power Plant PLTG/MG Duri form of recruitment, the production of electrical energy, machine maintenance, waste management (including waste Hazardous and Toxic Materials), greening and Corporate Social Responsibility (CSR).

Acceptance of Labor

Recruitment activity at this stage of the operations Power Plant PLTG /MG Duri will have an impact on their employment and business opportunity, the increase in people's income, and the emergence of attitudes and perceptions.

Electrical Energy Production

Production of electrical energy through the operation of steam boilers, turbines, generators and equipment condensation potential negative impact. The impact of a decrease in air quality, increased vibration, increased noise, the availability of electricity to be distributed to the public, and changes in the quality of the working environment and the improvement of local and regional economies.

Maintenance Engineering

The maintenance of the power generation engine PLTG/MG spines so that the operation can be done optimally will potentially have a negative impact. The impact of a decrease in surface water quality, and decreased quality of the work environment. Operation of the workshop will have an impact on the decline in water quality due to seepage or spills of oil, which in turn can lower surface water quality, and as a result cause the subsequent disruption of aquatic biota.

Waste Management (Including Hazardous and Toxic Materials)

Waste management activities generated from the operation of power generation Power Plant PLTG/MG Duri will potentially have a negative impact.

The impact of a decrease in air quality, surface water quality, nuisance aquatic life as well as attitudes and perceptions. The results of the processed wastewater WWTP will lead to a decrease in **Water Quality** due to seepage of waste water that can further degrade the **Quality Of Surface Water**. Conditions decreasing quality of surface water will result in a change in species **Composition Of Aquatic Biota**

Greening

Greening activities around complex Power Plant PLTG/MG Duri with a shade plant and fruit plants will potentially positive impact. The impact in the improvement of air quality, as noise barriers, and restoration of terrestrial vegetation.

Corporate Social Responsibility (CSR)

CSR activities of companies PT. PLN (Persero) as a form of concern to people around the Power Plant PLTG/MG Duri will potentially positive impact. The impact of the emergence of attitudes and perceptions are positive.

E. Phase Post-Operation

In the postoperative stage or when the plants are no longer operated it will be the dismantling of plants, termination and demobilization of equipment PLTG/MG Duri.

Generating Power Plant PLTG demolition/MG Duri

Demolition activities Power Plant PLTG/MG Duri will potentially have a negative impact. The impact of a decrease in air quality and an increase in noise intensity.

Termination

Activity termination of employment after the Power Plant PLTG/MG Duri no longer in operation will potentially have a negative impact. The impact of such a loss of job and business opportunities, the decline in revenue and the emergence of attitudes and perceptions.

Demobilization of equipment Power Plant PLTG /MG

Demobilization activities of the generating equipment Power Plant PLTG/MG Duri no longer in operation will potentially have a negative impact. The impact of a decrease in air quality, and increased arousal kebisngan increase road traffic.

Table 1. 5.

Potential Impact Identification Matrix EIA Study Capacity Power Plant PLTG/PLTMG Duri In the Balai Pungut Village, Districts Pinggir, Bengkalis Regency, Riau Province

No.	KOMPONEN LINGKUNGAN PENERIMA DAMPAK	KOMPONEN KEGIATAN (SUMBER DAMPAK)																			
		TAHAP PRA KONSTRUKSI			KONSTRUKSI						PASCA KONTRUKSI		OPERASI						PASCA OPERASI		
		Pengurusan Perizinan	Konsultasi Publik	Penerimaan Tenaga Kerja	Mobilisasi Peralatan & Material	Pematangan Lahan	Pembangunan Pondasi	Pemasangan Generator, Turbin dan Kompresor	Konstruksi Switch Yard	Pengujian dan Uji Coba	Demobilisasi Peralatan	Pemutusan Tenaga Kerja	Penerimaan Tenaga Kerja	Produksi Energi Listrik	Pemeliharaan Mesin	Pengelolaan Limbah (Termasuk Limbah B3)	Penghijauan	Tanggung Jawab Sosial Perusahaan (CSR)	Pembongkaran Pembangkit PLTG/MG	Pemutusan Hubungan Kerja (PHK)	Demobilisasi Peralatan PLTG/MG Duri
A.	**GEOFISIK-KIMIA**																				
1.	Kualitas Udara				√	√				√	√			√	√	√	√		√		√
2.	Getaran									√				√	√						
3.	Kebisingan				√	√				√	√			√	√		√		√		√
4.	Kualitas Tanah							√							√						
5.	Aliran Air Permukaan					√	√														
6.	Kualitas Air Permukaan					√	√	√	√						√	√					
7.	Transportasi Darat/Lalu Lintas Darat				√						√										√
8.	Ketersediaan Energi Listrik													√							
9.	Kualitas Lingkungan Kerja									√				√	√						
B.	**BIOLOGI**																				
1.	Vegetasi Darat					√											√				
2.	Fauna Darat					√															
3	Biota Air (plankton, bentos, nekton)					√	√	√	√						√	√					
C.	**SOSEKBUD-KESMAS**																				
1.	Kesempatan Kerja & Peluang Berusaha			√								√	√							√	
2	Pendapatan Masyarakat			√								√	√							√	
3	Ekonomi Regional & PAD													√							
4	Sikap dan Persepsi Masyarakat		√	√	√	√				√		√	√			√		√		√	
5	Kesehatan Masyarakat				√	√															
6	Kecelakaan Kerja						√	√	√	√											