

The Day Great Penyepian in Bali Evidently Can to Reduce Air Pollution

I Ketut Wijaya, I Made Mataram

Abstract— The Air pollution caused by exhaust emissions due to the engine being run by using posil fuel. Engineering Generator Electrical Power is one of the engines that produce emissions (pollution) is quite high because the engine never stops unless repairs. And incidentally engine generator of electrical power in Bali is located close to the city of Denpasar. Data generator of electrical power be taken from peak load in 2014 and 2015 on the State Electricity Company (PLN). Average peak load data weekday 425.49 MW in 2014 and data on a Penyepian is 254.40 MW. Average peak load on a weekday in 2015 amounted to 315.49 MW and peak load during penyepian of 151.50 MW. Data were analyzed with average emissions generating units for 1 hour with of HSD fuel and Specific Fuel Consumption (SFC) generating machine with fuel High Speed Diesel (HSD).

Analysis of the reduction of electric power in 2014 reached 171.09 MW with dust emissions 443.88 (mg / m³), SO₂ 3099.11 (mg / m³), and NO₂ 404.43 (mg / m³). Analysis of the reduction of electric power in 2015 reached 163.99 MW with dust emissions 807.79 (mg / m³), SO₂ 5371.29 (mg / m³), and NO₂ 690.95 (mg / m³). Decrease of Electrical Power used during the feast Berata Penyepian is evidence or way that can be used to reduce emissions into the air. Because only Bali have this mode, which able to stop all activities in one day, including reducing the use of electric power.

Index Terms— Hari Raya Brata Penyepian, Decreases Exhaust Emissions, Save Energy.

I. INTRODUCTION

Air pollution is not good for human growth, especially infants, because it affects the lungs (aspiration). Disruption of breathing due to pollution will result in difficulty breathing and allow contracting a respiratory cancer disease. The Air pollution levels will be affected by metal dust and carbon from the exhaust and vehicles including an electric machine that is used as a producer of electricity for the benefit of society (diesel in Sanggaran, Denpasar, Bali). Dust metal and carbon is very difficult to be distributed in the digestive center, because it will be attached to a respirator, so that over time will become more many and cause a respiratory disorders. Disruption Respiratory because smoke motor is very difficult to treat and require a long process to be good and should handled a Doctor. Pollution in Bali is not yet at the stage of worrying, but necessary precautions reasoned that, very necessary to countermeasures as early as possible so that pollution problems can be anticipated early. Pollution can be

overcome with a simple and natural way is by planting trees as perindang as well as reproduction of the CO₂ produced by the smoke and produce O₂. Planting trees became an extremely powerful way to combat pollution if all people consciously follow the advice to plant trees in unison on the home page as well as on the front of the house. Pollution in Bali must followed by religious activities carried out within 24 hours via Berata Penyepian (Bali Post, 2012). Berata Penyepian carried out by followers of Hinduism in Bali made the silence, like a return to nature the past, because at this moment the vehicle no beropersi and people were all inside the house without any activity undertaken (amati lelanguan), do not do activity with fire (amati geni), do not perform work activities (amati karya). On Berata Penyepian impact on the use of electric power, that is When Berata Penyepian use of electricity power is only 471.5 MW (already at peak load), whereas in a typical day the average electricity power use reached 780.9 MVA (at peak load) in 2015. Berata Penyepian can reduce use electricity up to 52% at peak load in 2015 (PLN, 2015). The decline in capacity use of electric power is an astounding number, because it can reduce of power consumption (save energy) is recommended by the government. On decrease of the Electric Power can reduce the use of fuels such as diesel and gasoline so that pollution would be can reduced (Bali Post, 2012).

Berata Penyepian should be maintained in Bali, especially because in addition to the application of religious discipline can also reduce the level of pollution. Bali has a way never thought of by followers of Hinduism that the Berata Penyepian that is has a very deep meaning for the benefit of Indonesia and even the world have recognized that the way this is very powerful in helping to pay attention to the world (Raditya, 2012). Reducing the level of pollution is also very important but the maintenance of the Generator of electrical is also very important, because it can interfere with people around and cause problems due to the loud sound of engine generator. Need to do some research in order to know how much reduction in pollution levels at the time of Berata Penyepian in Bali.

1.1 Problem Formulation

Based on the above can be prepared formulation problem as follows:

1. How much the consumption electricity during Berata Penyepian?
2. Does the model Berata Penyepian conducted in Bali there needs to be and must do?

II. MATERIALS AND METHODS

The material in this study is the electric power at the time Berata Penyepian. Data taken from the State Electricity Company (PLN) region of Bali is the peak electricity load data and from Bali Statistics office in Renon. Data which used

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is only data from power plant of diesel, power plant of gas in Bali in 2014 and 2015.

The methods used to solve the problem is the data obtained from the PLN (secondary data), then assessed based on the literature and data were analyzed with average emissions generating units for 1 hour with fuel of HSD and Specific Fuel Consumption (SFC) engine of generators with fuel High Speed Diesel (HSD).

III. WAY TO DO RESEARCH

- 1) Taking the data from diesel power plant and gas power plant in March 2014 and 2015,
- 2) Doing process to take data from generator to moons March randomly and obtained the average,
- 3) Data were analyzed with the emission of average from generating units for 1 hour with fuel of HSD and Specific Fuel Consumption (SFC) engine of generators with fuel High Speed Diesel (HSD).

IV. RESULTS

A. Average data from PLN on the Peak Load Electricity Bali 2014.

Table 1.
Average Peak Load in March 2014

Moons.	Condition of Electricity Power years 2014 in Bali		Condition
	Centre of Electrical Diesel Power (PLTD) (MW)	Centre of Electrical Gas Power (PLTG) (MW)	
1	333.90	73.30	Working days
2	312.10	102.50	Working days
3	325.90	101.70	Working days
4	316.50	101.80	Working days
5	323.30	140.90	Working days
6	331.20	71.30	Working days
7	311.10	143.00	Working days
8	297.80	184.80	Working days
9	308.60	109.40	Working days
10	265.20	84.40	Working days
11	316.70	125.00	Working days
Average	312.94	112.55	Working days

Table 2.
Results of Analysis Decline of Flue Gas (Emissions) on the Centre of Electrical Power in Bali in 2014

Condition	Generator	Emission			
		Power Capacity (MW)	Dust (mg/m ³)	SO ₂ (mg/m ³)	NO ₂ (mg/m ³)
Working days	PLTD	312.94	826.16	5,758.10	751.06
Nyepi Day	PLTD	145	382.8	2,668.00	348
Working days	PLTG	112.55	18.65	322.21	49.2
Nyepi Day	PLTG	109.4	18.13	313.2	47.82
Working days	PLTD dan PLTG	425.49	844.81	6,080.31	800.26
Nyepi Day	PLTD dan PLTG	254.4	400.93	2,981.20	395.82
Reduction		171.09	443.88	3,099.11	404.43

B. Average Data PLN On Peak Load Electricity in Bali 2015

Table 3.

Average Peak Load in March 2015

Moons	Condition of Electricity Power years 2015 in Bali		Condition
	PLTD (MW)	PLTG (MW)	
1	171.90	109.10	Working days
2	156.30	170.60	Working days
3	142.60	133.70	Working days
4	150.70	136.60	Working days
5	162.30	169.20	Working days
6	169.90	143.70	Working days
7	153.90	145.50	Working days
8	153.40	125.70	Working days
9	169.10	177.00	Working days
10	162.10	170.70	Working days
11	142.10	254.30	Working days
Average	157.66	157.83	Working days

Table 4.
Results of Analysis Decline of Flue Gas (Emissions) on the Centre of Electrical Power in Bali in 2015

Condition	Generator	Emission			
		Power Capacity (MW)	Dust (mg/m ³)	SO ₂ (mg/m ³)	NO ₂ (mg/m ³)
Working days	PLTD	157.66	416.22	2,900.94	378.38
Nyepi Day	PLTD	67.1	177.14	1,234.64	161.04
Working days	PLTG	157.83	26.15	451.84	68.99
Nyepi Day	PLTG	84.4	13.99	241.63	36.89
Working days	PLTD dan PLTG	315.49	832.89	5,805.02	757.18
Nyepi Day	PLTD dan PLTG	151.5	25.11	433.72	66.23
Reduction		163.99	807.79	5,371.29	690.95

C. Specific Fuel Consumption (SFC) Emissions The average of Unit Generator Over 1 Hour With The Fuel High Speed Diesel (HSD) is:

- (a) Power Plant of Diesel (PLTD): $\sim 0.240 \text{ s / d } 0,265 \text{ liter / kWh} = (0.240 + 0.265) / 2 = 0.2525 \text{ liters / kWh}$.
(Diesel Requires 0.2525 liter to produce 1 kWh)
- (b) Power Plant of Gas (PLTG): $\sim 0.372 \text{ liters / kWh}$ (Gas Requires 0.372 liter to produce 1 kWh).
- (c) Examples the emission of average The units the generating for 1 hour with The fuel HSD:

Table 5.

The Emission which Averaged On Units Generator Power 1 Hour with Of Fuel HSD

No	Generator	Power Capacity (MW)	Emission		
			Dust (mg/m ³)	SO ₂ (mg/m ³)	NO ₂ (mg/m ³)
1	PLTD	7.5	19.8	138	18
2	PLTG	35.0	5.8	100.2	15.3

V. DISCUSSION

Environmental pollution is a natural process that humans do to make human better in his life. The process is done human in excess will make environment are victims and change the environment becomes environment damaged that ultimately affect human life.

A. Decrease Electric Power Usage

a) On When Berata Penyepian 2014

The decline in the use of electricity power at all times should be done because it can affect existing pollution. Decrease in pollution that is based on a study on the Berata Penyepian can be used a reference in the future to come through the same model, because the results of the analysis which performed on the data obtain a decrease in use of electricity power used community at Bali is very extraordinary.

(a). Berata Penyepian to reduce electricity consumption.

Berata Penyepian in understanding as one of the concepts of compliance with one of the conditions Hindu annually celebrated by doing one *Berata* that exist in *Berata Penyepian* is *Berata amati geni* (no fire light/electrical). Adherents Hindus at this time only doing activities at home and do worship or activities do not go out home (*amati lelanguan*). Adherents Hindus do *Berata Penyepian* in general both day and night (24 Hours) not work (*amati karya*).

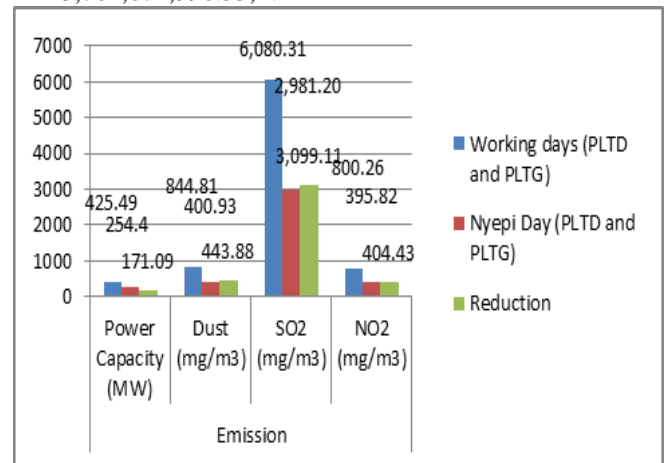
If the Hindu community are doing *Berata Penyepian*, while people of other faiths are also expected to participate in this activity. But if all people in Bali want follow, it would be different is also the result of this analysis. Condition even this is unlikely in forced, with no coercion it is sufficient also provide shade that was very well done to give breaks on all the elements on Earth for easily be able to see how the actual state of the authenticity of the island of Bali in the past by looking at the circumstances at the time *Berata Penyepian*.

After done analyzing to electric power used in one day ie on 31, March 2014, there was a decrease in the use of electric power. See Table 3, the average electricity use before *Berata penyepian* is 425.49 MW. At the time of *Berata Penyepian*, the average of the electric power used is 254.40 MW. Differences of electric the power used before and during *Berata Penyepian* decreased by as big as 171.09 MW (40%), thus it can be said *Berata Penyepian* reduced to consumption of electric power.

(b) Model Berata Penyepian is one good way to reduce pollution

In Table 2. Power the Capable of the PLTD (diesel) on weekdays was 312, 94 MW and during Hari Raya Penyepian power capable can only 145 MW. Power the Capable PLTG (Gas) on weekdays 112.55 MW and during Hari Raya Penyepian recorded 109, 40 MW.

Viewed from result the analysis of Table 3. Diesel Power Plant (PLTD) and Gas Power Plant (PLTG) on the weekdays produce power capacity 425.49 M PLTW with dust emissions by 844.81 (mg / m³), SO₂ amounted to 6,080, 31 (mg / m³), NO₂ amounted to 800.26 (mg / m³). When *Berata Penyepian* 2014, the used power is 254.40 MW. There was a decrease of electric power as big as 171.09 MW and decrease exhaust gas emissions as big as dust as much as 443.8 mg / m³; SO₂ as much as 3099.11 mg / m³; NO₂ as much as 404.43 mg / m³. Also there is a reduction of fuel as much 677,584.2 liters of diesel on peak load. If cashed becomes the value of Rp. 3,704,671,590.55, -.



Graph 1. Capacity Of Power and Emissions in March 2014

The fuel savings can be said to be remarkable, because only a few hours have reached the billion. According to PLN (2012) on *Berata Penyepian* could save Rp. 4 billion and reduced exhaust emissions.

b). When Berata Penyepian 2015

Reductions Emission which are carried out based on the study on the Hari Raya *Berata Penyepian* in 2015, that is based on data peak load electricity in Company Electricity Country (PLN).

(a) Berata Penyepian to reduce use of electric power Significantly

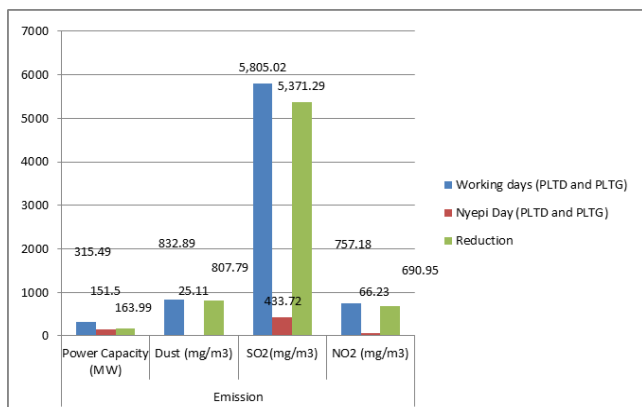
At Table 5. Use of electric power on diesel (PLTD) before *Berata Penyepian* amounted to 157.66 MW and at time *Berata Penyepian* 67.10 MW. On the gas power plant generates power as big as 157.83 MW and on the Hari Raya *Berata Penyepian* produce only 151.50 MW. Decreased the power reached 163.99 MW.

(b) Model Berata Penyepian is one good way to reduce pollution in years 2015.

Electric Power generated by generator of electric power on diesel (PLTD) and gas (power plant gas) in Bali in 2015 is the average of 315.49 MW. At the time of *Berata Penyepian* the electric power generated 151.50 MW on March 21, 2011. Reduction the electric power used during *penyepian* as big as 163.99 MW (52%); dust as much as 807.79 mg / m³; SO₂ as much as 5371.29 mg / m³; NO₂ as much as 690.95 mg / m³, and the total amount of fuel reduction 194.617.08 liters. With the reduction of emissions during the *Brata Penyepian* can already be said is one good way to reduce air pollution in general. If the price of diesel fuel is Rp. 5500, - the electric power saving in the rupiah is Rp. 3,058,252,661.56, -. The value of the

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saving of nearly four billion, with only a few hours, on peak load electrical.



Graph 2. Capacity Of Power and Emissions in March 2015

From the model Berata Penyepian in 2014 and 2015 can be seen the fact that there is the reduction of exhaust gases. This fact can be considered extraordinary things because based on the facts that happened there has never been a system or method that can alter or reduce pollution theoretically and reality like this. But there is already that have been try is to turn off the lights is only one hour or planting trees, it also does not produce a concrete evidence that can be used as a reference. But with Model Berata Penyepian has been recognized worldwide and even the airports only one in Bali was closed and the worlds respect.

B. Model Berata Penyepian Need To Do

True to its name, Berata which means hold lust, Berata Penyepian which means a quiet, so Berata Penyepian means hold lust, to do penance and meditation to draw near to God. There are three Berata which must to do, one of which makes the earth clean of all kinds of dirtiness caused by human activities that want change both in themselves and the world, so that the earth this is changed as a result of many motorcycle, cars and big machines work like machines of electrical power plant. Engine generator (PLTD and PLTG) is the engine that uses diesel fuel, with uses diesel fuel is certainly going will have fumes (emissions) more many than other fuels such as gasoline, except coal. Model Berata Penyepian should be implemented, so have the hope to reduce the emissions produced and the more it can reduce expenditure in terms the costs of fuel incurred. If a model like this can be done worldwide, even if done only one hour only, in accordance with the recommendation that ever existed, it would have many benefits.

a) Model Berata Penyepian As One Of Ways Which Best To Reduce Emissions

Bali is known as the Island of the Gods, many religious teachings concerning how to set the people in order to be fully human and willing to do and obey religious teachings. Berata Penyepian is one way to organize peoples and obedient to devote heart on Ida Sanghyang Wasa (God Almighty). Berata Penyepian only done by people who are Hindus. The entire Bali, conduct religious activities Brata Penyepian and invites people of other religions to participate.

Religious Activity that is owned by peoples Hindus can be emulated by region, or the world, because has the advantages of reducing greenhouse gas emissions that

cause pollution, but also can give the earth to breathe so as not susceptible of shocks due to the heat of the sun and the roar of a car engine , motors and machines that move without giving a breathing space earth.

Earth should be given to improve position and conditions so that we avoid vibration or movement of the earth due to excess capacity in load acceptance. The purpose of Berata Penyepian is in addition reduce exhaust emissions is also one good way to give a rest earth to fix what has been lost or has gone wrong on the earth so that the with break of the earth, earth can work be normal again.

According to the PLN, Hindus in Bali contribute significantly to saving of electricity power, especially at the time of the Feast Berata Penyepian which reached 52%. Even in the agenda titled Nations Framework Convention on Climate Change (UNFCCC) said the celebration of Nyepi considered capable of reducing fuel use, saving energy, reducing pollution, and to break for earth.

VI. CONCLUSIONS

From the discussion above can made conclusions as follows:

1. On the feast of Berata Penyepian seen in the data obtained and when analyzed visible a difference in the conditions before and during Berata Penyepian. This difference indicates very necessary Berata Penyepian models in order to reduce exhaust emissions to a healthy life for humans.
2. Model Berata Penyepian can save of fuel costs approaching four billion at peak loads, for that, the model Berata Penyepian should be made to provide the earth of breathe after burdened and may give an opportunity to improve themselves.
3. Model Berata Penyepian can be used as one good way to reduce pollution, because this model can reduce operational from power plants that use diesel fuel, which is basically one of the largest emitters which able to make the surrounding area is filled with dirt dust from fuel combustion.

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