INTISARI

Sumber daya energi batubara di Indonesia mencapai 36,5 milyar ton dengan sekitar 5,1 milyar ton dikategorikan sebagai cadangan terukur. Porsi penggunaan batubara dalam proyek pembangkit listrik di Indonesia mencapai 60 persen. Penggunaan batubara dapat menyebabkan sejumlah dampak negatif, salah satunya adalah emisi CO_2 yang mempunyai potensi terhadap pemanasan global. Oleh karena itu, diperlukan suatu teknik yang digunakan untuk mengukur dampak lingkungan yang terkait dengan suatu produk, suatu proses pembuatannya, ataupun layanan yang diberikan oleh produk tersebut selama siklus hidupnya yang disebut dengan *Life Cycle Assessment* (LCA).

Penelitian ini bertujuan untuk mengevaluasi konsumsi energi dan dampak lingkungan dari PLTU Batubara di Indonesia dengan menggunakan metode LCA. Lingkup penelitian yang diambil adalah fase produksi listrik beserta dengan infrastruktur PLTU, fase pengadaan batubara beserta transportasinya, fase pengadaan batu kapur beserta transportasinya, fase produksi bahan bakar solar beserta transportasinya, dan fase *recovered waste*. Fungsional unit yang digunakan adalah satu Mega Watt dalam satu jam (MWh). Database dikumpulkan berdasarkan hasil laporan secara langsung dan empiris penunjang lainnya.

Hasil penelitian menunjukkan bahwa potensi dampak yang dihasilkan dari produksi listrik satu unit fungsional PLTU Batubara di Indonesia *Abiotic Depletion Potential* (ADP) sebesar 1.23E-11 kg Sb_{eqv}/MWh, *Global Warming Potential* (GWP) sebesar 1.81E+04 kg CO_{2eqv}/MWh, *Ozone Depletion Potential* (ODP) sebesar 2.22E-08 kg CFC11/MWh, *Human Toxicity Potential* (HTP) sebesar 4.77E+02 kg 1,4-DCB_{eqv}/MWh, *Ecotoxicity Potential* (Eco) sebesar 6.46E+00 kg 1,4-DCB/MWh, *Photochemical Ozone Creation Potential* (POCP) sebesar 5.22E+00 kg ethylene/MWh, *Acidification Potential* (AP) sebesar 2.56E-01 kg SO_{2eqv}/MWh, serta *Eutrophication Potential* (EP) sebesar 3.35E-02 kg PO^{3-}_{2eqv}/MWh.

Proses yang memberikan kontribusi dominan terhadap potensial dampak adalah *electricity*, yaitu pada ADP, sebesar 70 %, ODP sebesar 76%, Eco sebesar 87%, dan AP sebesar 82%, EP sebesar 100%, GWP sebesar 79% dan POCP sebesar 72%. Potensial dampak HTP kontribusi dominan berasal dari crude oil, yaitu 49%.Fase pengadaan batubara merupakan fase yang memberikan kontribusi dominan terhadap dampak lingkungan dengan presentase sebesar 86% sampai 92%, kemudian diikuti oleh proses *power generation* atau produksi listrik.

Kata kunci: *Life Cycle Assessment* (LCA), *Life Cycle Inventory* (LCI), PLTU, batubara, emisi, energi, dampak lingkungan

ABSTRACT

Coal energy resources in Indonesia has already reached 36,5 billion tons, around 5,1 billion tons classified as measured resources. The portion used of coal in power plant in Indonesia has reached 60 percent. Coal combustion can lead to some negative effects, one of those is the CO2 emissions have a big potential for global warming. Therefore, we need a technique used to measure the environmental impacts associated with a product, a manufacturing process, or the services provided by that product during its life cycle, called the Life Cycle Assessment (LCA).

This research aimed to evaluate the energy consumption and environmental impact of coal power plant in Indonesia using LCA method. The scope of the research is from power production phase along with the infrastructure, procurement of coal and its transportation phase, procurement of limestone and its transportation phase, diesel fuel production along with transportation phase, and recovered waste phase. Functional unit used in this research is one Mega Watt in one hour (MWh). Database compiled based on field reports and other supporting literature.

The results of potential impact from the electricity production of the functional unit of coal-fired power plant in Indonesia are Abiotic Depletion Potential (ADP) of 1.23E-11 kg Sbeqv/MWh, Global Warming Potential (GWP) of 1.81E+04 kg CO2eqv/MWh, Ozone Depletion Potential (ODP) of 2.22E-08 kg CFC11/MWh, Human Toxicity Potential (HTP) of 4.77E+02 kg 1,4-DCBeqv/MWh, Ecotoxicity Potential (Eco) of 6.46E+00 kg 1,4-DCB/MWh, Photochemical Ozone Creation Potential (POCP) of 5.22E+00 kg ethylene/MWh, Acidification Potential (AP) of 2.56E-01 kg SO2eqv/MWh, and Eutrophication Potential (EP) of 3.35E-02 kg PO3-2eqv/MWh.

The most dominant process that contributes to the potential impact is electricity, which is on ADP by 70%, ODP by 76%, Eco by 87%, AP by 82%, EP by 100%, GWP by 79%, and POCP by 72%. The potential impact of HTP comes from crude oil, which contributes 49%. Coal procurement phase is the most dominant phase that contributes to environmental impact with a percentage of 86% to 92%, followed by the process of power generation or electricity production.

Keywords: *Life Cycle Assessment* (LCA), *Life Cycle Inventory* (LCI), *coal-fired power production*, *coal*, *emission*, *energy consumption*, *environmental impact*