Prevention and Mitigation of Health Impacts of Biomass Power Plants

Situation, problems and impacts

1. Renewable energy is a vital alternative energy source to which various countries all over the world are giving more and more emphasis because of its contributions to economic development, technological innovation, conservation of natural resources and mitigation of environmental impacts, particularly climate change problems (International Energy Agency, 2011; World Energy Outlook 2010; and Intergovernmental Panel on Climate Change, 2012; Special Report on Renewable Energy Sources and Climate Change Mitigation). Consequently, these countries have been endeavoring to create a balance in the development of different types of renewable energy, including biomass, biogas, solar, wind, small-scale hydropower and bio oil, so as to achieve utmost benefits for societies.

2. Biomass crop is a vital alternative energy source of Thailand due to the fact that Thailand is an agricultural country and there are abundant agricultural residues left over from production processes in agricultural industries. The Office of Agricultural Economics (2009) reported that Thailand produced biomass from agricultural residues totaling 59,539,905.20 tons. According to the Alternative Energy Development Plan (2012-2021), the ratio of alternative energy use is targeted to increase to 25 percent of domestic energy consumption in 2021, whereby biomass used in electricity generation is targeted to reach 3,630 megawatts (Department of Alternative Energy Development and Efficiency, 2012).

3. Despite the targets and efforts to promote biomass-based electricity generation, according to the information released by the Energy Policy and Planning Office under the Ministry of Energy in March 2012, it was found that only 88 biomass power plants with a total installed capacity of 1,465.68 megawatts could generate and sell electricity to the Electricity Generating Authority of Thailand and Provincial Electricity Authority, accounting for only 4.3 percent of the overall installed capacity. Out of the total number of plants, 22 plants (614 megawatts) are categorized as small power producers and 44 plants (851.68 megawatts) are categorized as very small power producers. In addition, according to the information from the Ministry of Energy, currently there are another 284 small and very small projects with a combined capacity of 2670.7 megawatts which are in the process of application filing for project approval. This number signifies a tremendous increase, but the policy framework and promotion guidelines are unclear. If there is no good management or things are allowed to run their course like nowadays, the general public will suffer from adverse effects and hardship.

4. The operations of biomass power plants without good management and control measures bring about environmental and health impacts, including pollution from toxic substances and dust particles causing diseases and health hazards. Moreover, dust from ash heaps emitted by biomass burning and dust from fuel heaps dirty houses, clothes, and personal effects of the people living around the power plants. Besides, there are problems relating to polluted water and disputes among communities over water use because power plant operation consumes a huge amount of water. In a study on health impacts of a biomass power plant in Surin province

conducted by some civil groups and networks (community researchers, the sustainable energy working group in Surin province, and Isan Development Foundation 2012), it was found that people faced water shortage problems after a biomass power plant appeared in the area. Furthermore, problems relating to traffic congestion and trucks running through the area have been on the rise, and there are also problems relating to damaged roads and public distress and nuisance stemming from foul odors and loud noises.

5. Based on the information on illnesses suffered by residents living near two power plants, in the sample group of 392 people, it was found that the most commonly reported chronic disease is allergy, followed by asthma and heart disease. The number of allergy sufferers correlates with proximity to the power plants. It was also found that in the course of the past week more people living near a power plant suffered from cough, sore throat, nasal and throat irritation, shortness of breath/breathing difficulty, eye irritation/eye inflammation/conjunctivitis and rashes than those who lived farther away. (Chatchawan Chantharawichit, 2011)

Main problems and solutions

(a) Lack of health impact assessment and lack of control on health impacts of biomass power plants with a capacity less than 150 megawatts

6. Due to its solid state, biomass is a fuel which is not easily burnt, and normally combustion produces incompletely burnt substances, ranging from 10 to 38 percent. In fact, these substances are pollutants which may be a form of particulate. It is estimated that biomass burning emits about 30-80 mg. of dust particles per kilowatt of electricity generated (most of them are smaller than 10 microns in size (PM10)) and 290-820 mg. of oxides of nitrogen (NOx) per kilowatt as well as carbon monoxide (CO). Besides, it was found that smoke emitted by biomass burning consists of more than 60 hydrocarbons and 17 aldehydes and ketones. The substances in this group, particularly PAH (polycyclic aromatic hydrocarbons), are carcinogenic compounds, including benzene, formaldehyde, 1,3-butadiene and styrene. (Zhang and Smith, 2007) Some study findings indicate that exposure to smoke emitted from biomass burning for cooking and warmth is harmful to health in many ways, including eye irritation and the respiratory system, impaired lung function, acute lower respiratory tract infection, chronic obstructive pulmonary disease (COPD), asthma, tuberculosis and lung cancer. (Torres- Duque, et al., 2008)

7. Fine dust particles can enter the lung and lung sacs. Various study findings throughout the world confirm that such exposure can cause illnesses, including respiratory system diseases, heart diseases and reduced pulmonary efficiency, resulting in increased mortality rate from pulmonary and heart diseases. (WHO, 2006) Oxides of nitrogen are gases that can combine with water vapor to form nitric acid, which can cause respiratory irritation. Exposure to nitric acid causes irritation in the respiratory system which may result in breathing difficulty, coughing, chest tightening and collapsing trachea. Once exposed, asthma sufferers will have more frequent attacks, and later they may develop bronchitis and pneumonia. (WHO, 2006) Carbon monoxide deprives the body of oxygen and heightens the risk of heart disease and heart attack, and exposure to a high concentration can be fatal. (WHO, 2003) Based on the information reported by health-promoting hospitals in the sub-districts of Salakdai and Ram in the vicinity of the Mung Chareon power plant it was found that out of 7,040 patients receiving medical care, 2,285 patients suffered from respiratory diseases, representing the highest number or 32.46 percen. This

revelation is consistent with the information reported by the health-promoting hospital in Ram sub-district. It was found that out of 9,840 patients receiving medical care, 3,382 patients suffered from respiratory diseases, accounting for the highest number or 34.37 percent.

8. Besides, biomass power plant also contributes to the formation of ozone gas (O_3), which is created by reactions between oxides of nitrogen emitted from biomass fuel burning and hydrocarbon compounds in the atmosphere. Primary harmful effects of ozone gas include blood disorders, respiratory irritation, increased morbidity rate of respiratory diseases and impaired lung functions. In addition, it also contributes to the occurrence of asthma and lung cancer and causes a higher mortality rate among those exposed to ozone gas. (WHO, 2003)

(b) Issues regarding EIA evasion by power plants with a capacity below 10 megawatts and construction of many projects within the same compound to circumvent the law

9. The notification of the Ministry of Natural Resources and Environment issued in 2009 mandates that a biomass power plant with a capacity over 150 megawatts is required to prepare an environmental quality assessment report for any project or activity which may cause severe impacts on communities in terms of environmental quality, natural resources and public health (EHIA – Environmental Health Impact Assessment). However, a thermal power plant with a capacity over 10 megawatts is required to prepare only an environmental impact assessment report. As a result, many operators have taken advantage of this legal loophole. As discerned from the information released by the Energy Policy and Planning Office, among the biomass projects offering to sell electricity, out of a total of 281 plants, in 2010 there were 205 plants operating with a capacity of 9.0-9.9 megawatts. Moreover, out of a total of 110 operators, 41 operators who previously applied for an operating license in the small power producer (SPP) category filed a request to switch to the very small power producer (VSPP) category. (Energy Policy and Planning Office, Ministry of Energy, 2011)

(c) Lack of supports for modern technology

10. In Thailand, almost all power plants use a technology known as "direct burning". This technology uses the heat derived from biomass fuel burning to generate steam to turn on the generator. The limitations associated with this system include low-efficiency power generation and a large amount of pollution emitted from the incineration. Therefore, it is imperative to have a good pollution control system. Several options are available, ranging from fuel quality control, selection of incinerators to system maintenance. Importantly, there must be good equipment that can trap pollutants emitted from the smoke stack. However, this system may not be practical in a small power plant due to higher operating costs and system maintenance expenses. (Chatchawan Chantharawichit and Yuwayong Chantharawichit, 2012)

11. The gasification technology is a cleaner technology (the solid form of biomass fuel is converted into gaseous form (gasification) first, then gas passes through the quality improvement process to attain a cleaner gas before it is used as a fuel to run an engine to generate electricity) which not only has higher efficiency but also emits much less amount of pollution, equivalent to emission from a large engine. Nevertheless, in Thailand there are only a few power plants of this type which presently generate and transmit electricity into the system. This issue may stem from lack of research and technological development and lack of active support from concerned

agencies, leading to constraints in terms of investment and generation capacity. (Chatchawan Chantharawichit and Yuwayong Chantharawichit, 2012)

(d) Lack of community participation in decision making, monitoring and oversight as well as lack of compensation, rehabilitation and redress mechanisms for those affected by biomass power plants

12. Presently, the issuance of an energy business operating license involves a process, starting from filing an application for approval of building construction in an area. The local administrative organization is duty-bound to give an opinion, while the issuance of energy business operating licenses falls under the purview of the Energy Regulatory Commission. However, in most cases there is a lack of the civil sector's participation. Some project may publicize that it creates jobs in the community and ensures energy security in the locality but does not present information on adverse impacts to the general public. In addition, such project may entice the local administrative organization with potential property tax collection. As a result, the local administration organization may disregard the information on potential impacts on the people. Even though the project may be a power plant with a capacity over 10 megawatts which requires an environmental impact assessment (EIA) report, the people cannot actively participate in the process that defines its scope of study. They are merely information providers. Then, the company will develop preventive and corrective measures, and eventually the project will be reviewed and approved. The process that calls for local decision making to determine whether this enterprise is suitable for the area and how it will affect the community involves little public participation. Even if the people actively participate in the process and decide, for example, that they do not want the power plant to be built in the area, and a public forum is held and objects to its construction, at the end of the day the Energy Regulatory Commission would give permission anyway because they consider that the operator has properly fulfilled all legal requirements. A key point that should be pondered is the decision made based on relevant information must be fair; otherwise, the voice of the people would not be meaningful at all, despite the fact that they were told they have a role to play in the decision making. If this is a recurring incident, the current mechanism and process cannot bring about suspension of power plant operation.

13. Regarding the electricity development fund of communities in the vicinity of a power plant, the objective is to rehabilitate the locality affected by a power plant, promote renewable energy and enhance knowledge and encourage participation in electricity-related aspects (Energy Business Act B.E. 2550 (2007)). However, it does not have mechanisms for continual monitoring of impacts arising from a power plant, including clear mechanisms and measures to provide remedies to affected people.

14. At provincial level, there is no biomass energy development plan which compiles information on its potential and is used as a project review framework to ascertain how much construction of power plant should be permitted in each province. Local people have not yet been given opportunities to learn and understand various alternatives for electricity generation as well as options in terms of technology and areas suitable for power plant construction. In addition, they do not participate in impact monitoring.

(e) Lack of benefit distribution from the development of biomass power plants to communities and farmers

15. At present, there are no community-owned power plants. The development of biomass power plant can add value to local resources. For instance, rice husk price has risen from 200-300 baht per ton to the current level of 1,000 baht per ton. However, benefits of rice husk, which is now a main type of fuel widely used by most biomass power plants, fall into the lap of rice mill plants, not farmers. Meanwhile, while other types of biomass, such as corncob or rice straw among others, are in the early stages of development, there are no definite systems or mechanisms which distribute the benefits of biomass resources to farmers. Moreover, biomass power plant projects belong to private companies, and there is no opportunity for communities to participate in the project as owner or shareholder whatsoever.

16. Regarding the benefits of developing biomass into electricity, there are no systems or mechanisms that fairly distribute such benefits to communities and farmers yet.

(f) Lack of site selection criteria and standards

17. Town planning layout and land use provisions in the overall town planning do not yet have standards for the determination of land use by biomass power plants.

18. Under the classification by types of industry that permits or prohibits activities in certain areas, a biomass power plant is categorized as a type of factory that produces, transmits or sells electricity, and all types of power plant are included in the same category. However, production aspects, impacts and land use as well as exploitation of resources and raw materials of each type of power plant are different. Therefore, the classification of all types of power plant in the same category based on factory permit review and approval may be too broad and imprecise when it comes to review of land use which does not cause adverse impacts.

Pertinent policy, laws and measures

19. The alternative energy development plan of the Ministry of Energy sets targets to increase alternative energy use to 25 percent of total domestic energy consumption by the end of 2022 and to generate 3,630 megawatts of electricity from biomass energy. (Department of Alternative Energy Development and Efficiency, 2012)

20. Under the Constitution of the Kingdom of Thailand B.E. 2550 (2007), Sections 66 and 67 prescribe community rights with respect to preservation and exploitation of natural resources, environment and biodiversity as well as the right to safeguard, promote and preserve environmental quality so that people can sustain their normal livelihoods in sustainable manners in the environment which does not have adverse effects on their health and hygiene, welfare or quality of life. In addition, Section 287 stipulates that if any conduct of a local government organization substantially affects local people's ways of life, the local government organization shall inform the people of relevant details well before such action is taken.

21. The Sub-district Council and Sub-district Administrative Organization Act B.E. 2537 (1994) and Amendment No. 5 B.E. 2546 (2003), in conjunction with the Act Prescribing Plan and Procedure of Decentralization to Local Government Organizations B.E. 2542 (1999), stipulate that sub-district administrative organizations have the duty to safeguard and maintain natural resources and environment as well as to make arrangements for public health, building control, town planning and promotion of public participation in local development. In case a sub-district administrative organization expresses an opinion regarding such undertakings, relevant ministry,

bureau, department or state organization or agency shall heed its opinion in the review of such undertakings.

22. The Ministerial Regulation No 2 (B.E. 2535), issued pursuant to the provisions in the Factory Act B.E. 2535 (1992), contains sections regarding location, environment, features of factory building and its internal aspects and prohibition of setup of type 3 factory. However, this ministerial regulation does not prescribe a distance between a project and the community. Only housing estates, condominiums and shop-houses are mentioned.

23. Under the Ministry of Industry's Notification on Preparation of Report on Study of Preventive and Corrective Measures Pertaining to Impacts on Environmental Quality and Safety B.E. 2552 (2009), biomass power plants are mentioned on the list regarding types of factory attached to the ministerial regulation B.E. 2535 (1992), as a factory that produces, transmits or sells electricity (Item No. 88). This information is submitted along with the factory operating license application or factory expansion permit application.

24. The Office of Energy Regulatory Commission (ERC) is a main agency responsible for issuance of energy business operating licenses. At present, ERC is in the process of announcing and enforcing ERC regulations and notifications pertaining to environmental impact preventive, corrective and monitoring measures for those exempted from the preparation of EIA report, pursuant to the environmental promotion and conservation law, for electricity generation from biomass (solid fuel type). Currently, such regulations and notifications are in the process of being published in the Government Gazette, and they will be used to determine environmental impact preventive, monitoring and corrective measures so that they fall in the same standards.

25. The Ministry of Natural Resources and Environment's notification in 2009 stipulates that a biomass power plant with a capacity over 150 megawatts is required to prepare an environmental impact assessment report for any project or enterprise that may cause severe impacts to communities in terms of environmental quality, natural resources and health (EHIA – Environmental Health Assessment). Additionally, a power plant with a capacity over 10 megawatts is required to prepare only environmental impact assessment report. As a result, many operators have taken advantage of this legal loophole by developing 9.0-9.9 megawatt biomass power plant projects instead.

26. In summary, biomass is a vital alternative energy source of Thailand. However, there are still some problems regarding adverse impacts on the environment and public health. Such problems call for good measures and guidelines to prevent and control health impacts; guidelines and standard criteria for area selection; management of adverse impacts, especially from power plants with a capacity less than 10 megawatts; promotion of efficient, low pollution technology; decentralization of control of power plants; measures and mechanisms for public participation in decision making and control of power plant's operation; and handbooks and study guidelines on health impacts of biomass power plants.

Issues for consideration by the National Health Assembly

Requesting the National Health to consider Document Health Assembly 5/Draft Resolution 6

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