

# A Long Road to the Development of<sup>108</sup> Bio-Fuel in Indonesia

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**Abstract:** Increased energy usage in line with economic growth and the increase in world population has an immediate impact for the depletion of fossil -based energy, especially petroleum. The fact that world oil supplies are limited, many states are forced to prioritize energy policy as a top priority in development policy. In addition, this condition has raised new fears that the global energy security. With a strong concern of potential extinction of petroleum and other fossil -based energy sources , policy makers should pay more attention to energy security. The same trend is occurring in Indonesia. Along with the increase in the national population, national and regional development plans, the need for national energy security is a must. The Indonesian government must be able to answer the challenge is to strengthen national energy security. Because energy is a strategic conditions to support national development through the availability of sufficient, safe, and energy- quality and evenly distributed throughout Indonesia at an affordable price, it requires a government policy that supports national energy security. An attempt was made by the Government of Indonesia to ensure energy security is to issue a policy for the use of renewable energy in Indonesia .

**Key Words:** renewable energy, policy, national security, economic growth

**Abstrak:** Meningkatnya penggunaan energi yang sejalan dengan pertumbuhan ekonomi dan peningkatan populasi dunia memberikan dampak langsung bagi deplesi energi berbasis fosil khususnya minyak bumi. Fakta bahwa pasokan minyak dunia yang terbatas, banyak negara dipaksa untuk memprioritaskan kebijakan energi sebagai prioritas utama dalam kebijakan pembangunan. Selain itu, kondisi ini telah menimbulkan kekhawatiran baru yaitu pada keamanan energi global. Dengan keprihatinan tangguh kepunahan potensi minyak bumi dan sumber energi berbasis fosil lainnya, pembuat kebijakan harus lebih memperhatikan keamanan energi. Kecenderungan yang sama terjadi di Indonesia. Seiring dengan meningkatnya populasi nasional, rencana pembangunan daerah dan nasional, kebutuhan untuk keamanan energi nasional adalah suatu keharusan. Pemerintah Indonesia harus dapat menjawab tantangan yaitu dengan memperkuat ketahanan energi nasional. Karena energi adalah suatu kondisi strategis untuk mendukung pembangunan nasional melalui ketersediaan yang cukup, aman, dan energi kualitas dan merata di seluruh Indonesia dengan harga yang terjangkau, hal ini memerlukan sebuah kebijakan pemerintah yang mendukung ketahanan energi nasional. Sebuah upaya yang dilakukan oleh Pemerintah Indonesia untuk menjamin keamanan energi adalah dengan mengeluarkan kebijakan untuk menggunakan energi yang dapat diperbaharui di Indonesia.

**Kata Kunci:** Energi dapat diperbaharui, kebijakan, ketahanan nasional, pertumbuhan ekonomi

## Introduction

The increasing use of energy that is in line with economic growth and increasing world population provides a direct impact for fossil-based energy depletion especially

petroleum. One research by Dr. John Edwards (University of Colorado), states in 2009 the world population reached 6 billion people with the world's energy consumption reaching about 200 million barrels of oil equivalent per

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day; and in 2025, with about 8 billion people the world's total energy consumption will rise around 233 million barrels of oil per day.<sup>109</sup> Another data from BP Statistical Review of World Energy June 2010 showed that by the end of 2008, there were 1,258 billion barrels of decreasing oil reserves which was higher compared to the 1,261 billion barrels in 2007.<sup>110</sup> It is estimated that until 2030, worldwide energy consumption will remain dependent on petroleum. The fact that world oil supplies are limited, many countries are forced to prioritize energy policies as a major priority in development policies. In addition, this condition has raised new concerns namely on global energy security. With formidable concern of potential extinction of petroleum and other fossil-based energy sources, policymakers should pay more attention to energy security.

The same trend happens in Indonesia. Along with the increasing national population, regional and national development plans, the need for national energy security is a must. Data released by the Central Bureau of Statistics (BPS) showed that Indonesia's population in 2000 was at 206.2 million people and was estimated to reach 238 million in 2010.<sup>111</sup> Noted that, from 2000 until 2010

average oil production per year went down to 3.82% or a total 32.25% in 2010 compared to year 2000.<sup>112</sup> The data from the Ministry of Energy and Mineral Resources reveals that Indonesia's oil reserves is about 3.7 billion barrels with an average production rate of 357 million barrels per year and is estimated to run out within the next 12 years.<sup>113</sup> The country has also turned itself as an oil importer due to inadequate refinery capacity in fulfilling its domestic demand. In fact, Indonesia had to resign from the Organization of Petroleum Exporting Countries (OPEC). The Government of Indonesia (GOI) is facing not only facing that reality, but also challenges in strengthening national energy security.<sup>114</sup>

Because energy is a strategic condition to support national development through the availability of sufficient, safe, and quality energy and distributed evenly throughout Indonesia at an affordable price, it requires a government policy that supports national energy security.

Mason Willrich describes two different context of energy security. The first

<sup>109</sup> "Donggi Senoro", alpen steel.com. viewed 25 october 2011( <http://www.alpensteel.com/article/65-109-energi-fuel-cell-sel-bahan-bakar/1717--Ing-donggi-senoro-jalan-atau-tidak.html>.2010).

<sup>110</sup> BP Statistical Review of World Energy June 2010

<sup>111</sup> M. Subekti, 2010, 'Indonesian strategy for challenges national energy crisis' (Strategi Menghadapi Krisis Energi Nasional) 4 august 2010, viewed 30 September 2011 (<http://www.mediaindonesia.com/read/2010/08/08/159646/68/11/>)

<sup>112</sup> " BP Review" in bicara energi.com available at <http://bicaraenergi.com/2011/09/bp-statistical-review-2011-minyak-bumi/>, Accessed date 30 September 2011.

<sup>113</sup> Course material "Indonesian Energy Strategy" in development studies major graduate program Bandung Insitute of Technology by Widjajono Partowidagdo. On March 2011, he is a member of the National Energy Council, currently he is a Vice Minister For Ministry Of Energy And Mineral Resources Republic Indonesia.

<sup>114</sup> According to draft regulation on energy security, national energy security is defined as a condition in which the needs for energy for household, public facilities, commercial, transportation and industry are fulfilled fairly and equitably in both quantity and quality at affordable prices both in normal or crisis or energy emergency condition.

context sees energy security in a narrow manner where it only senses the guarantee of sufficient energy supplies to support countries during armed confrontation. While the second context sees energy security from a broader sense, as the assurance of adequate energy supplies in order to maintain sustainable national economic levels.<sup>115</sup> According to Bob Sugeng Hadiwinata, the concept of sustainable economy is often associated with reasonable economic growth for ensuring social welfare and allowing the national economy to function in a politically acceptable manner.<sup>116</sup>

*"In many cases, energy security policies consist of three major components. First, 'rationing attempts to allocate available supplies and limit to allocate available supplies and limit consumption. A country adopts this type of policy on the grounds that reduction in consumption will diminish the magnitude of many energy supplies problem and extend the time for solving them. Second, 'stockpiling' aims to reduce an importing country's vulnerability to a supply interruption by providing a cushion against its effect. In this type of a policy, a country may set aside sufficient national energy reserves to ensure security and hedge against abnormal price fluctuations. Third, 'diversification' attempts to ensure continuity of energy supplies by diversifying sources and suppliers. Developing alternative sources ( coal, nuclear, solar power, hydropower, etc.) will reduce a country's dependency on a single energy source. Similarly, by opening contacts with other suppliers, a country will reduce its dependency on single supplier energy."*<sup>117</sup>

<sup>115</sup> Mason Willrich, *Energy and World Politics*. New York: The Free Press, 1978, p.67.

<sup>116</sup> B.S. Hadiwinata, *Energy Conservation Policy Development in Indonesia*, In: Thomson, Elspeth et.al. (eds.): "Energy Conservation in Southeast Asia: Towards Greater energy Security". London: World Scientific, 2011, p. 161-162.

<sup>117</sup> Ibid

An effort made by the Government of Indonesia to ensure energy security is by issuing a policy to use renewable energy in Indonesia.<sup>118</sup> Developing renewable energy can improve energy security because renewable energy can partly or fully substitute fossil fuels. Renewable energy manages to acquire the government's attention following a quadruple surge of world oil prices over a 4-year period (2001 - 2005) which inflicted fuel prices to rise in Indonesia. On October 1st, 2005, the government reduced fuel subsidy causing fuel prices to increase by 80%.<sup>119</sup> Three months later the government launched and promoted bio-fuel as a 'new deal' to replace fossil fuel.<sup>120</sup> Bio-fuel can be seen as a source of renewable energy that in the long run can be used as a tool to alleviate poverty and reduce unemployment rate.<sup>121</sup>

The Government was trying to develop bio-fuel more intensively than other renewable energies as mandated in Presidential Instruction (Inpres) No. 1 of 2006 on the Provision and Use of Bio-fuel as alternative fuel.<sup>122</sup> There is also a regulation from the

<sup>118</sup> A renewable energy source is an organic non-fossil fuel of biological origin. Renewable energy sources include biomass (include bio-fuel), hydro, geothermal, solar, wind, ocean thermal, waves and tidal waves.

<sup>119</sup> "Harga bahan bakar minyak di Indonesia", Wikipedia.com, viewed 20 September 2011, ([http://id.wikipedia.org/wiki/harga\\_bahan\\_bakar\\_minyak\\_di\\_Indonesia](http://id.wikipedia.org/wiki/harga_bahan_bakar_minyak_di_Indonesia)).

<sup>120</sup> "Bio-fuel" refers to liquid renewable fuels such as ethanol (an alcohol fermented from plant materials) and biodiesel (fuels made from vegetable oils and animal fats) that can substitute for petroleum-based fuels.

<sup>121</sup> M.T Sambodo, "Changing Energy Frontier: Challenges and Prospects" in: *Economics and Finance in Indonesia* Vol. 56 (2), 2008, p.118.

<sup>122</sup> Presidential Instruction No. 1/2006 on the "Supply Side and Utilization of Bio-fuel as a Source Other Fuels".

Ministry of Energy and Mineral Resources (ESDM) No. 51 of 2006 on procedures for the application of business license in the field of bio-fuel as alternative fuel.<sup>123</sup> Finally, the Government issued Presidential Regulation (Perpres) No. 5 of 2006 on National Energy Policy (KEN) in order to ensure the energy security in Indonesia. This regulation set the target to create optimum energy mix by 2025.<sup>124</sup> The Presidential Regulation also notes that the contribution of bio-fuel use would reach 5% of the total energy needed in 2025.<sup>125</sup> Bio-fuel is said to be the more equipped option of renewable energy sources from the regulation point of view.<sup>126</sup> In addition, the government has established the Directorate General of New Energy, Renewable and Energy Conservation which reflects the government's commitment to achieve national energy security as an effort to cope with energy crisis that occurs today and in the future.<sup>127</sup>

Nevertheless, it comes to the author's concern that although the GOI has set bio-fuel energy blueprint year 2005 – 2025 based on Perpres No. 5 of 2006, the actual condition still faces several challenges which interrupt its implementation success. For example, bio-fuel from castor oil was launched in 2006 where

many plants were built in Central Java and East Nusa Tenggara, however, their contributions are not really significant since many of the plants are no longer in operation.

With many regulations issued (will be explained later on) in order to support the development of bio-fuel, there is no assurance that the achievement of these targets will be simple and smooth.<sup>128</sup> It requires coordination between involved parties to encourage the use of renewable energy towards national energy security. These Parties are academics/universities, the government itself, and private companies joined together in the Triple Helix. In Triple Helix a partaker is an integral part to the others. The Parties are also expected to give contribution in accordance with their capacities and capabilities synergistically and proportionally. Triple Helix facilitates the realization of mutual collaboration among the three Parties.<sup>129</sup> Academics that are in charge of renewable energy technology development, the government as policy makers, the investors in charge of fulfilling financial requirements and also doing research and development (R&D) should synergize with one another. It requires continuous and dynamic efforts so that each Party would be able to do their best for the sake of mutual interests. The three Parties cannot act individually therefore there is a need for a synergistic and balanced cooperation.

<sup>123</sup> Ministerial Regulation No. 51/2006 on the "Requirement and Guidance for Bio-fuel trading as a Source of Other Fuels".

<sup>124</sup> Presidential regulation No. 5/ 2006 on the "National Energy Policy".

<sup>125</sup> Ibid

<sup>126</sup> M.T Sambodo, "From Fossil to Bio-fuel" in: *Energy sector in Indonesia and Enviromental impacts*, 2007, p.13.

<sup>127</sup> Opening speech by Minister of Energy and Mineral Resousces Indonesia Darwin Shlaeh, on Indonesia Bio-energy. May 2011.

<sup>128</sup> Presidential Regulation No. 5 of 2006 noted that the contribution of bio-fuel use would reach 5% of total Indonesian energy need in 2025.

<sup>129</sup> K. Kadiman, "The Triple Helix and The Public". Seminar on Balanced Perspective in Business Practices, Governance, and Personal Life, Jakarta. 2005.



Lesson learned from the implementation of bio-fuel development in several countries is that it takes time and needs serious attention. Since 1979 the government of the United States of America provides tax incentives for bio-fuel users and the South Korean government does the same as well. Meanwhile, Brazil has tested the use of bio-ethanol in motor vehicles since 1925.<sup>130</sup> Learning from the experiences of these countries, the GOI during the second term of President SBY must pay serious attention to bio-fuel development in Indonesia as the follow up of the presidential regulation on renewable energy issued in the first term of the presidency in order to achieve national energy security today and in the future.

First, this paper will discuss what the efforts that are done by the government of Indonesia, academic/universities and private companies (business) to develop bio-fuel as part of the implementation of energy security concept in Indonesia. Second, this paper will also discuss obstacles faced in the course of bio-fuel development by those three stakeholders. This paper will be limited for the years 2005 to 2010, which at that time President Susilo Bambang Yudhoyono is conducting his second presidential term.

This paper consists of three chapters. The paper will start with the introduction followed with problem identification to discuss the key

issues and the purpose of this paper, and then it will address relevant framework to explain the phenomenon being studied. In the first chapter, the author will explain energy policies in Indonesia especially the bio-fuel as renewable energy during the period of 2005 to 2010. Second, this paper will explain the efforts among the three Parties namely the government, academics/universities and business' actors in terms of bio-fuel development in Indonesia. Third, this paper will explain the obstacles faced by the government, academics/universities and private (business) for development of bio-fuel in Indonesia. The last chapter is the conclusion which contains the summary of all the explanations.

### **Condition and Energy Sources of Indonesia**

Energy plays a vital role in terms of pursuing social, economic and environmental objectives to maintain sustainable development and support the national economy. The country has been experiencing a considerable energy consumption juxtaposing the economic and population growth. Indeed, access to reliable and affordable energy comes as a key prerequisite to improve people's living standards. Indonesia is the fourth largest population in the world. Data released by Central Bureau of Statistics (BPS) showed that the country's population rose from 119.2 million (1971), 147.5 million (1980), 179.4 million (1990), to a staggering number of 206.2 million (2000). This figure hits 238 million in 2010, with similar trend line, Indonesia's population could reach 285 million

<sup>130</sup> Luhur Fajar Martha & Ratna Sri Widyastuti.2011,"SOS Energi Terbarukan di Indonesia", Kompas.com, 18 March 2011, viewed 25 October 2011, (<http://nasional.kompas.com/read/2011/03/18/04354012/SOS.Energi.Terbarukan.Indonesia>)

by 2025 and 360 million by 2050.<sup>131</sup>

Indonesia uses energy in four major sectors, namely household, commercial, transportation and industry. So far, the industry comes as the biggest energy consumer with 39.6% growth in 1990 to 51.86% in 2009 dominating more than half of total national energy use.<sup>132</sup> The second biggest energy consumer is the transportation sector with 30.77%, followed by household of 13.08% and commercial sector of 4.28%.<sup>133</sup> The supply of national energy remains largely dependent on conventional sources such as petroleum, natural gas, and coal by 95.6% in 2009, an increase from 95.2% in 2000.<sup>134</sup> Transportation took more than two-thirds of nationwide fuel supply, 89% supply of energy for industry relies on conventional energy, particularly natural gas, coal, and fuel.<sup>135</sup> The remaining portion is used for electricity, which comes from coal.

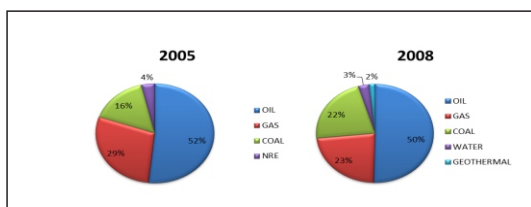


Figure 1.1. Pie Chart of Indonesia's Primary Energy in 2005 and 2008. ESDM 2009

These figures are presented in circle graphs that represent the national energy consumption in 2005 and 2009. In 2005 the use of oil is 52%, gas 29%, coal 16% and the rest is 4% for Geothermal and hydroelectricity. In 2008 more than 90% of energy use in Indonesia used fossil-based energy, namely oil 50.3%, gas 22.5% and coal 22%, geothermal 1.6%, hydroelectric 3%, and other new and renewable energy 0.2%.

The national energy potential in 2008 is presented in table 1.1 comprising of non-fossil based energy and fossil-based energy. It can be seen that current national oil reserves is only 3.7 billion barrels. Despite of that, Indonesia is endowed with even more non-oil energy resources such as gas, coal and coal bed methane. In 2008, the country's oil production was 357 million barrels per year, crude oil export was 146 million barrels per year, crude oil import was 93 million barrels per year and fuel import was 153 million barrels per year with oil consumption amounted to 457 barrels per year; there is a deficit of 100 million barrels per year, thus now our national oil reserve is only 3.7 billion barrels or 0.3% of overall world's oil reserves.<sup>136</sup>

Table 1.1 Energy Reserves in Indonesia (Fossil-Based Energy)

Fossil-Based Energy	Resources	Confirmed Reserves	Potential Reserves (Probable + Possible)	Production (Annually)
Petroleum	56.6 billion barrels	3.7 billion barrels	4.5 billion barrels	357 billion barrels
Natural Gas	334.5 TSCF	112.4 TSCF	57.6 TSCF	2.7 TSCF
Coals	104.5 billion tons	5.5 billion tons	13.3 billion tons	229.2 billion tons
Coal Bed Methane (CBM)	453 TSCF	-	-	-

<sup>131</sup> "Population in Indonesia based on province in year 1971, 1980, 1990, 1995, 2000 and 2010", (2010), bps.go.id, viewed 30 October 2011, ([http://www.bps.go.id/tab\\_sub/view.php?tabel=1&daftar=1&id\\_subyek=12&notab=1](http://www.bps.go.id/tab_sub/view.php?tabel=1&daftar=1&id_subyek=12&notab=1))

<sup>132</sup> Source : Ministry of Energy and Mineral Resources Indonesia, 2010.

<sup>133</sup> Ibid

<sup>134</sup> Luhur Fajar Martha & Ratna Sri Widyastuti. 2011, "SOS Energi Terbarukan di Indonesia" *kompas.com*, 18 March 2011, viewed 25 October 2011, (<http://nasional.kompas.com/read/2011/03/18/04354012/SOS.Energi.Terbarukan.Indonesia>)

<sup>135</sup> Ibid

<sup>136</sup> Course material "Indonesian Energy Strategy" in development studies major graduate program Bandung Institute of Technology by Widjajono

**Table 1.2 Energy Reserves in Indonesia (Non-Fossil Energy)**

Non-Fossil Energy	Resources	Equivalent	Installed Capacity
Hydro	845.00 million SBM	75.67 GW	4.2 GW
Geothermal	219.00 million SBM	27.51 GW	1,052 GW
Mini/Micro Hydro	500 MW	500 MW	0.086 GW
Biomass	49.81 GW	49.81 GW	0.445 GW
Solar	-	4.80 kWh/m <sup>2</sup> /day	0.012 GW
Wind	9.29 GW	9.29 GW	0.0011 GW
Uranium (Nuclear)	24,112 tons*) or 3 GW for 11 years	-	-

\*) only in Kalan – West Kalimantan, Source: ESDM 2008.

The Government of Indonesia has issued several policies in response to national energy development. One of the policies is the Presidential Regulation No. 5 of 2006 on National Energy Policy. This regulation is mostly aimed at securing national energy supplies to support national development and serves as standing guidelines for national energy development to meet national energy security.<sup>137</sup> Table 1.3 shows the targeted contribution of each energy type for 2025 (for comparison it also shows the 2004 energy mix data).

**Table 1.3 Target of Contribution to Indonesia Energy Mix**

No.	Energy	Contribution on Energy Mix	
		2004	Targeted 2025
1	Oil	52.50%	≤ 20%
2	Gas	19.04%	≥ 30%
3	Coal	21.52%	≥ 33%
4	Biofuel	0%	≥ 5%
5	Geothermal	3.01%	≥ 5%
6	Others renewable energy (Biomass, Solar, Wind, Nuclear, Hydro)	3.93%	≥ 5%
7	Coal Liquefaction	0%	≥ 2%

The policy indicates that by 2025, energy mix is expected to be more proportionate to optimize the role of renewable energy. Energy mix (energy mix) is a concept /

Partowidagdo. On March 2011, he is A Member Of National Energy Council, currently he is a Vice Minister For Ministry Of Energy And Mineral Resources Republic Indonesia.

<sup>137</sup> Presidential Regulation No. 5/2006 on the “National Energy Policy” viewed 20 October 2011 (<http://www.esdm.go.id/regulasi/perpres.html>).

strategy which can be used as an instrument to meet a sustainable economic development and energy. Energy mix highlights that the utilization of energy should optimize existing energy sources. Indonesia should not be largely dependent on non-renewable fossil-based energy sources (oil, coal, and gas), however, efforts should be made to develop renewable energies such as bio- fuel, hydro, geothermal, solar power, and so on.<sup>138</sup>

### Renewable Energy Policy in Indonesia.

A way to enhance national energy security is to develop and promote renewable energy to replace fossil-based energy. As mentioned in the blueprint of the Presidential Regulation No. 5 of 2006 on National Energy Policy (KEN) year 2005 to 2025, by 2025, 17% of national energy requirements would be supplied by renewable energy.<sup>139</sup> Efforts to promote and optimize the role of renewable energy are expected to reduce dependence on fossil fuels (oil, coal, gas) to meet more proportional energy. As explained, the next energy needs would be supplied by bio-fuels 5%, geothermal 5%, biomass, nuclear, water, and solar panels, and wind 5%, and liquefied coal as 2%.<sup>140</sup>

<sup>138</sup> Ibid

<sup>139</sup> Ibid

<sup>140</sup> Bio-fuel is methyl ester compound derived from esterification or trans esterification of various vegetable oil or animal fats. Geothermal is heat (thermal) derived from the earth (geo), thermal energy contained in the rock and fluid (that fills the fractures and pores within the rock) in the earth's crust. Biomass is carbon based and is composed of a mixture of organic molecules containing hydrogen, usually including atoms of oxygen, often nitrogen and also small quantities of other atoms, including alkali, alkaline earth and heavy metals. Nuclear energy is originates from the splitting of uranium

In addition, the Government of Indonesia has set a target of renewable energy development in Indonesia including short-term and long-term targets. In short-term target, renewable energy will be developed in a small scale to meet the basic needs of energy in rural area; the government will enhance access to energy in rural areas so that renewable energy can contribute considerable roles to create new economic activities.<sup>141</sup> The long-term renewable energy target is to replace fossil-based energy.<sup>142</sup>

To achieve these targets, the Government of Indonesia has issued relevant policies to support the implementation. One of the important policies issued by the government is the obligation for local governments to maintain sustainable energy programs and promote energy conservation and the use of renewable energy as set out in article 18 Law No. 30 of 2007 on Energy.<sup>143</sup>

The top institution governing renewable energy is the Directorate General of Renewable Energy and Energy Conservation of the Ministry of Energy and Mineral Resources in charge of the formulation of

national policies, implementing policies and technical policies. To support the government program in terms of renewable energy, the Ministry is not the only party involved but other government agencies should participate to achieve the target; the government has also established stakeholder organization networks to contribute their views on the development and provide public relations of renewable energy in Indonesia. Several government agencies and organizations involved are as follow:

- a. Ministry of Research and Technology and the Agency for the Assessment and Application of Technology (BPPT) which have conducted researches on the use of renewable energy in Indonesia by involving several leading universities in Indonesia. In 2006 both institutions issued a white paper of Indonesia's energy years 2005 to 2025 which discusses research plan and the implementation of renewable energy policies.
- b. Indonesian Renewable Energy Society (METI) is a forum for communication, consultation and cooperation among Renewable Energy (ET) actors which aims to accelerate and promote renewable energy to meet national energy requirements. The establishment of METI was initiated by intellectuals, government officials, entrepreneurs and professionals; the organization is committed to contribute to global efforts to mitigate negative effects of global climate change by offering ideas and solutions to global

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atoms in a process called fission. At the power plant, the fission process is used to generate heat for producing steam, which is used by a turbine to generate electricity. Hydro-power (water) is the capture of the energy of moving water (falling or flowing water) to generate electric power. Solar panel is a solid state electrical device that converts the energy of light directly into electricity by the photovoltaic effect. Wind energy is the conversion of wind energy into a useful form of energy, such as using wind turbines to make electricity.

<sup>141</sup> International Energy Agency, "Energy Policy Review of Indonesia" IEA: 2008, p.93-95.

<sup>142</sup> Ibid

<sup>143</sup> Law No. 30/2007 on the "energy" available at <http://www.esdm.go.id/regulasi/uu.html>. Accessed date 20 oktober 2011.

- issues particularly through advocacy and promoting the use of Renewable Energy.
- c. National Team for Bio-fuel Development was established by virtue of Presidential Decree No. 10 of 2006. The team's main task is to develop a blueprint to promote bio-fuel use in Indonesia. The team consists of several elements including government, private, and research organizations.
  - d. Indonesia Biodiesel Forum (FBI) was established in February 2002. FBI has prepared a Tentative Standards of Indonesia Biodiesel and submitted it to the government for approval as Official Standards of Indonesian Biodiesel. FBI members are now eager to help the development of biodiesel production from a variety of vegetable oil and fat resources in which the country is rich of.

### **Bio-fuel Sector in Indonesia**

In the recent Energy Blueprint, bio-fuel is explicitly mentioned as a renewable energy source that is expected to contribute 5% of the national energy supply by year 2025. Bio-fuel is methyl ester compound derived from esterification or trans-esterification of various vegetable oil or animal fats. Bio-fuel comes as an alternative energy source, which is renewable and should be used for future energy sources in Indonesia. Bio-fuel first appeared to the public in 2005 when world crude oil surged to a high price while national oil reserves were decreasing steadily. There are three types of bio fuel: bio diesel, bio ethanol and bio oil. Bio-fuel can be used to replace

diesel fuel, gasoline or kerosene.<sup>144</sup> This third bio-fuel feedstock is abundantly available in Indonesia. Abundant sources of raw materials are expected to promote serious efforts to further develop the bio-fuel that can create effective security energy. Bio-fuel could also reduce dependency on fossil fuels to the transportation sector, household and electrical power. In addition to the potential market being large enough, Indonesia has advantages for both the development of bio-fuel, including the diversity of plants that can be used as a source of raw material such as oil palm, coconut, jatropha, cassava and sago. The availability of critical land is large enough to develop as a garden of energy, and technology is quite advanced and can be handled directly by existing local human resources. And also, the technology for developing bio-fuel is achievable, because it has already been included in the National Research Agenda.<sup>145</sup> For environmental issues, developing bio-fuel can reduce GHGs emissions.<sup>146</sup>

To stimulate the use of bio-fuels as an alternative to fossil-based energy, the Government of Indonesia has issued Presidential Regulation No. 5 of 2006 on National Energy Policy and Presidential Instruction No.1 of 2006 on Provision and

<sup>144</sup> Ibid

<sup>145</sup> Ibid.

<sup>146</sup> Technically speaking, bio-diesel has a better performance than diesel based on fossil fuels. If diesel fuel based on fossil fuel is mixed with bio-diesel, the octave number will increase to 64 and as the number increases, the emission is good for the environment.

To see 13 Ministry task see at Presidential Instruction No.1/2006 on "Supply Side and Utilization of Bio fuel as a Source of Other Fuel" available at <http://www.esdm.go.id/regulasi/inpres.html>



Utilization of Bio-fuels as other fuels. The message of this Presidential Directive is to instruct 13 (thirteen) Ministries and Governors and Regents/Mayors throughout the country to: "Take steps to accelerate the utilization of Bio-fuels as other fuels."<sup>147</sup>

According to the national energy blueprint, bio-fuel as renewable energy makes a 5% contribution to meet national energy needs by 2025. Bio-fuel has been experiencing a considerable progress since the issuance of two presidential regulations aforementioned, with the development of bio-fuel area to reach 5.25 million hectares, comprising 1.5 million hectares of oil palm plantation, 1.5 million hectares of jatropha plantation, 1.5 million hectares of cassava and 750 million hectares of sugarcane plantation.<sup>148</sup>

To accelerate the development and utilization of bio-fuel in Indonesia, President of the Republic of Indonesia held a meeting on July 2, 2006 in Sejong, Magelang, Central Java, Indonesia. The meeting was attended by relevant ministers and stakeholders. There the government expected the birth of strategic innovations to increase employment opportunities, basic education, health and improvement of people's income. Indirectly, the development of bio-fuel will offer more job opportunities and household incomes as many

as 3.5 million for those working in this sector.<sup>149</sup> In addition, the Government of Indonesia is also planning the development of 1000 energy independent villages and 12 special bio-fuel zones so that the target of reducing fuel consumption by 10% will be met immediately.<sup>150</sup> The results of a strategic innovation that are considered relevant to economic increase are:<sup>151</sup>

1. PRO - Growth: Economic growth toward exports and investment era
2. PRO - Job: Increasing job opportunities
3. PRO - Poor: Poverty eradication in rural areas

With regard to bio-fuel programs, the President announced a new program aimed at increasing job opportunities, income and reducing poverty. To implement the policy of bio-fuel development, the Government of Indonesia established a National Team for Bio-fuels Development in 2006 based on Presidential Decree No. 10 of 2006. The Team has developed a blueprint for national energy development containing a roadmap of bio-fuel management in Indonesia. In summary, the main policies of bio-fuel development are as follows:<sup>152</sup>

1. Based on the blueprint of national energy policy (2006), bio-fuel is targeted to hit 2 percent of total diesel fuel consumption in 2010.

<sup>147</sup> To see 13 Ministry task see at Presidential Instruction No.1/2006 on "Supply Side and Utilization of Bio fuel as a Source of Other Fuel" available at [www.esdm.go.id/regulasi/inpres.html](http://www.esdm.go.id/regulasi/inpres.html)

<sup>148</sup> Arifin Bustanul, (2010) "bio-fuel development is at a crossroad", Metro tv.com, 2 December 2010, viewed 23 September 2011 (<http://www.metrotvnews.com/read/analisdeta il/2010/12/02/113/Pengembangan-Bioenergi-di-Persimpangan-Jalan>).

<sup>149</sup> Ibid

<sup>150</sup> Ibid

<sup>151</sup> S.S Wirawan, "The current status Bio-diesel Development in Indonesia" course material on one day Seminar on Biodiesel, BPPT Jakarta, March 2006.p.6-8.

<sup>152</sup> "Based on Indonesia's roadmap for bio-fuel development", prepared by National Team for Bio-fuel.2006.

2. Biodiesel made of palm oil should be the first priority, with a target of 62,000 kiloliters (equivalent to 62,000 tons).
3. The government shall issue various policy instruments to develop crude palm oil (CPO) through DMO (domestic market obligation) and certain areas of oil palm plantation to be intended for bio-fuels.
4. Biodiesel made of *Jatropha (atropha-curcas)* shall be the next priority because *Jatropha* has been widely recognized by communities and are non-trade-off with food commodities.

Plantation and bio-fuel plant location must be conformed to the location of raw material producers. For example, oil palm plantations should be opened in Sumatra and *Jatropha* plantations should be in East Nusa Tenggara (NTT) and Sulawesi.<sup>153</sup>

Fuel	Use		
	2005-2010	2011-2015	2016-2025
Biodiesel	10% of diesel fuel consumption 2,41 million kilolitres	15% of diesel fuel consumption 4,521 million kilolitres	20% of diesel fuel consumption 10,22 million kilolitres
Bioethanol	5% gasoline consumption 1,48 million kilolitres	10% gasoline consumption 2,78 million kilolitres	15% gasoline consumption 6,28 million kilolitres
Bio-oil			
Bio-kerosene	1 million kilolitres	1,8 million kilolitres	4,07 million kilolitres
Pure Plantation Oil (PPO) for power plants	0,4 million kilolitres	0,74 million kilolitres	1,69 million kilolitres
Biofuel	2% of energy mix 5,29 million kilolitres	3% of energy mix 9,84 million kilolitres	5% of energy mix 22,26 million kilolitres

**Fig 1.2 Roadmap of Bio-fuel Development in Indonesia**

Based on Indonesia's roadmap for bio-fuel development prepared by the national team, bio-fuels are expected to constitute 5% of the national energy mix by 2025, totaling

22.26 billion liters of bio-diesel, bio-ethanol and bio-oil (fig 1.2). The use of bio-diesel expected to account for 10% (or 2.4 billion liters) of the total diesel fuel consumption by 2010 and 20% (or 10.22 billion liters) by 2025.<sup>154</sup>

However, the development of bio-fuel in Indonesia is not as simple as expected. The very first challenge to the development of bio-fuel is fuel price and price of food commodities fluctuation happening globally and nationally. When fuel price surges, the price of renewable energy raw material will follow. In Indonesia, bio-fuel cannot yet compete with petroleum-based fuel. It is often assumed that biodiesel could be competitive and profitable when international CPO prices are on par with crude oil; bio-fuel was still more expensive than petroleum-based fuels and required heavy government subsidies.<sup>155</sup>

The other challenge is deforestation in terms of land management policy. Deforestation is one key issue facing the development of bio-fuel, for example in Sumatra and Borneo, approximately 4 million hectares of forest have been converted to palm farms. New land opening for bio-fuel raw material is an alternative because it requires time and more costs while in general the opening of new land involves forest clearing so the implementation of bio-fuel development as alternative energy sources should take into account all relevant

<sup>153</sup>

S. S Wirawan, 2006, "The current Status Biodiesel Development in Indonesia" course material on one day Seminar on Biodiesel, BPPT Jakarta, March

<sup>154</sup> W. Caroko, H. Komarudin, K. Obidzinski, P. Gunarso, "Policy and institutional frameworks for the development of palm oil-based bio-diesel in Indonesia", Working Paper 62, CIFOR, Bogor, Indonesia. 2011.p.4.

<sup>155</sup> Ibid., p.20.

aspects such as agriculture, industry, labor, and finance as a whole.

It is reasonable to say that the present bio-fuel development is at a crossroad, whether to proceed with high acceleration or leave it flowing without well-defined management. The fact that national energy source is dominated mostly by non-renewable energy is undeniable. In the next section, the author conveys an explanation of development and highlight factors that impede Bio-fuel development in Indonesia.

**The effort of government, academics/university, private (bussines) sector in developing Bio-fuel, as part of the implementations in the concept of energy security in Indonesia.**

In this section the author will identify efforts made by the three stakeholders namely government, academic and private companies in term of bio-fuel development in Indonesia and investigate factors that challenge the implementation of bio-fuel policy in Indonesia.

**Government's efforts in Bio-fuel Development**

Government policies serve as supporting instrument in achieving successful bio-fuel development in Indonesia. With so many Parties involved from ministries, State Institutions, Municipal/District and Provincial governments, Universities, Private Companies and the community, government policies are needed as a legal umbrella in order for the development of renewable energy to grow. Government policies to support bio-fuel

development ranges from highest law rank namely Act to the appointment of national working team. The set of government policies is as follows:

1. Presidential Instruction No. 1 of 2006 on Provision and Utilization of Bio-fuel as alternative fuel. This presidential instruction was issued earlier than Law No. 30/2007. When this Presidential Instruction is issued by the government, Indonesia was experiencing a drastic rise in oil prices and affected its domestic price equilibrium. Meanwhile, the Presidential instruction mandated 13 state ministers, governors and regents to take steps to accelerate the utilization of bio-fuel as alternative fuel.
2. Presidential Regulation No. 5 of 2006 on National Energy Policy. This regulation is the continuation of Presidential Instruction No. 1 /2006. In principle, the government seeks to increase energy diversity to meet national energy demand. By 2025 renewable energy from bio-fuel is targeted to reach 5% of total national energy need while fossil-based oil is targeted to decline to below 20%.
3. Presidential Decree No. 10 of 2006 on National Team for Bio-fuel Development in terms of acceleration of poverty and unemployment reduction. This Presidential Decree is intended to implement Bio-fuel development policies. The team is mandated to develop the blueprint of bio-fuel development in Indonesia, prepare steps

- of bio-fuel development for follow up by relevant institutions in accordance with Presidential Instruction No. 1/2006. In performing these tasks, the Team cooperated with the Agency for the Assessment and Application of Technology (BPPT) and state-owned and private enterprises associated with bio-fuel.
4. Regulation of Minister of Energy and Mineral Resources No. 51 of 2006 as revised by Regulation No. 32 of 2008 on Requirements and Guidelines for Bio-fuel Business License as alternative fuel. This Regulation governs bio-fuel priority usage, bio-fuel categorization, bio-fuel standards and quality (specifications), pricing, bio-fuel business activities, coaching and supervision, and administrative sanctions.
  5. Law No. 30 of 2007 on Energy which generally defines the source of national energy should be used efficiently, increasing value added, energy sustainability, the welfare of the people for the purpose of national security. Law No. 30/2007 provides that nonrenewable resources are limited therefore conservation and energy resources diversification is needed to preserve the availability is energy.
  6. Presidential Regulation No. 45 of 2009 on Amendment of Presidential Decree No. 71/2005 on Provision and Distribution of particular type of fuels.

Apart from the above- described regulations, the government also issued other

regulations to support Bio-fuel development program in Indonesia. With respect to bio-fuel quality improvement, the government has set standard specifications of bio-fuel in Indonesia. Bio-fuel specification is one of the prerequisites to evaluate successful commercial utilization of bio-fuel in the community. In 2005, Directorate General of Electricity and Energy Utilization and relevant agencies and biodiesel stakeholders developed a Draft National Standard of Indonesia (RSNI) on Biodiesel Quality Requirements which is based on the same standards in the United States and European Union.<sup>156</sup> Furthermore, RSNI on Biodiesel Quality Requirements was certified by National Standardization Agency (BSN) as Indonesian National Standard (SNI) pursuant to Decree of Head of BSN Number: 73/KEP/BSN/2/2005 dated February 22, 2006 under number SNI 04-7182 -2006 on Biodiesel and No. SNI - 27 - 0001-2006 on Bio-ethanol.

To enhance bio-fuel development, investments by state-owned or private enterprises is needed. Therefore the government invites industries to take advantage of Government Regulation No. 1 of 2007 on Income Tax Facilities for investments in particular line of businesses and Government Regulation No. 8 of 2007 on government investment. In addition, to further support the development of bio-fuel industries in Indonesia, in 2008 the Minister of Energy

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<sup>156</sup> Bio-diesel (SNI 04-7182-2006) and bio-ethanol (SNI DT27-0001-2006) standards were approved. These standards were based on the United States' standard (ASTM D6751) and the European Union's standard (EN14214:2002).

and Mineral Resources Issued a regulation (No. 32/2008) governing the production, trade and use of bio-fuel. This regulation specifies targets for the phased introduction of bio-fuel up to 2025, for transportation, industry, and power generation sectors. Industry and other commercial sectors are required to use at least 5% biodiesel (of their total fuel consumption) by 2010, 10% by 2015 and 15% by 2020. The regulation also provides fiscal and non-fiscal incentives for those who implement the mandatory use of bio-fuel. For example, value added tax levied on the transfer of bio-fuel will be absorbed by the government (Ministry of Finance Decree No. 156/PMK.011/2009).

In addition to issuing relevant policies and regulations, the government has conducted several researches and development to support bio-fuel development in Indonesia through ministry of ESDM, Ministry of Research and Technology, and Agency for the Assessment and Application of Technology (BPPT). The Engineering Center of BPPT has been developing biodiesel since 2000 and the center has focused its work on the process of technology and engineering of biodiesel production.<sup>157</sup> For example, study on the results of bio-fuel research in Indonesia is conducted by BPPT and Research and Technology Ministry in 2006 and by other institutions in Indonesia in terms of process technology development, product testing, and engineering appear in tables below.

**Table 2.1 Bio-Fuel Research in Indonesia**

No	Name of Institution	Tasks
1	Center for Energy Technology (B2TE-BPPT)	Coordinate activities and carry out review and development of Jatropha oil extraction and energy conversion of Jatropha oil.
2	Petroleum and Gas Institute	Conduct testing of coconut oil, kapok seed oil, palm oil biodiesel as diesel fuel, properties testing, performance, endurance test, and road test.
3	Department of Agriculture	Has worked on biodiesel for several years. Its BB-Mektan (Agricultural Mechanization Research Center) has tested the performance of Various blending of biodiesel and ADO on the 5.5 kW stationary diesel engines (Handaka and Agung Hendriardi, 2005).
4	Center for Research and Development of Isotopes and Radiation Technology (P3TIR - BATAN)	Conduct research and development of improved seed varieties of Jatropha by using transgenic mutation technology

<sup>157</sup> S.S Wirawan, 2006, "The current Status Biodiesel Development in Indonesia" course material on one day Seminar on Biodiesel, BPPT Jakarta, March 2006,p.4.



5	Assessment Center of Biotechnology (Biotech-BPPT)	Conduct research and development of improved seed varieties of Jatropha plants by using tissue culture technology
6	Center for Environmental Technology (BTL - BPPT)	Conduct research and development of Jatropha tree cultivation technologies on degraded or marginal land and waste utilization.
7	Center for Science and Technology Research and Development (Puspitek)	Provide land for the experiment and breeding and maintenance of Jatropha trees.

**Source : compiled from ESDM (2006), BPPT (2008), RISTEK (2007).**

The existing regulations issued by the government reflect the government's efforts in terms of bio-fuel development program as seen in these regulation are complementary to one another. In addition to the idea to improve these regulations, for example, Regulation of Minister of Energy and Mineral Resources No. 51/2006 was revised and replaced by Regulation of Minister of Energy and Mineral Resources No. 32 of 2008 including several revisions such as bio-fuel categorization and pricing policy. Besides these regulations, the seriousness of the government is also reflected in bio-fuel research and development. This is seen with the issuance of White Paper of

Indonesia Energy for year 2005 - 2025 on Research, Development and Application of Science and Technology in the field New and Renewable Energy Sources to Support the Security of Energy Availability by the year 2025 where one of government's role in developing bio-fuel is to conduct research and development of low-cost bio-fuel production process. This example reflects the government's effort to support bio-fuel development in Indonesia.

#### **Universities/Academic efforts in of Bio-fuel Development**

The Development of bio-fuel cannot be separated from active participation and support of universities in research activities, socialization, consultation and technical assistance, the provision of human resources (HR) and improvement of human resources quality, as well as analysis services. The research conducted by these universities/academics is intended to give input on the model of bio-fuel development policies and instruments needed, and to produce technologies to support working procedures and the utilization of bio-fuel in Indonesia. In the course of bio-fuel renewable energy development, researchers represented by universities must also cooperate with industries and government. Industry functions to produce energy products while the government seeks efforts to create regulations to support the development of renewable energy research. Ideally, the synergy of the three Parties will be able to support the development of bio-fuel renewable energy in Indonesia.

Research of bio-fuel utilization development has been developed for quite a long time in Indonesia; some even say that bio-fuel researches and development were initiated since the Japanese colonialism era. Center for Energy Research in Bandung Institute of Technology (ITB) has been conducting many researches on bio-fuel development as energy basis since 1980.<sup>158</sup> However, to the author's knowledge, during 2004-2005 bio-fuel research once appeared to boom which greatly encouraged the government at the time and many other research conducted not only by universities in major cities but also by local universities.

Bio-fuel technology development has been conducted by several universities in Indonesia such as Bandung Institute of Technology (ITB), Bogor Agricultural University (IPB) and Gadjah Mada University (UGM), Institute of Technology Surabaya (ITS), University of National Development (UPN). Bio-fuel technology developed by ITB and UGM uses raw materials obtained from castor oil. Among universities in Indonesia that conduct bio-fuel research and development are:

1. ITB (Bandung Institute of Technology) has focused its research and development on Macroeconomic studies of biodiesel, developing technology for *Jatropha* oil extraction and its conversion to methyl esters. The institute is also focusing on standardization of fuels and diesel

engines on a test series. The pilot scale of the biodiesel plant has the capacity of 150 L product per batch which was developed by ITB.<sup>159</sup>

2. Mechanical Engineering and Chemical Engineering Departments of Institute of Technology Surabaya (ITS) conducted biodiesel spray characteristic testing on injector engine and developed a study of biodiesel form olein, rice bran oil, and castor oil.
3. Research and Community Service Institute of IPB conducted biodiesel process at 100 liter scale, engine performance test using *Jatropha* biodiesel, road test on car and fishing boat, biodiesel process without catalyst. Additionally, IPB (Bogor Agricultural University), BPPT Biotechnology Center, Puslitbangbun (Center for Plantation Research and ture) now have active research in the field of farming technology.<sup>160</sup>
4. Chemical Engineering Department of Gadjah Mada University (UGM) conducted a biodiesel study using coconut oil, Jarak Kepyar (*Ricinus communis*), and high bio-fuel.
5. The Universitas Pembangunan Nasional (UPN) Veteran Yogyakarta conducted biodiesel testing to replace

<sup>158</sup> In an interview with one member of Indonesia Energy Council, DEN on 13.00 WIB 10 May 2011

<sup>159</sup> S. S Wirawan, & Tambunan Armansyah. 2011. "The Current Status and Prospects of Biodiesel Development in Indonesia : a review." 2011.

<sup>160</sup> Ibid

kerosene, designed biodiesel stoves, and create small and medium scale biodiesel plant.

Currently, the development of bio-fuel by product utilization technology to derivative products can be a solution that can address uncontrolled availability of bio-fuel by product. Several universities and research institutions have initiated to figure out and develop the utilization of wastes and byproducts generated from bio-fuel production process. Development of byproduct utilization technology can offer positive outputs to support the creation of highly competitive science and technology-based bio-fuel industry.

The results of a study should be disseminated, universities are expected to transfer bio-fuel knowledge and technology to the government, society and as well as private companies (participating in developing business aspects). This simultaneously reflects the commitment of universities and academics to contribute to the development of renewable energy development in Indonesia.

#### **Private companies efforts in Bio-fuel development.**

The role of private investment is needed to develop bio-fuel in Indonesia. Private investment could earn plenty of profit from exports. Today there are nearly 22 companies involved in the bio-fuel business.<sup>161</sup>

These companies are part of the Indonesian Association of Bio-fuel Producers (APROBI) which was formed in 2006. The government was reported to have committed £ 10 trillion (U.S. \$ 1.1 billion) in the 2007 budget for bio-fuel infrastructure subsidies, in addition to subsidies for plantation improvement, training, and research and development.<sup>162</sup>

During 2006 - 2008 it can be said that businesses were eager to develop bio-fuel since bio-fuel was considered as the future of Indonesia's energy to replace fossil-based oil. Indonesia's oil reserves continue to decline and bio-fuel appears as an alternative fuel. Several companies engage in plantation and energy begins to develop bio-fuel plant with palm oil while home industries started developing bio-fuel as well. Here are among major Indonesian companies investing in bio-fuel:

1. PT. Bakrie Sumatera Plantation. Prior to the biodiesel boom in 2004, PT Bakrie Sumatera Plantation had 32.712 ha of oil palm plantation and in 2006 saw its production jump 74% from the previous year. To enter bio-fuel sector, the company plans to add 25.500 hectares to expand its plantation acreage in Jambi and to partner with PT Engineering Industry to build a second biodiesel refinery projected to start operation in 2008, with a capacity of 60.000 to 100.000 tons/year. The investment is worth US\$ 25 million.

<sup>161</sup> In an Interview with secretary Indonesian Association of Bio-fuel Producers (APROBI) on 4 August 2011. 13.30 – 17.30 WIB at PT Indo Bio-fuel Energy. Sequis Plaza 5th floor, Jl. Sudirman Kav.25 Jakarta.

<sup>162</sup> H.S. Dillon, Tara Laan and Harya Setyaka Dillon. "Bio-fuels – At What Cost? Government Support For Ethanol And Biodiesel In Indonesia" in : The Global Subsidies Initiative of the International Institute for Sustainable Development. 2008.

Bakrie group operates two palm oil refineries, one in West Java and the other in Edinburgh.<sup>163</sup>

2. PT. Astra Agro Lestari (AAL). By 31 December 2005, AAL counted the total outstanding shares of 1.574.745.000, with PT Astra International Tbk being the sole shareholder, controlling 79.68%, while the rest is traded in the stock exchange. Following the bio-fuel boom, AAL has set to increase its palm oil production by 12% to 950.000 tons, from the previous year's 857.000 and start palm oil-based biodiesel production. In 2007, the company has also decided to open a Jatropha estate of 5.000 ha in East Kalimantan.<sup>164</sup>
3. PT. Sinar Mas Agro Resources and Technology (SMART) Corporation. SMART is in partnership with China National Offshore Oil Corporation (CNOOC) and Hong Kong Energy to finance a bio-fuel project, the largest in the world to date, of which requires 1 million hectares of land to develop oil palm, sugarcane and cassava estates in Kalimantan and West Papua.<sup>165</sup>

Investing in bio-fuel offers several advantages since the development of bio-fuel raw materials or upstream business and business on farm building is labor intensive, and opens more job opportunities in rural areas especially business opportunities for farmers and their families to improve welfare. This

means coping with poverty (which increases continuously) and solving unemployment issues. In addition to long-term profit investment in bio-fuel, it will help the Government in dealing with national issues such as poverty and unemployment. The downstream business is equally valuable because the bio-fuel industry offers new job opportunity and long-term technology application which can ultimately reduce unemployment in urban areas and enhance professional aspects of bio-fuel energy business.

The development of bio-fuel in Indonesia will be quickly seen if the progress between private sector and universities are working together. One relation that can be done between both sides is to conduct research and development of bio-fuel. The research being carried out should have thorough connection between aspects of technology, regulatory, business, commercialization, enterprise structure, marketing, and real implementation program for each of the research. The result of this study shows that both sides need the information transmitted to the private sector in order to participate in developing the business aspect. There is one example; Bogor Agricultural University (IPB) conducts cooperation in terms of research and development of Jatropha with Tjipta Eka Widjaja Foundation. This cooperation is expected to further develop alternative renewable fuels in Indonesia. With many companies investing in bio-fuel, it is expected to promote market and commercialize bio-fuel industry in Indonesia. This can be a good

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<sup>163</sup> The Business Watch Indonesia (BWI) "Bio-fuel Industry In Indonesia: Some Critical Issues".2007. p.14.

<sup>164</sup> Ibid.

<sup>165</sup> Ibid

indication towards healthy competition in regards to the achievement of bio-fuel development in Indonesia.

### **The Relationship between Government and Academics**

The relationship between government and universities/academics appears to be major supporting factors in the course of bio-fuel development in Indonesia. Both Parties must synergize and create mutual relationship in terms of the development of bio-fuel to promote and accelerate this program. In this paper I shall limit my analysis in terms of the relationship between government and academics. First, I will investigate the cooperation between both Parties related to government policy to support bio-fuel program. Second, I will reveal the relationship between government institution and universities in terms of research of bio-fuel development in Indonesia.

First, in issuing bio-fuel related development policies the Indonesian government accommodates inputs from universities in Indonesia. The most noticeable example is in the implementation of Presidential Decree no. 10 of 2006 concerning National Team for Bio-fuel Development to accelerate poverty and unemployment reduction. The member of this national working team is comprised of not only government officials but also academics and researchers from different universities. The mixed composition is expected to create mutual and complementary relationship for the purpose of continuous bio-fuel program in

Indonesia.

Second, some research is highly needed to support existing policies issued by the government with the addition of related ministries and government agencies participating in this research. Therefore the government holds cooperation with several universities in Indonesia to allow information exchange so as to make the output of the research more effective. Among government agencies which continuously conduct cooperation is Agency for the Assessment and Application of Technology (BPPT). Here are two examples of existing cooperation:

1. BPPT Biotechnology Center, Puslitbangun (Center for Plantation Research and Development, Department of Agriculture) with IPB (Bogor Institute of Agriculture), now have actively researched in the field of farming technology.
2. BPPT with Bandung Institute of Technology (ITB). Following the completion of process/plant engineering and road test of diesel-generated vehicle using biodiesel fuel. BPPT develops biodiesel plant with palm oil waste used as raw materials and ITB develops biodiesel technology directly from palm oil fruit as well as a wide range of other potential oil plants.

In addition, the government has given incentives to several universities to conduct bio-fuel-related researches. The existing relationship between government and universities/ academics is expected survive and



appears as a sustainable relationship.

### **Relationship between Academic and Private Companies**

The progress of bio-fuel development in Indonesia would be able to exhibit direct impact with the existence of close relationship between private companies and academics. One of the potential cooperation is through research of bio-fuel's development where the research must be conducted comprehensively by involving all aspects of technology, regulatory, business, commercialization, corporate structure, marketing and real implementation programs of each research that has been finished. The output of the research conducted by both entities should be disseminated so that private companies can enhance the business aspect. There is one example; IPB conducts cooperation in term of research and development of *Jatropha* with Tjipta Eka Widjaja Foundation. This cooperation is expected to further develop alternative renewable fuels in Indonesia.

### **Obstacles Faced by Government**

Although Indonesian government has issued several regulations and conducted researches to support bio-fuel development in Indonesia as described earlier, the author notes many challenges continue to exist in the areas of government in terms of the principles of good governance.<sup>166</sup>

One of these challenges, for instance, appears from the Presidential Instruction No. 1/2006. In this instruction President asks 13 ministries and governors and regents to take any steps to accelerate the supply and utilization of bio-fuel as an alternative fuel. Presidential Instruction No. 1/2006 became the first regulation to support the development and sustainability of bio-fuel programs in Indonesia but unluckily many challenges still occur from this regulation which impedes the progress of bio-fuel program itself.

Based on data of field investigation and interview with several experts of relevant ministries, there is a coordination issue across ministries; these institutions have not established well-defined coordination among themselves. For example, coordination among Ministry of Research and Technology (RISTEK) and Ministry of Energy and Mineral Resources, and Ministry of Finance to formulate the amount of subsidy for bio-fuel.<sup>167</sup> Another challenge is that relevant ministry and government agencies have their own interests in the project. For example the Agriculture Ministry, according to the interview, bio-fuel is not perceived as a priority by the ministry because the main focus of the ministry is ensuring national food security.<sup>168</sup> Overlapping jurisdiction is seen between Ministry of Research and Technology and the Agency for the Assessment and Application of Technology

<sup>166</sup>

In this paper, the author will take a look at the principles of good governance in terms of policy making process, organization of the relevant ministries in implementing the policy on bio-fuel

<sup>167</sup>

In an interview with one of the directors of the Agency for the Assessment and Application of Technology (BPPT), on 13.00 WIB 9 July 2011 at BPPT (MH Thamrin, Jakarta).

<sup>168</sup>

Ibid

(BPPT) to conduct bio-fuel-related researches.<sup>169</sup> In addition, there are overlapping regulations between regional regulations and government regulations concerning bio-fuel development which is often noticeable.

In fact, with many government agencies involved in bio-fuel development program, the implementation of the program itself is not simply supported due to extensive responsibilities which ultimately these institutions fail to perform better. Issues lie not only in downstream but also in upstream policy makers.<sup>170</sup>

Other governmental challenges is the lack of monitoring and evaluation processes during the decision making process, and there is no clear mechanism on how decision makers should accommodate public input and reflect this in any proposed policies or regulations. For example, the blueprint for bio-fuel development; this blueprint is frequently criticized for the manner in which it was produced. Despite the need for public participation and consultation, the blueprint was developed with limited involvement from stakeholders, such as the business sector, nongovernmental organizations and the scientific community. Stakeholder input was sought after, only when the final draft was released.<sup>171</sup>

Summary of governmental challenges

specifically on Presidential Instruction No. 1/2006, is presented in the following tables.

**Table 3.1 Presidential Instruction No. 1/2006**

Institutional Arrangement	Decision Making Process	Decision Implementation
In bio-fuel program planning and implementation poor cooperation noted among relevant ministries and local governments. For example, the lack of continuous communication between finance Ministry and Ministry of ESDM in formulating subsidy for bio-fuel.	Poor transparency without involving other stakeholder and without sufficient information of community. In addition, there are lacks of program evaluation and monitoring conducted by each Ministry involved. The absence of clear mechanism on how to execute the program represents the aspiration of all stakeholders.	Implementation is not well defined due to short deadline and no priority is set in program implementation due to frequent changes of policy. Ongoing implementation merely represents a message that the program is ongoing and then discontinues afterward, referred to in economic term as dormant cluster.
There are non-conforming regulations that impede program performance such as overlapping between MINISTRY OF RISTEK and BPPT in conducting research concerning bio-fuel.	Significant policy change often occurs with poor planning in term of fund adequacy and infrastructure.	Unprepared bio-fuel supporting infrastructure leads to efforts to reduce oil dependence is not successful.
Programs are not handled properly among ministries causing many programs to overlap. This is because each ministry has its own agenda rather than a shared agenda.	Selection of technology is based solely on economic considerations without considering if the technology is user friendly and lack of consideration of future implication and anticipation.	While first generation of bio-fuel program is running slowly with inadequate funding the government has launched the second generation of bio-fuel program. This is a potential mistake repetition.

### Obstacles Faced by Academics

Although the government has intensified energy conservation policy, the Government of Indonesia does not have the political will to conduct research and development of renewable energy. It has occurred in 2009 when the government changed the priorities in the activities of national energy, when SBY elected as the president for the second time, the program is focused more on providing of several thousand mega watts of electricity rather than other alternative resources. There is the impression that bio-fuel formerly as a flagship program suddenly became pointless at the top government. It had occurred on the Ministry of Research and Technology (RISTEK) that changed the priorities that are directly affecting the partners in this University who has done their research and development in the field of bio-fuels.<sup>172</sup>

As an example, the research of

<sup>169</sup> In an Interview with one of expert staff in Ministry of Research and Technology Indonesia on 15.00 WIB 9 July 2011 at BPPT (MH Thamrin, Jakarta).

<sup>170</sup> Ibid

<sup>171</sup> In an interview with one of the directors of the Agency for the Assessment and Application of Technology (BPPT), on 13.00 WIB 9 July 2011 at BPPT (MH Thamrin, Jakarta).

<sup>172</sup> In an interview with director for expert Bio-energy Council, IKABI. on 11.00 WIB May 2011

renewable energy in bio-fuels field boomed during 2004 to the late 2008. The government provides more incentives to many universities who conducted the research and development to support government programs of bio-fuels in Indonesia. However, in 2009, Susilo Bambang Yudhoyono's government changed the priority of national energy, research of bio-fuels conducted by many academics / universities are stacked. There are two main reasons why it happened; the first is the reduced funding from the government to do the research and to develop a bio-fuel. Secondly, the results of research that has been done by several participants from academics / university no longer gain close attention from the government institutions.<sup>173</sup>

#### **Obstacles Faced by Private Companies**

In this paper the author will present the most notable issues in the private sector that engages in bio-fuel production which directly impedes bio-fuel development in Indonesia. In 2007, when Indonesia's bio-fuel policies went into effect, investment in the bio-fuel sector was significant. In addition to private sector actors, banks and government institutions also were the resource persons involved in supporting growth of the sector (BBN National Team 2006).

According to Subsidy Global Initiative, IISD, in 2008 there were 11 biodiesel plants with a capacity of 824 million liters of biodiesel per year, or about 50% of the total production potential. In the same year

there were four bio-ethanol plants with a capacity of 145 million liters per year. In 2009, the remaining 3 companies that produce biodiesel with a total capacity of 3 million liters per year. This decline was caused by a drop in oil prices and a spike in the price of crude palm oil (CPO), which made palm oil-based bio-fuels uncompetitive. The price of CPO continued to rise in the international markets, reaching a peak in March 2008 at U.S. \$ 1,146 per metric ton. In April 2011, the price of CPO was nearly at the same level.<sup>174</sup> This price increase does not lead to the development of bio-fuels industry in Indonesia because they cannot go against fossil fuel, the cost of production low and high income elasticity levels.

There is another reason bio-fuel production did not meet targets and it was the failure to significantly reduce petroleum subsidies, which distort the energy market and make bio-fuels uncompetitive.<sup>175</sup> If bio-fuel price cannot compete with fossil fuels in the market and when the distribution lines of the bio-fuel are limited, consumers will continue to use fossil fuels and the bio-fuel program will collapse. Other cause is that it is impossible for the bio-fuel industry to be handled by small scale industry which is closely associated with product quality standards that must be tested in laboratories. There are only 4 laboratories in Jakarta capable

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<sup>173</sup> In an interview with one member of Indonesia Energy Council, DEN on 13.00 WIB May 2011

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<sup>174</sup> W. Caroko, H. Komarudin, K. Obidzinski, P. Gunarso, "Policy and institutional frameworks for the development of palm oil-based bio-diesel in Indonesia", Working Paper 62, CIFOR, Bogor, Indonesia. 2011.p.17.

<sup>175</sup> Ibid

of examining ISO parameters and none has the ability to check all parameters at once. Large-scale producers must check the standards in Singapore. High transportation cost to bring the product from plant to market appears as another issue.<sup>176</sup>

Currently many bio-fuel companies ceased their production. From twenty bio-fuel companies, only three companies are still in operation and their production capacity is at stake; the frequency of entrepreneurs and government is not in parallel which causes many bio-fuel producers to be unable to continue their production.<sup>177</sup> Among bio-fuel companies that have ceased bio-fuel production are Sinar Mas Group, Sampoerna Group, Asian Agri Inti Nusantara, and Rajawali Nusantara Indonesia (RNI).<sup>178</sup> Private companies that had already started the business begin to suspend or even halt their bio-fuel projects. Private companies that have just initiated a new plan immediately cancelled it. With the government failing to act consistently and provide security to investors, makes bio-fuel sector unfavorable for private companies. Ineffective policies arranged by the government makes them impracticable at technical level. Private companies and investors are disappointed with policies and poor political support from the government.

## Conclusion

In 2006, the Government of Indonesia launched and promoted the bio-fuel as a “new deal” that gives support in regulation, funding, and research development. This was done to deduct the fossil, oil fuel dependency, and as one of the efforts to secure the national energy security. The coordination of several Parties is needed to support the goal of bio-fuel utilization in order to create national energy security in Indonesia. Such as, the government as the policy makers, academics/university which conduct the research and development on bio-fuel technology, and the private sector as the investor which is also involved in the research and the development of bio-fuel. All those sectors must cooperate.

Those three sectors have already done their part with regards to the development of bio-fuel in Indonesia. The Government of Indonesia has published some policies as the basis of regulation of bio-fuel in Indonesia. As an example, Presidential Instruction No.1 of 2006 is about the working disposal to the government institution to accelerate the development of bio-fuel. It constructively explains the task of every sector that is involved. The academics/university has done research and development on the bio-fuel, such as Bandung Institute of Technology which focused its research and development on macroeconomic studies of bio-diesel, developing technology for Jatropha oil extraction and its conversion to methyl ester and also focusing on standardization of fuels and on diesel engine test series. The increasing number of private companies that invests in

<sup>176</sup> H.S. Dillon, Tara Laan and Harya Setyaka Dillon. “Bio-fuels – At What Cost? Government Support For Ethanol And Biodiesel In Indonesia” in: The Global Subsidies Initiative of the International Institute for Sustainable Development. 2008.

<sup>177</sup> In an interview with secretary Indonesian Association of Bio-fuel Producers (APROBI) on 4 August 2011. 13.30 – 17.30 WIB at PT Indo Bio-fuel Energy Sequis Plaza 5th floor Jl. Sudirman Kav.25 Jakarta.

<sup>178</sup> Ibid

bio-fuel is a good thing in order to accelerate bio-fuel markets in Indonesia. Therefore the relations between government, academics/university and private sector are the driving factors for the development of bio-fuel in Indonesia.

However, lack of coordination among the government institutions on implementing the Presidential Instruction No. 1/2006 detains the development of bio-fuel in Indonesia indirectly, such as in determining the amount of subsidy for bio-fuel. Since funding control from the government to conduct the research and the development of bio-fuel is unclear, it becomes one of the problems within the researcher/university sector. The private sector also experiences some obstacles. For example, the drop in oil prices and a spike in the price of crude palm oil (CPO) have made palm oil-based bio-fuels uncompetitive. The increase in price results in the stopping of bio-fuel industry development in Indonesia because it cannot compete with fossil fuels which have a low cost production and the highest amount of acquisition.

The development of bio-fuel is needed to be done in order to maintain the national energy security. Nevertheless, Indonesia has to endure a long journey before being able to ensure national energy security. Some programs conducted by the government, academics/ university, and the private sector nowadays still experience some problems with its implementation. In fact, until this paper is finished on November 2011, the development and the target explained previously can be accessed by society. The lack of coordination

between government agencies and no sustainability of government policies' implementation have resulted in uncertainty to create policies that can guarantee national energy security.

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