



Indonesian Institute of Sciences

Economic Research Center

## ***National Case Study on Energy***

***Country : Indonesia***

# **Final Workshop – RISPO-II**

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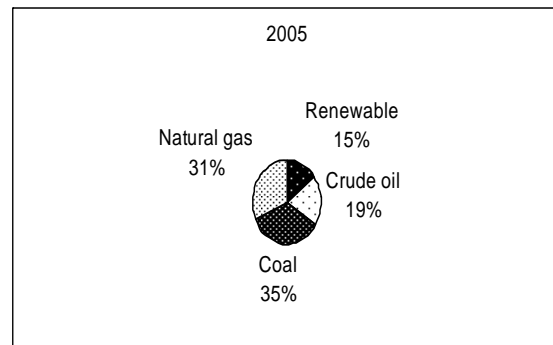
## **Outline**

- **Overview of country RE sector**
- **Effects of Economic Integration**
- **Challenges and Opportunities to promote RE**
- **Proposed New RE policies considering EI effects**
- **Analysis of new recommended policies**
- **Conclusion**
- **Strategic Policy Recommendation**

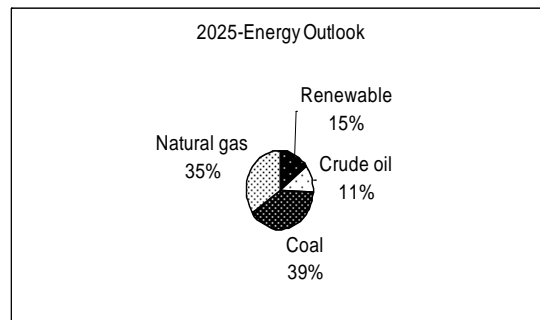
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# Overview of country RE sector

- There will be no difference in terms of share of RE to total primary energy mix
- Share of natural gas and coal will increase in the future
- **Thus, reduction in share of oil will be replaced by coal and natural gas instead of RE**



Source: National Energy Blueprint, 2005



Source: Indonesia Energy Outlook, 2006

## Overview of Renewable Energy sector in Indonesia

- **Promoting renewable energy is driven by five main reasons: rapid increased in fossil fuel price, Indonesia becomes net oil importer, high oil subsidies, improving energy security, awareness to promote sustainable development.**
- Based on Energy Law No 30/2007, it is a must for central and local government to promote new and renewable energy. For certain period of time government can give incentives until price of new and renewable energy achieve economic price (no subsidy).
- Based on National Energy Blueprint, government needs to provide regulation that imposing power generating firms to use renewable energy at least 5%
- According to Declare Minister of Energy and Mineral Resources No 2923 K/30/MEM/2006, in 2010, share of primary energy (in terms of TWh) in electricity sector will be oil (5%), coal (63%), gas (17%), Hydro (8%) and geothermal (7%) , others RE (?%)
- Biofuel (Bio-oil, Bio-diesel, Bio kerosene, Bio-ethanol) → PT PLN → Bio-oil→ PLTD→ in 2015 → 20% bio-oil of fossil fuel consumption (volume)
- **Thus, there is lack in clarity and consistency in RE energy policy**

Optimal Primary Energy Mix in 2025 Based on President Regulation No 5/2006	
Crude oil	< 20%
Natural gas	> 30%
Coal	> 33%
<b>Biofuel</b>	<b>&gt; 5%</b>
<b>Geothermal</b>	<b>&gt; 5%</b>
<b>Biomass, Nuclear, Water, Solar, and Wind</b>	<b>&gt; 5%</b>
Liquefied coal	> 2 %

# POTENTIAL RENEWABLE ENERGY

## Current Status

	RE	Potential
1	Geothermal	19,685 MW
2	Hydropower	75,000 MW
3	Micro hydro Energy	495.91 MW
4	Photovoltaic	6.5 MW
5	Wind power	9,286.61MW
6	<b>Biomass</b>	<b>134.6 GW</b>

- **Projection 2025 INOSYD (2006)**

Energy final for electricity generation: the contribution of RE increases in terms of quantity from 14.29 million BOE in 2004 to 78.62 million BOE in 2025

In terms of proportion in energy mix for electricity generation, its contribution also increases from 8.91% in 2004 to 13.05% in 2025

The contribution of renewable energy to the whole energy mix increases from 251.35 million BOE in 2004 to 504.99 million BOE in 2025 and its proportion in the whole energy mix decreases from 28.69% in 2004 to 21.62% in 2025

**Thus, although share of RE in total energy mix decreases, it shares in the electricity sector tends to increase**

Source: Indonesia Energy Outlook, 2006

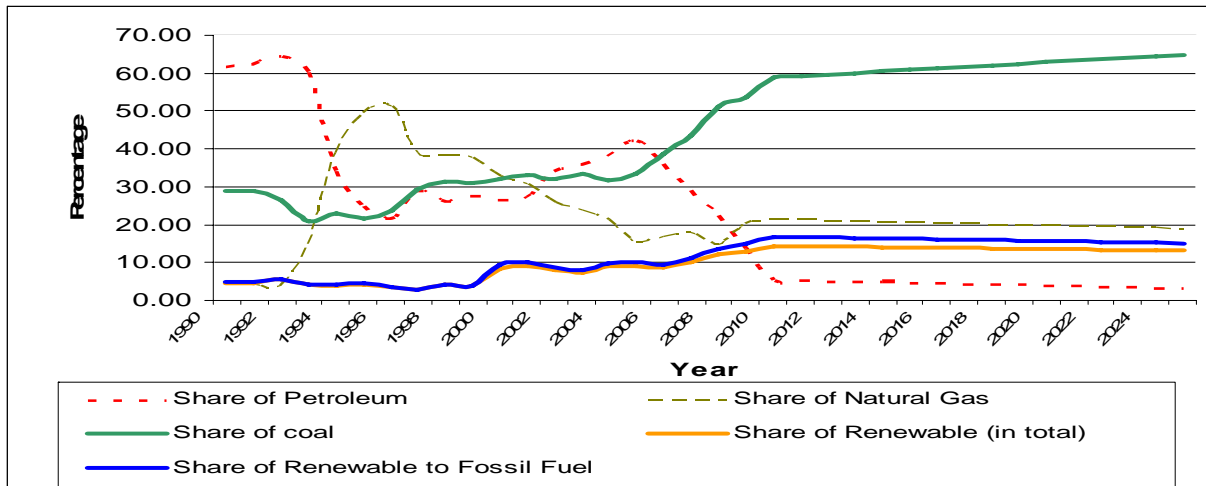
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## RE in electricity sector

- Growing electricity demand from industrial sector
- Electricity shortage in many areas, even in Java island
- Directly affect tradable sector
- Prospect for long term economic growth

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# Primary Energy Sources in Electricity Sector 1990-2025



Source: Indonesia Energy Outlook (2006) and author's calculation

- Coal is the most important energy source in electricity sector
- Share of renewable is higher than petroleum but most of reduction in oil consumption is replaced by coal while share of RE remain constant
- The potential of environmental degradation will be higher in the future if there is no improvement in coal clean technology
- There is no clear direction of share of RE utilization in electricity sector in the future, but according to National Energy Outlook (2006), most of RE will be supplied by geothermal :the potential of biomass has not been fully exploited

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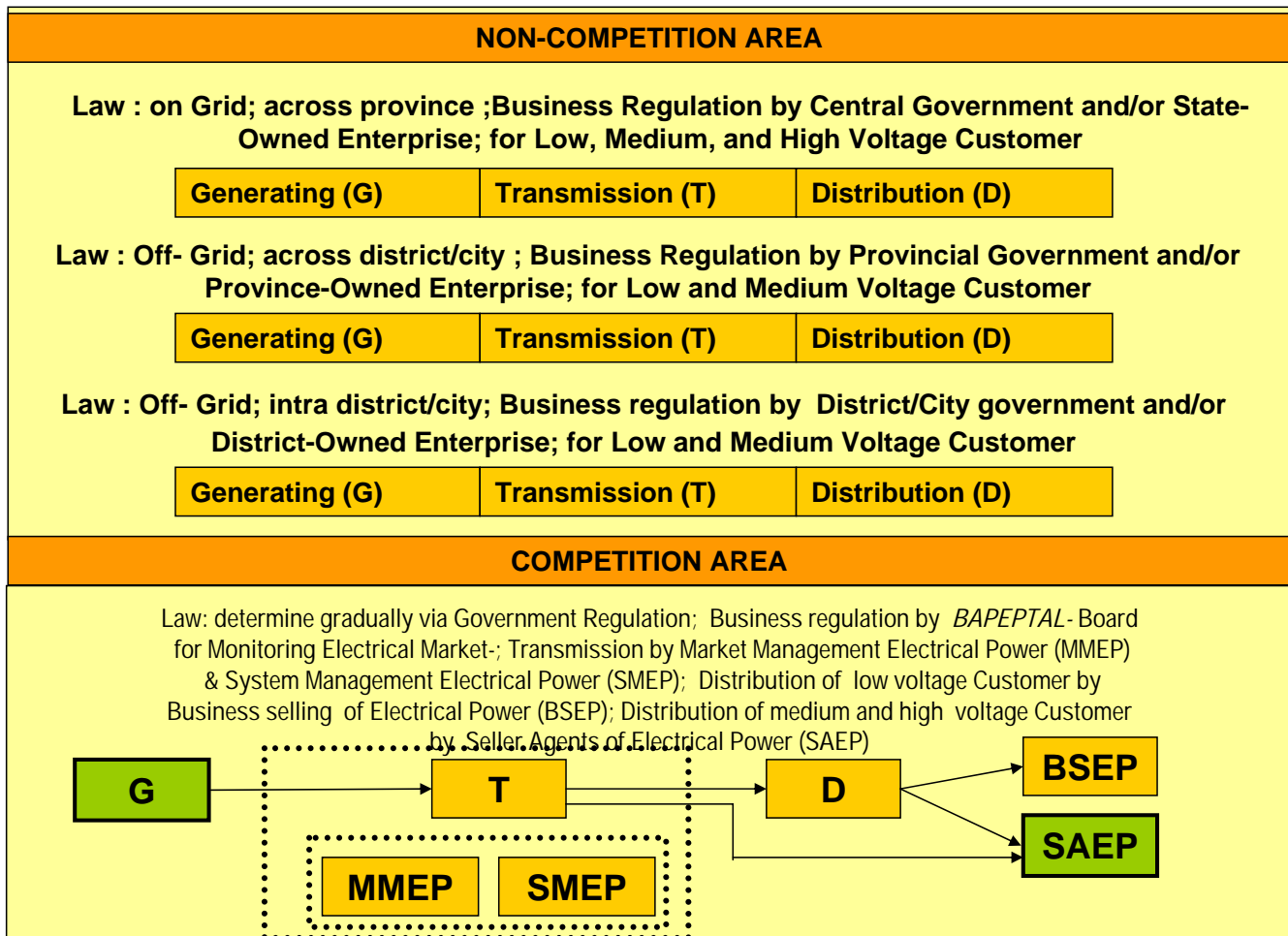
## Policy on RE in Electricity Sector

Indonesia adopted the [Law No 20/2002](#) about electricity sector. However, this has several [shortcomings](#) which are listed as follows:

- The law only creates obligations for using RE for electric power suppliers, but no binding target
- There is no clear direction which RE that will be the primary source for electricity
- The law encourages tax incentives for development of RE, but no quantitative target
- The law mainly is targeted on the supply side, and lack of the demand side policies

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## Supply Side Policy in Electricity Sector



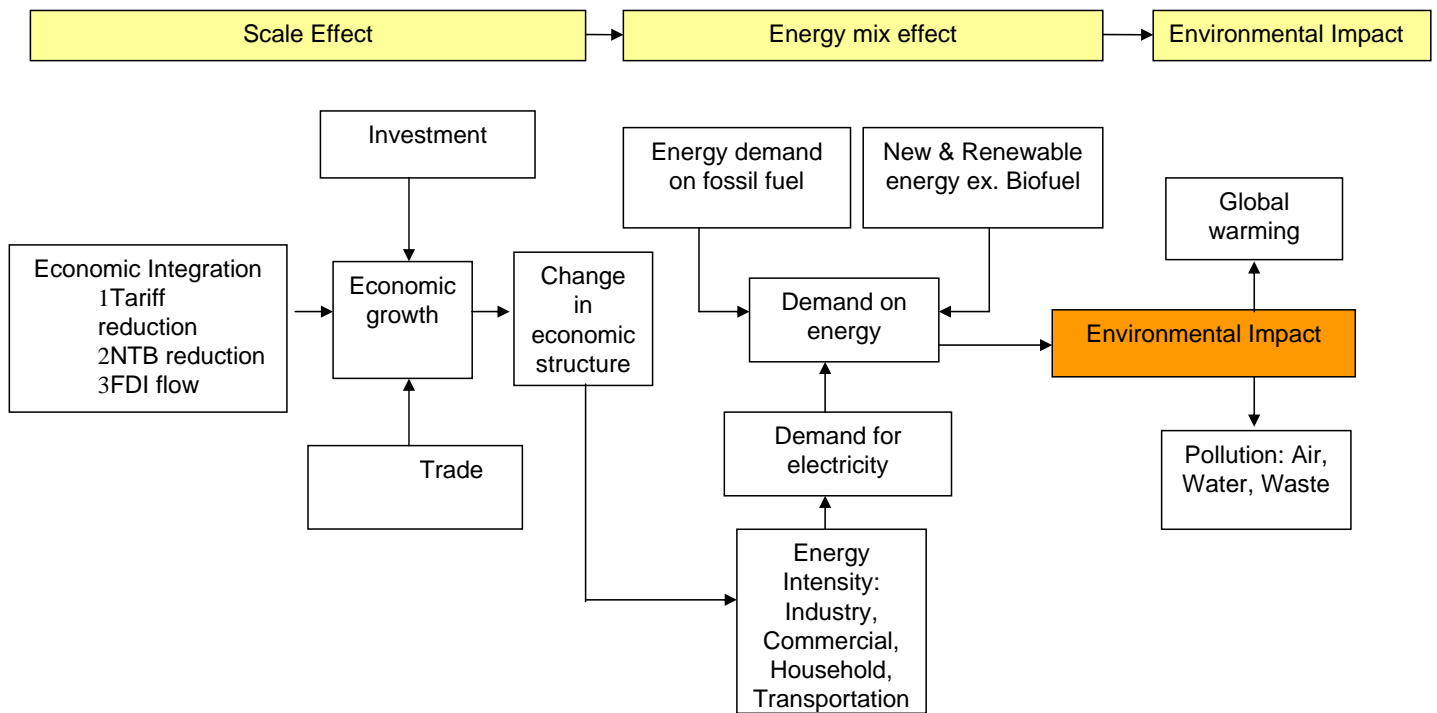
Source: Blueprint Electricity Sector, 2003-2020

### Business Scheme on Competition and Non-Competition Areas (On Grid and Off Grid Policies)

Type of Business	Competition	Non-Competition
Power Generator	Players: State Owned Enterprise, Local State Owned Enterprise, Private, and Cooperatives	-
Transmission, Distribution, and Selling Business	Natural Monopoly: Player → State Owned Enterprise	-
Seller Agents	Players: State Owned Enterprise, Local State Owned Enterprise, Private, and Cooperatives	-
Electrical Business (Vertical integration) → Monopoly Ownership generating, transmission, distribution, and business selling electrical power	Off Grid: Intra province: Players → State Owned Enterprise, Local State Owned Enterprise, Private, and Cooperatives Intra district: Player → Local State Owned Enterprise, Private, and Cooperatives Internal district: Player → Local State Owned Enterprise, Private, and Cooperatives	Off Grid: 1. Internal district: Player → State Owned Enterprise, Local State Owned Enterprise, Private, Cooperatives, Society 2. Internal district within province: Player → State Owned Enterprise, Local State Owned Enterprise, Private, Cooperatives, Society 3. Internal district, intra district, intra province: Player → State owned enterprise On Grid: State owned enterprise

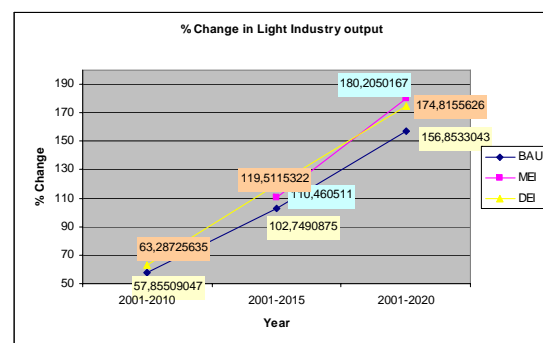
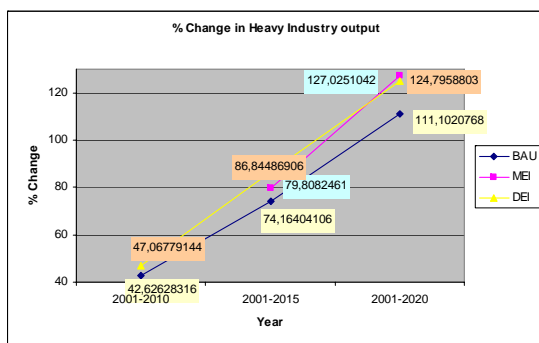
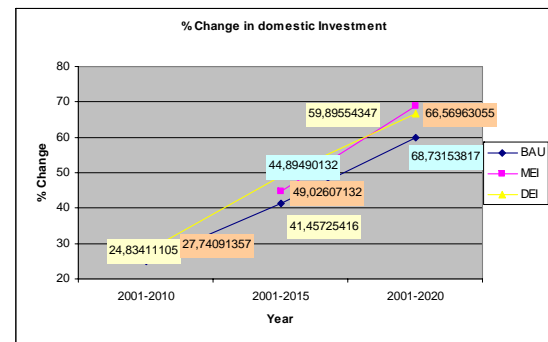
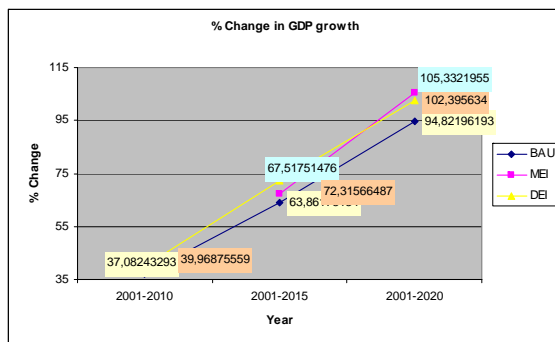
Source: Blueprint Electricity Sector, 2003-2020

# Effects of Economic Integration



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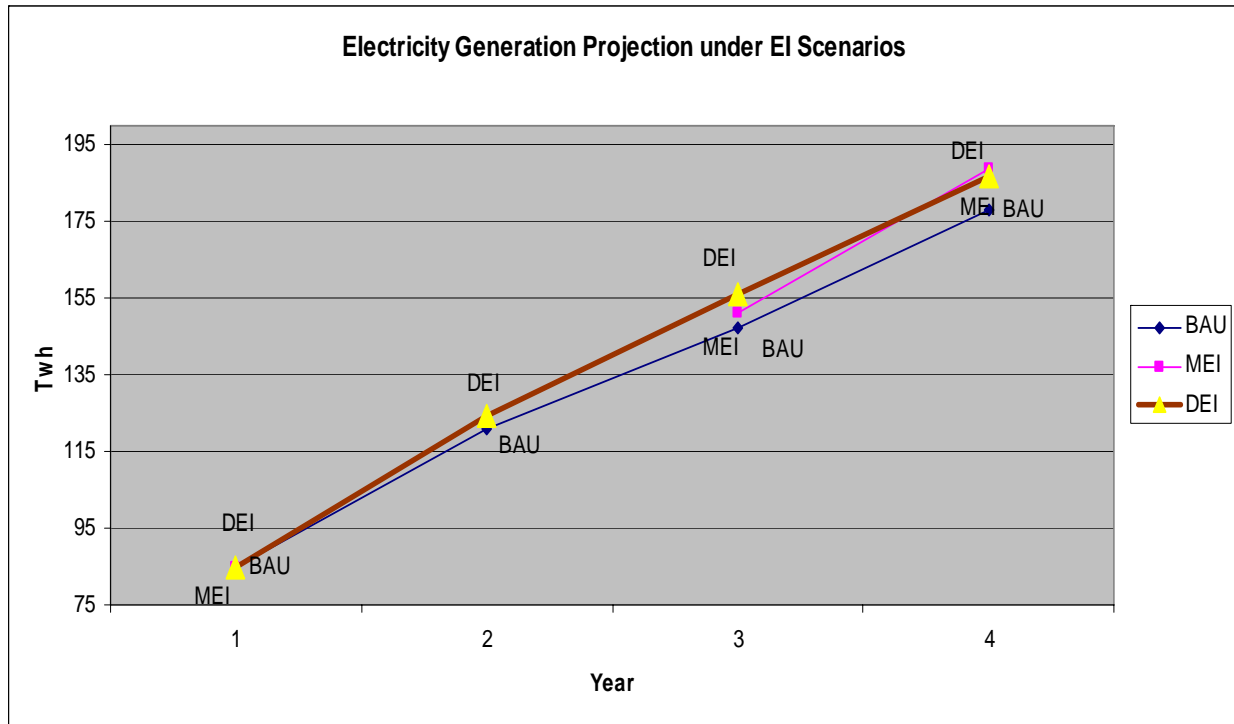
## GTAP Result 1



Economic integration (DEI&MEI) has positive impact on GDP, investment, heavy and light industries compare to BAU scenario)

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## GTAP Result 2



With DEI and MEI demand for electricity will be higher than BAU → need to provide more electrical power

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## GTAP Result 3

		ton/Mil.USD
CO2 Emissions Impact due to EI	CO2 Emissions Coefficient	9871,044
BAU- MEI by 2015	3.138.991,99 tons	
BAU- DEI by 2020	6.978.828,11 tons	
% Change of CO2 emissions	5,038	

- Due to economic integration, Indonesia CO<sub>2</sub> emissions from the electricity sector will increase by 5 % or by 7 Mt compared to the baseline scenario → This is mainly driven by high coal consumption → need to promote **RE**

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# Challenges to Promote RE in Indonesia

- **Major Technical Difficulties**

- Lack of funding for large scale biofuel project
- Low capacity in the upstream level
- Trading system (in the up stream and down stream)
- Low price in the farmer level
- Need standardization biofuel products
- Low productivity of seeds (jatropha curcas, palm oil)
- Jatropha technology processing – reducing the effect of acid
- High Technology - Expensive (PV)
- High load during the peak load time**
- High transmission and distribution loss
- Environmental consequences (geothermal, hydro, biomass)

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# Challenges to Promote RE in Indonesia

- **Major policy level difficulties**

- Subsidies on fossil fuel → struggling between economic and political rationality
- Uncertainty in price of CPO → imposing export tax
- Poor investment climate → law uncertainty (land issue), bureaucratic behavior
- Conflict of target between food and energy security → Edible plant for bio-energy
- Low capacity local government to promote off grid system
- Lack of demand side policy → no binding target, no e.g. regulation to set production for domestic and export
- Policy bias to coal → 10.000 MW electrical power plant

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# THE SWOT ANALYSIS OF NRE BASED POWER GENERATION IN INDONESIA

STRENGTHS	WEAKNESS	THREAT	OPPORTUNITIES
<ul style="list-style-type: none"> <li>▪ Huge Potential and variety of NRE</li> <li>▪ Can reduce fossil fuel consumption</li> <li>▪ Can be generated by cooperatives and IPP schemes</li> </ul>	<ul style="list-style-type: none"> <li>▪ Expensive compared to the conventional power (photovoltaic)</li> <li>▪ The industries have not fully established yet</li> <li>▪ Can't be supplied to meet the peak demand (energy security)</li> <li>▪ Lack in / limited supply of bio fuel</li> <li>▪ Lack in technology development</li> <li>▪ Lack in coordination for project implementation</li> </ul>	<ul style="list-style-type: none"> <li>▪ Conflict of interest between energy security and food security</li> <li>▪ Fossil fuel subsidies</li> <li>▪ Increasing use of coal and gas</li> <li>▪ Regulated price in electricity</li> <li>▪ More advanced combustion technological progress for fossil fuel</li> <li>▪ Progress in clean coal technology</li> <li>▪ Increasing collaborative exploration activities</li> </ul>	<ul style="list-style-type: none"> <li>▪ Rapid increase in crude oil price</li> <li>▪ High demand for electricity power</li> <li>▪ Low level electricity ratio</li> <li>▪ Unequal distribution electricity (spatial)</li> <li>▪ High demand for better quality of environment</li> <li>▪ High demand for export especially from EU</li> <li>▪ Global warming - public awareness</li> </ul>

## RE SECTORAL SWOT ANALYSIS: Case Study Bio fuel

STRENGTHS	WEAKNESS	OPPORTUNITIES	THREAT
<ul style="list-style-type: none"> <li>▪ Land availability (especially critical land)</li> <li>▪ Climate factor-tropical country</li> <li>▪ Labor abundant</li> <li>▪ Competitive player in the world CPO market</li> <li>▪ Availability of edible and non-edible products</li> </ul>	<ul style="list-style-type: none"> <li>▪ Different Perception among stakeholders especially in local level</li> <li>▪ Coordination failures among departments</li> <li>▪ Conflict of interest with other purposes</li> <li>▪ Uncertainty on the future price of bio fuel</li> <li>▪ lack implementation on incentives</li> <li>▪ It has not founded seed of <i>Jathropa</i> that has high productivity to produce oil</li> <li>▪ Limited down stream industries</li> </ul>	<ul style="list-style-type: none"> <li>▪ Reducing poverty</li> <li>▪ Reducing unemployment</li> <li>▪ Transfer of technology</li> <li>▪ Export market</li> <li>▪ Raising environmental awareness</li> <li>▪ Low electrification ratio</li> <li>▪ reducing air pollution in the city</li> <li>▪ Reducing global warming emitters</li> <li>▪ Bio fuel project has been implemented by state owned electricity enterprises in Bali and it looks profitable</li> </ul>	<ul style="list-style-type: none"> <li>▪ Land clearing – haze pollution</li> <li>▪ Deforestation</li> <li>▪ Loss in biodiversity</li> <li>▪ Monoculture</li> <li>▪ Further oil subsidies</li> <li>▪ Low of social acceptance</li> <li>▪ Availability of non oil fossil fuel such as gas and coal</li> <li>▪ Competing user with other purposes such as cooking oil</li> <li>▪ Negative energy return to produce bio fuel</li> </ul>

# Policy Recommendations 1

Overall policy recommendations:

- Reducing oil subsidy gradually → Subsidy switching to RE
- Promoting biofuel → edible and non edible (focus non edible plant → least cost)
- Clarity on RE target → portfolio energy choices need to be binding (reward and punishment)
- Promoting open access for off grid system → non competition area → enhancing private participation → promoting rural electrification → in line with Village Self-Sufficiency Energy Program (VSSEP)

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# Policy Recommendations 2

## Supply side policy recommendations

- Implementation for least cost of NRE development in the community/village basis
- Create RE cluster industries (special RE zone) – one region one RE cluster industries-if possible
- More incentives in the up stream level (tax and non tax benefits) both for farmers and producers
- Boost participation (active) of private sector, NGOs and societies in the whole process of formulating RE development
- Human resource development through education and training, and knowledge and technology transfer

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# Policy Recommendations 3

## Demand side policy recommendations

- Binding target for RE consumption across economic sector (transportation, industry, household, electricity) → continuous socialization
- Improving domestic supply first by creating competitive price with export price → increasing tariff or export tax need to be considered in the short terms
- Reducing fossil fuel subsidy gradually → people will switch to RE
- Improving standardization of RE → for safety and quality reasons

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## Recommended Policy Packages

The packages are complementarities and can be done simultaneously

- Package 1
  - Progressive approach in substituting fossil fuel (diesel oil) with RE (portfolio) in many of Electricity Power Plant
- Package 2
  - Village Self-Sufficiency Energy Program (VSSEP) and RE cluster industries (special RE zone) → Based on Comparative Advantage → broad based

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## Effectiveness and Implementability assessment of the recommended policies Package 1

- **Effectiveness** → supply of RE-rigidities, supply shortage, price competitiveness between RE and fossil fuel, substitute to the cheaper oil such as Marine fuel oil instead of high speed diesel and marine diesel oil
- **Implementability** → political agenda-decision to reduce subsidies need approval from the parliament → government has decided no subsidy reduction for oil until 2009 → government implicitly ask parliament to use it budget right to reduce subsidies but parliament does not want to do that → there is kind of policy trap in oil subsidies, trade off energy supply and environmental dimension → rapid increase on supply of RE funding scheme, alliance among stakeholders, incentives, comparative advantage, profitability, coordination

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## Effectiveness and Implementability assessment of the recommended policies Package 2

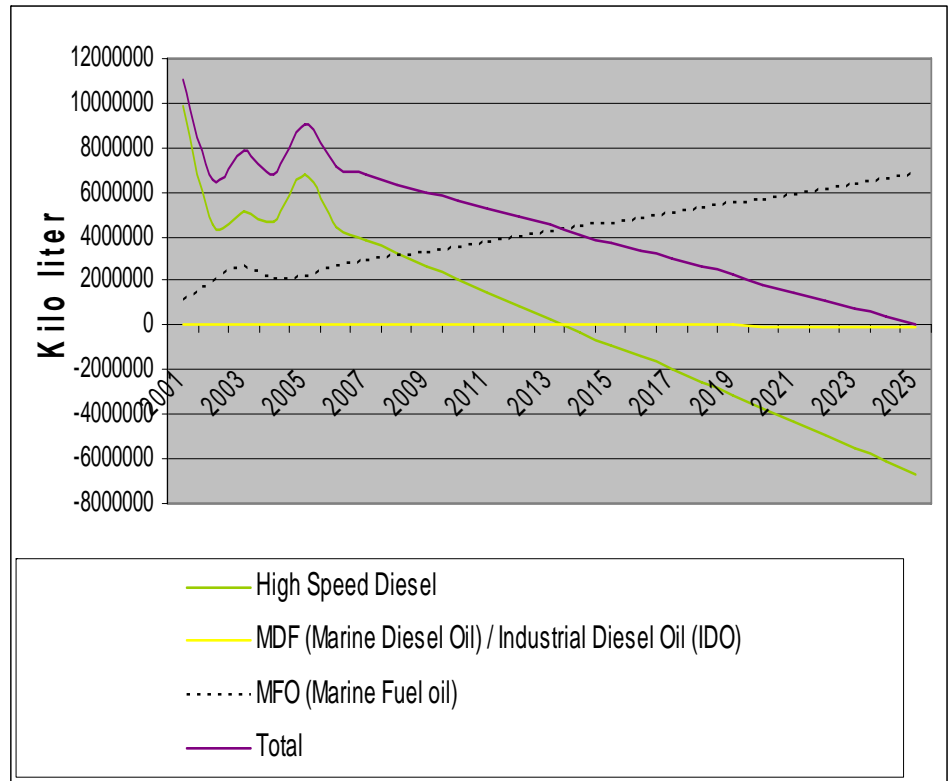
- **Effectiveness** → land viability, participation from societies, supply of RE-rigidities, high quality of seeds, manufacture industry, institutional capacity in the local level, financial institution support-banking, support form private & foreign investors, price competitiveness between RE and fossil fuel, in line with related program such as National Movement for Forest and Land Rehabilitation -GNRHL (*Gerakan Nasional Rehabilitasi Hutan dan Lahan*), market based approach → not just the purpose for cooking but also energy
- **Implementability**. Synergy among stakeholders (government, private sector, societies), consistency from the government. Off grid policy for non competition area is on the right of local governments → local governments to optimize their right for promoting private participation

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# Policy Assessment – Package 1

## Pattern of Fossil Fuel Consumption in Electricity Sector

Trend analysis indicates that fossil fuel consumption tends to fall except for MFO because its price is lower than the other oil. Thus, it is substitution effect.

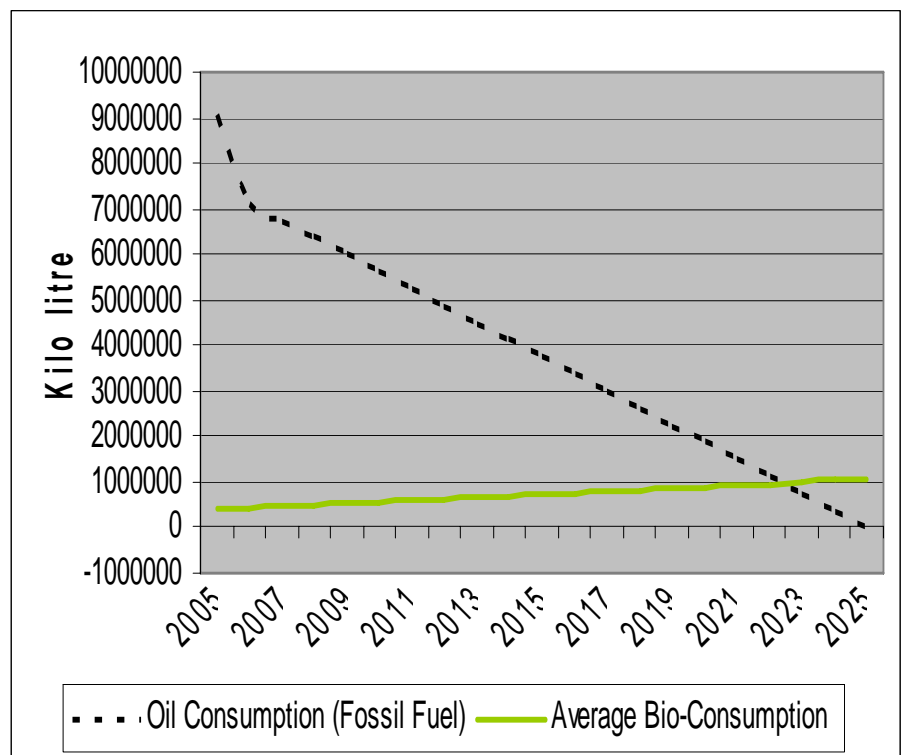


Source: Indonesia Energy Outlook 2006 and author calculation

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## Continue...

- Based on current scenario (8.25% annual growth of bio-oil), bio-oil cannot offset the falling in oil consumption. Thus it is possibility for energy shortage based on current scenario especially for power plant generating by diesel → room for coal to replace petroleum → slowdown coal rapid consumption by promoting biofuel
- Need to promote other renewable energy (geothermal, wind, mini hydro)-portfolio RE policy

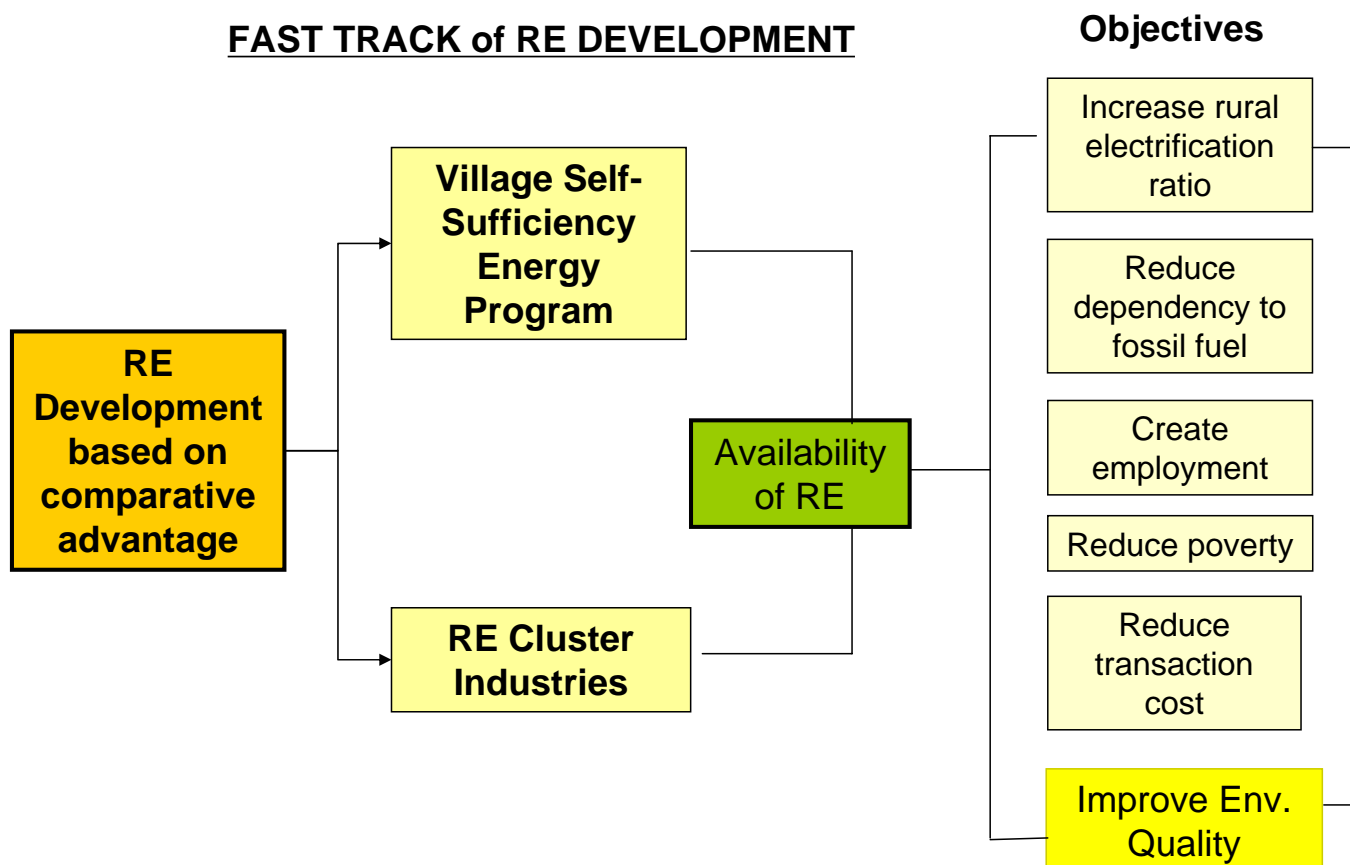


Source: Author's calculation

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# POLICY ASSESSMENT – PACKAGE 2

## FAST TRACK of RE DEVELOPMENT



... continue

- Subsidy switching for promoting **Village Self-Sufficiency Energy Program (VSSEP)**

Government of Indonesia biofuel incentives (Sudrajat, 2007) → planned expenditure consists of: Infrastructure; Investment: tax allowance, seed capital for biofuel fund; Incentives to farmer (subsidy interest rate) → total fund Rp 13 trilliun per year or USD 1.4 billion per year

Currently subsidy on fossil fuel (oil) based on government planning budget 2008 is about Rp 106.2 trilliun or USD 11.5 billion

Thus, share of RE subsidy to total fossil fuel subsidies is about 12.2%.

Government plan to allocate Rp 25 trilliun for biofuel development until 2010, but in Government planning budget 2007, government allocated only Rp 1 trilliun (National Secretariat, 2007) → government subsidy on fossil fuel in 2007 was Rp 55.6 trilliun.

Looking at huge disparity between funding to promote RE and fossil fuel subsidy → lack of fund will be the major problem for promoting VSSEP → thus need to reduce oil subsidies and to encourage private participation

# Conclusion of the study

- High potential RE, but low effort & lack in capacity → unfriendly investment climate → oil subsidy, transparency, leadership, coordination failure → institution
- Doubt on promoting RE in the future, technical and political difficulties (policy bias to fossil fuel → coal), unclearness binding target in promoting RE (there is no reward and punishment)
- Energy security will be the constraint under the DEI (need further investment for electricity sector)
- Promoting RE critical part of political agenda → reducing subsidy and binding target need approval from the parliament → government and parliament need to cooperate
- Promoting energy security and slowing down coal consumption while enhancing RE portfolio may reduce environmental impact
- There is still lack in political will to promote RE → there is no explicit number of RE subsidy in National Budget Planning
- Enhancing awareness among the global leaders for promoting RE → setting target on share of RE in the future → Indonesia has comparative advantage in RE (climate factor) → high responsibility → support from developed country

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## Strategic Policy Recommendations

- Setting higher target on promoting bio-oil in electricity sector-this is important for reducing share of coal in replacing reduction in oil consumption → at the same time government need to develop portfolio RE in electricity sector → this is important to slowdown growing demand on coal → fast track approach
- Local government need to be more progressive to promote rural electrification → the authority in off grid policy that owned by local government need to be maximized
- There is a need to include explicitly subsidy for RE into National Planning Budget
- Incentives in research and technology for promoting RE need to be enhanced by government → government takes all the risks
- Research collaboration in the up stream and down stream level

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Thank You  
For Your Attention