MINISTRY OF ENERGY AND MINERAL RESOURCES
REPUBLIC OF INDONESIA

ENERGY TECHNOLOGY R&D NEEDS OF INDONESIA

Prensented at 'Workshop of Energy Technology R&D Needs of Emerging Economies", Beijing, 28,29 Nov. 2012

RESERACH & DEVELOPMENT CENTER FOR ELECTRICITY TECHNOLOGY, NEW,-RENEWABLE ENERGY AND ENERGY CONSERVATION,
THE AGENCY OF RESEARCH AND DEVELOPMENT FOR ENERGY AND MINERAL RESOURCES

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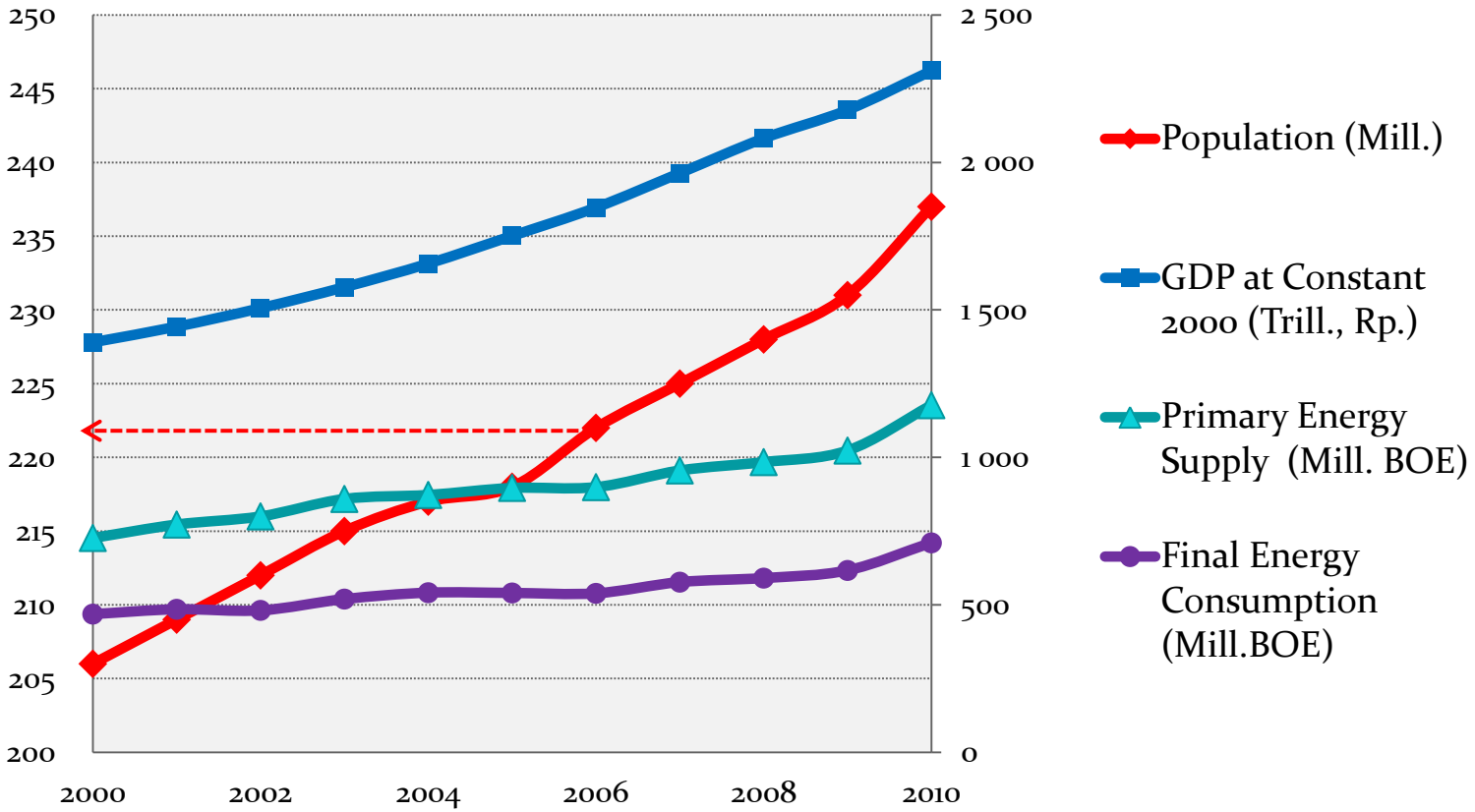
GDP AND ENERGY INDICATOR

History and Recent Status

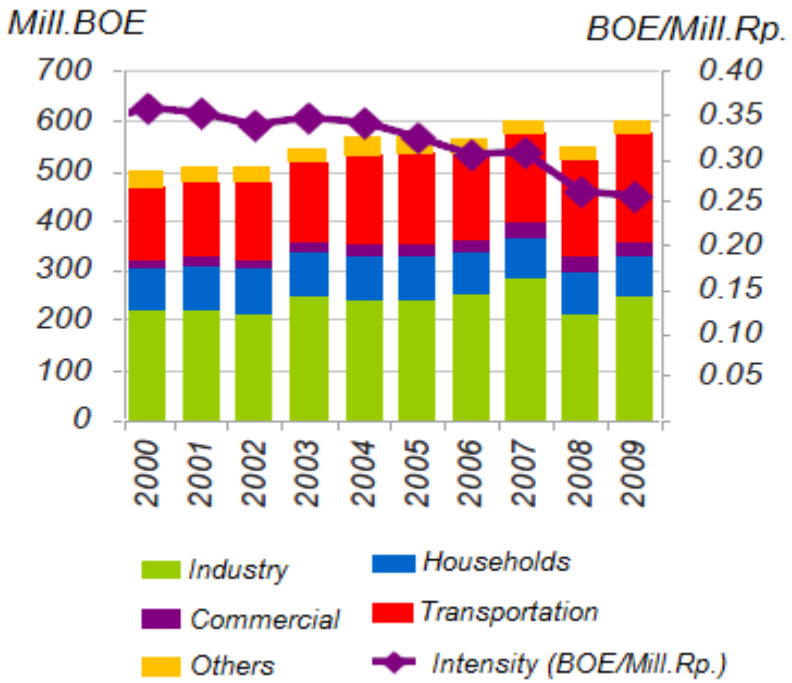
Growth of Population, GDP, Energy Supply and Consumption



Note: Primary energy supply & consumption calculated based on commercial energy (excluded biomass)

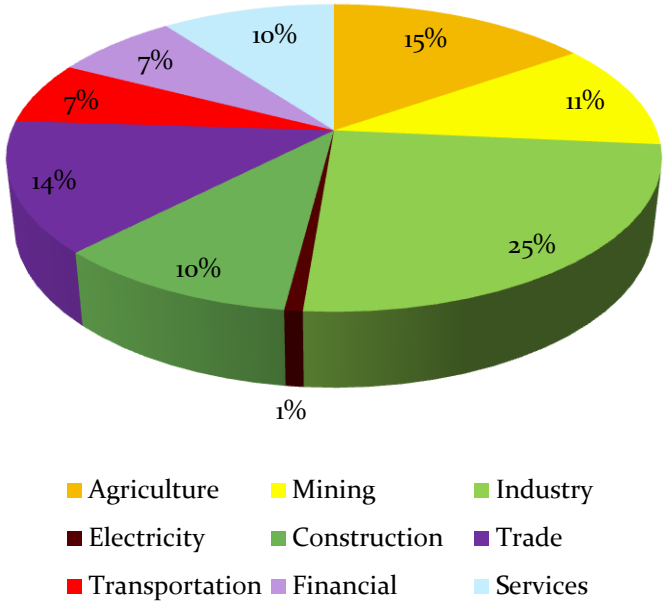
Source: Handbook of Energy & Economic Statistics of Indonesia 2011

Energy Intensity



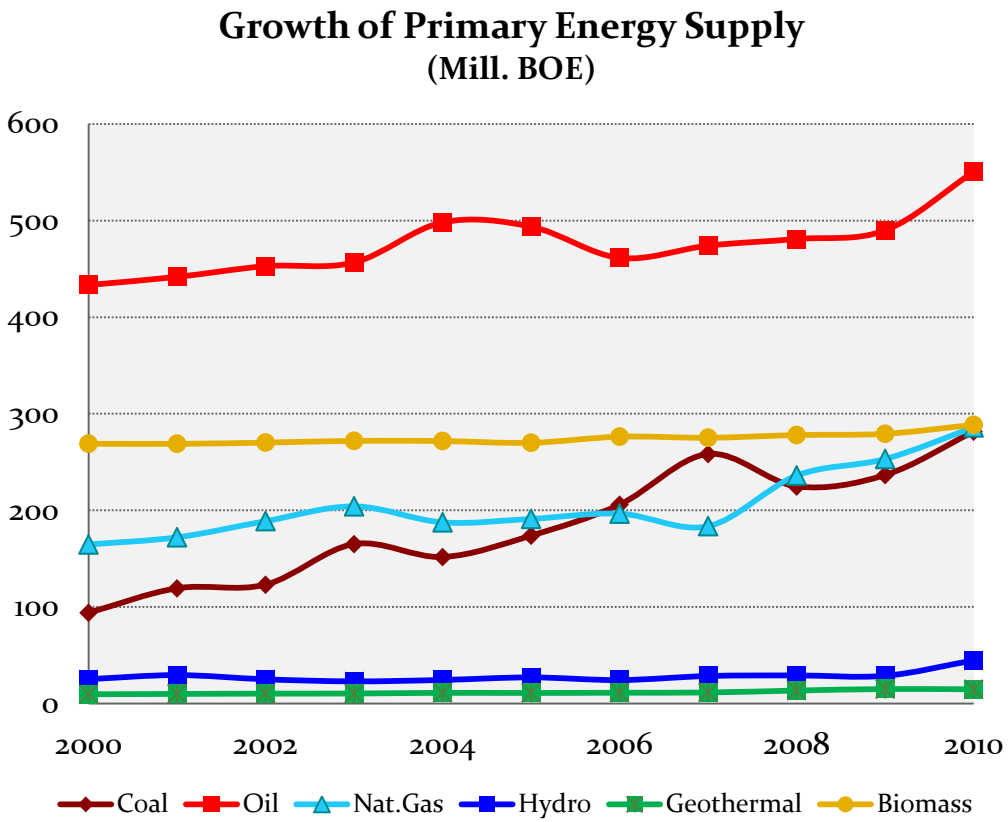
Source: Indonesia Energy Outlook 2010

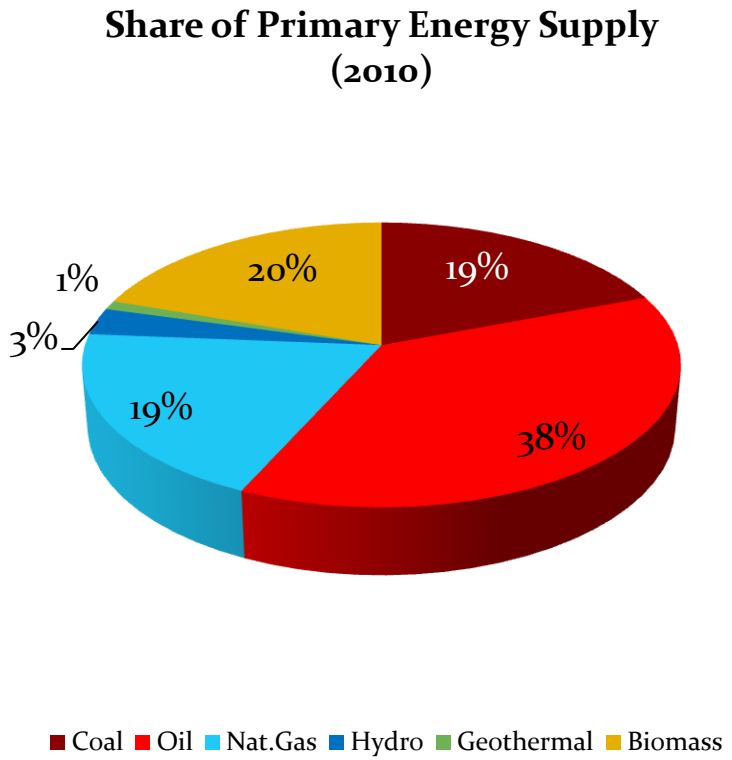
Components of GDP 2010



Source: Bank Indonesia

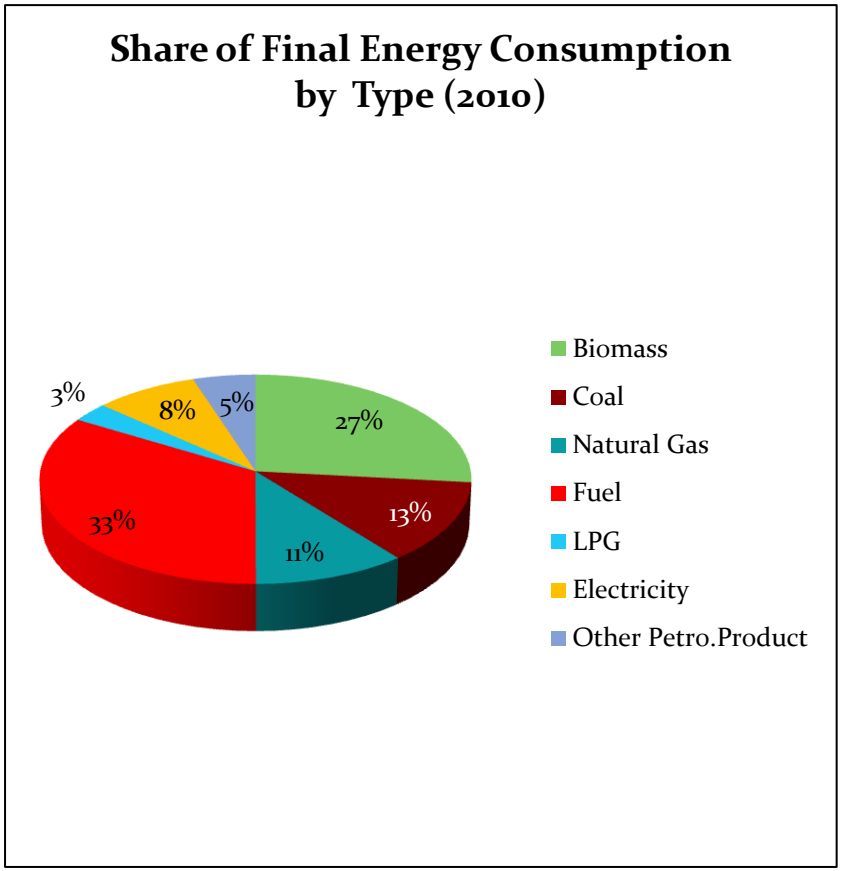
Supply of Primary Energy by Type

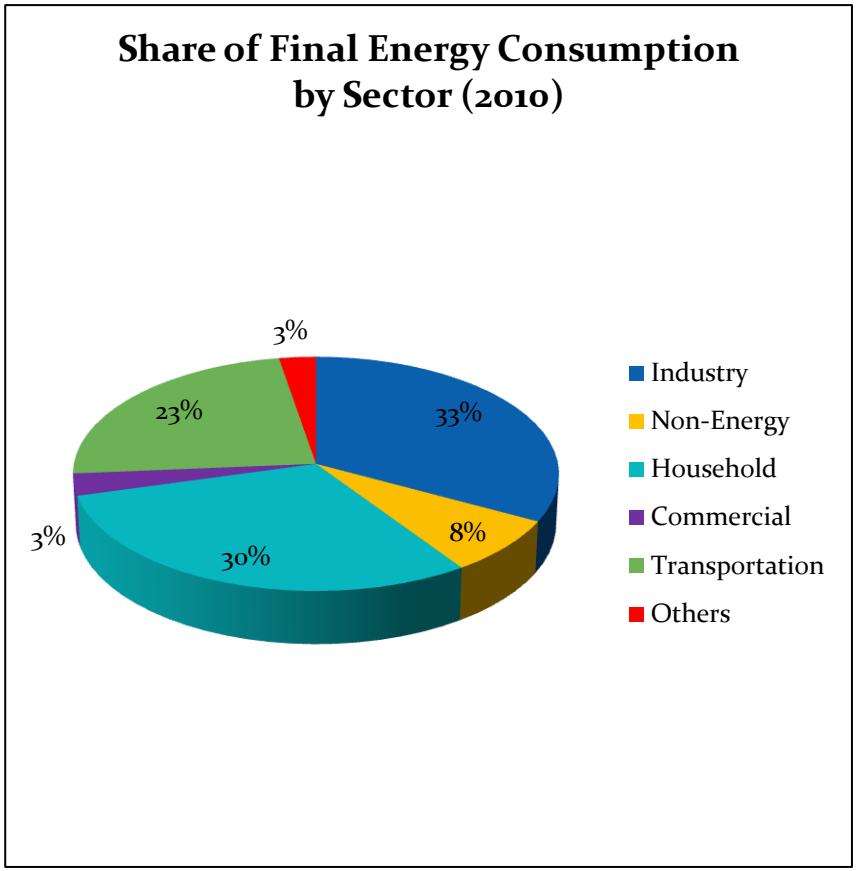




Note: Primary energy supply included biomass (firewood and charcoal)

Final Energy Consumption (2010)





Note: Final energy consumption included biomass (firewood and charcoal)

ELECTRICITY STATUS (2010)

Total PP Installed [MW]

Hydro PP	Steam PP	Gas PP	CC PP	Geothermal PP	Diesel PP	Oil-Gas PP	Wind PP	Solar PP	Total
3,709.57	12,290.50	3,460.38	7,840.32	1,189.00	4,342.76	38.84	0.60	0.19	32,872.6

Production PLN'PP [GWh]

Hidro PP	Geothermal PP	Steam PP				Gas PP	Combined Gas-Steam PP	Diesel PP	Solar PP	Wind PP	Sub-Total
		Coal	Oil	Gas	Total						
15827	3398	46685	6712	1009	54,407	9,266	36,812	11,926	0.50	0.026	131,710

PLN Purchase [GWh]

Hydro PP	Geothermal PP	Steam PP			Combined Gas-Steam PP	Diesel PP	Sub- Total	Grand Total
		Coal	Biomass	Total				
1,849	5,959	21,429	95	21,524	8,020	724	38,076	169,786

PLN Electricity Performance

Year	Average Thermal Efficiency	Capacity Factor	Load Factor	Peak Load	Transmission & Distribussion Losses
	(%)	(%)	(%)	(MW)	(%)
2000	34.66	46.29	69.54	15,320	11.65
2001	34.49	47.90	71.13	16,314	13.52
2002	34.56	48.28	72.10	17,160	16.45
2003	34.35	49.78	71.88	17,949	16.88
2004	34.23	51.14	72.64	18,896	11.29
2005	34.62	52.15	75.48	19,263	11.54
2006	33.51	48.00	64.15	20,354	11.45
2007	32.04	64.47	59.60	21,306	11.08
2008	30.19	52.62	80.77	21,120	10.46
2009	29.95	53.71	76.37	23,438	9.93
2010	29.46	55.90	77.78	24,917	8.89

Source : PLN Statistic

Energy Potential

Status as of January 1, 2010

Energy Type	Resource	Reserve	Production/annum
Oil	-	7.8 Billion barrel	344.9 Million barrel
Nat.Gas	-	157.1 TSCF	3.4 TSCF
Coal	105.2 Billion ton	21.1 Billion ton	275.2 Million ton
Geothermal	-	15, 867 MW	1,189 MW (installed capacity)

Source: Handbook of Energy & Economic Statistics of Indonesia 2011

Type	Potential	Installed Capacity
Hydro Power	75.67 GW	5,705 MW
Mini/Micro-hydro	769.7 MW	217.9 MW
Biomass	49, 810 MW	1,618 MW
Solar Energy	4.8 kWh/m^2/day	13.5 MW
Wind Energy	3-6 m/sec	1.87 MW

Source: Directorate General REEC, 2010

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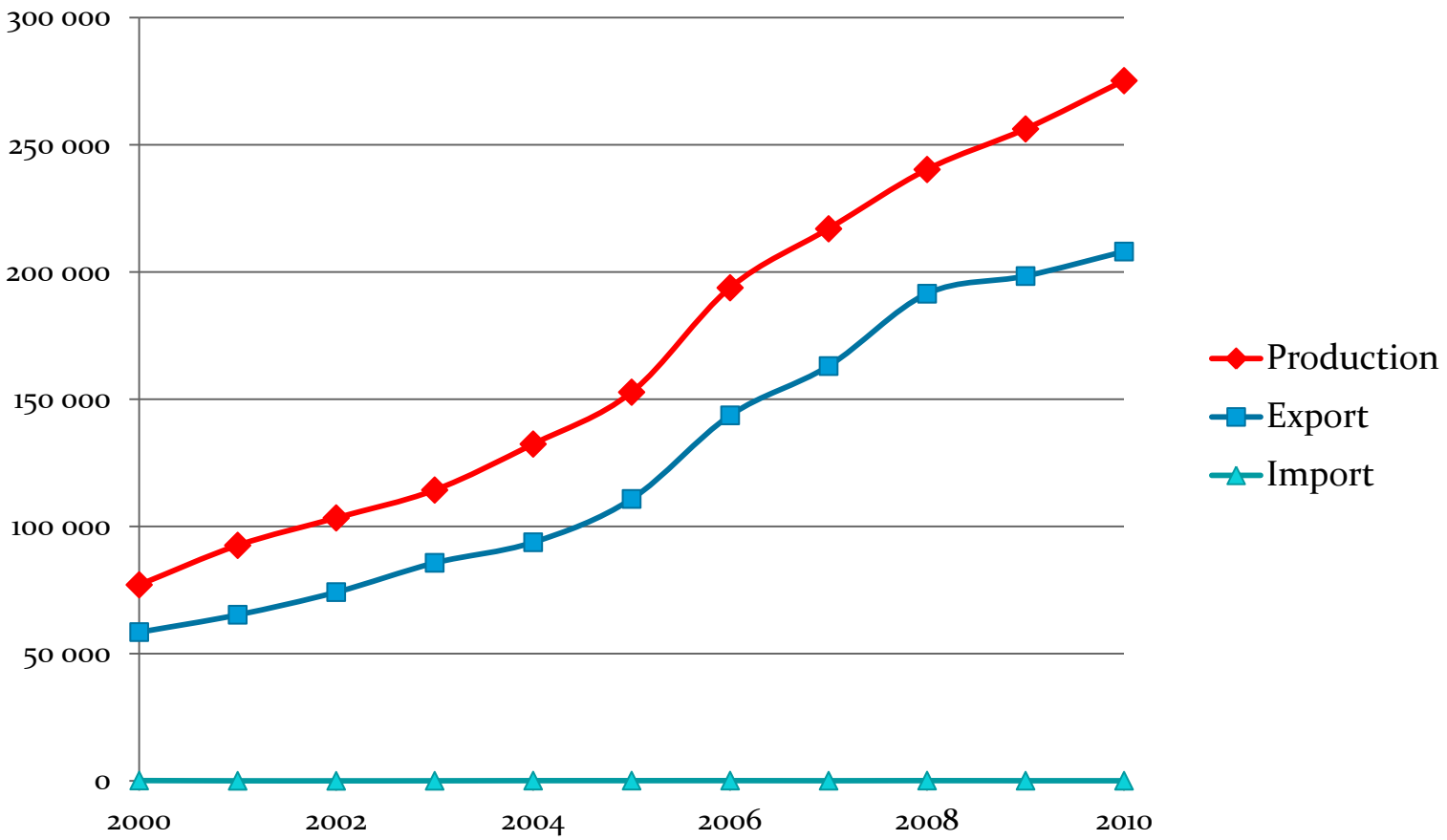
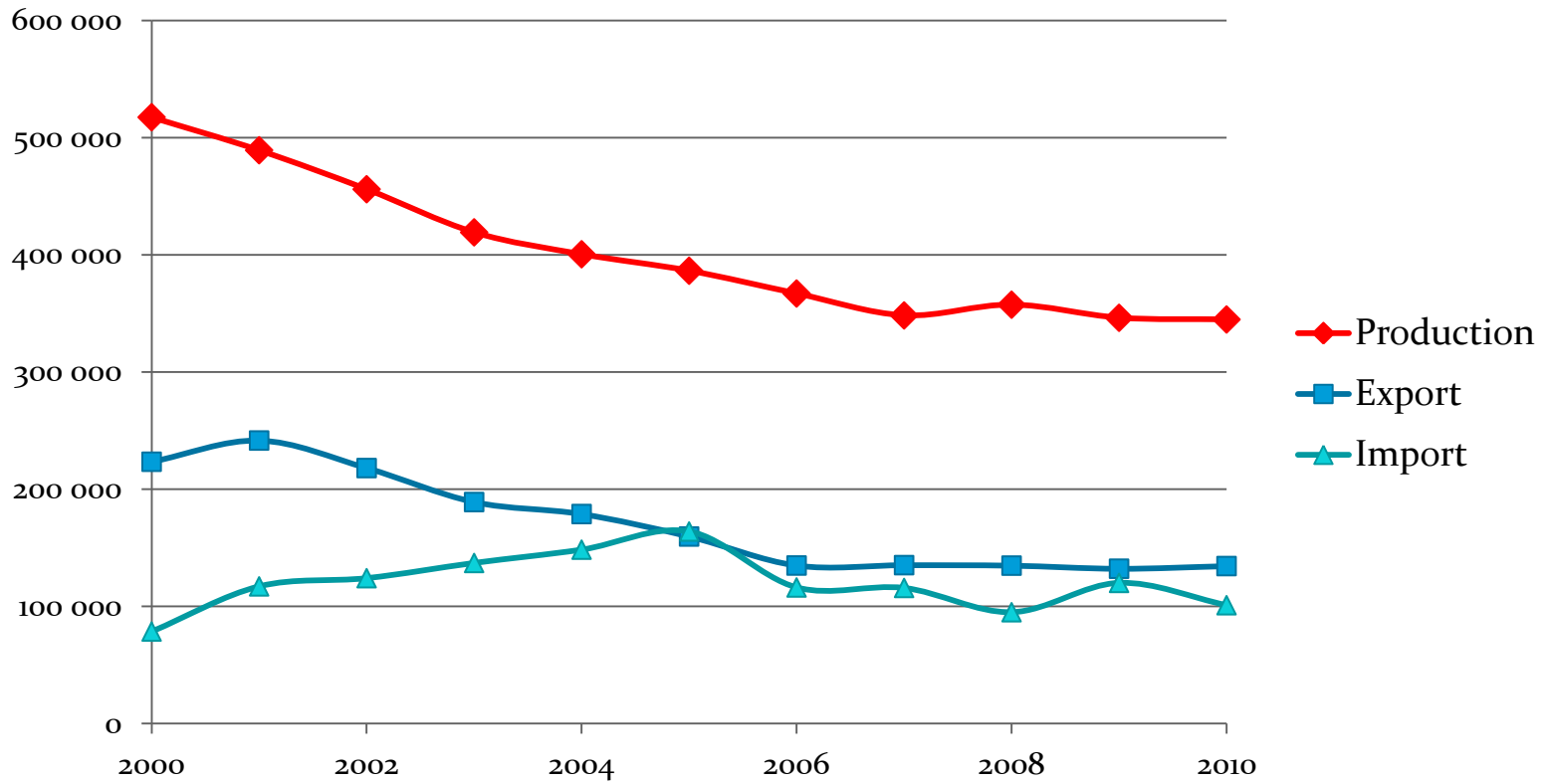
Export-Import Coal (Thousand Ton)



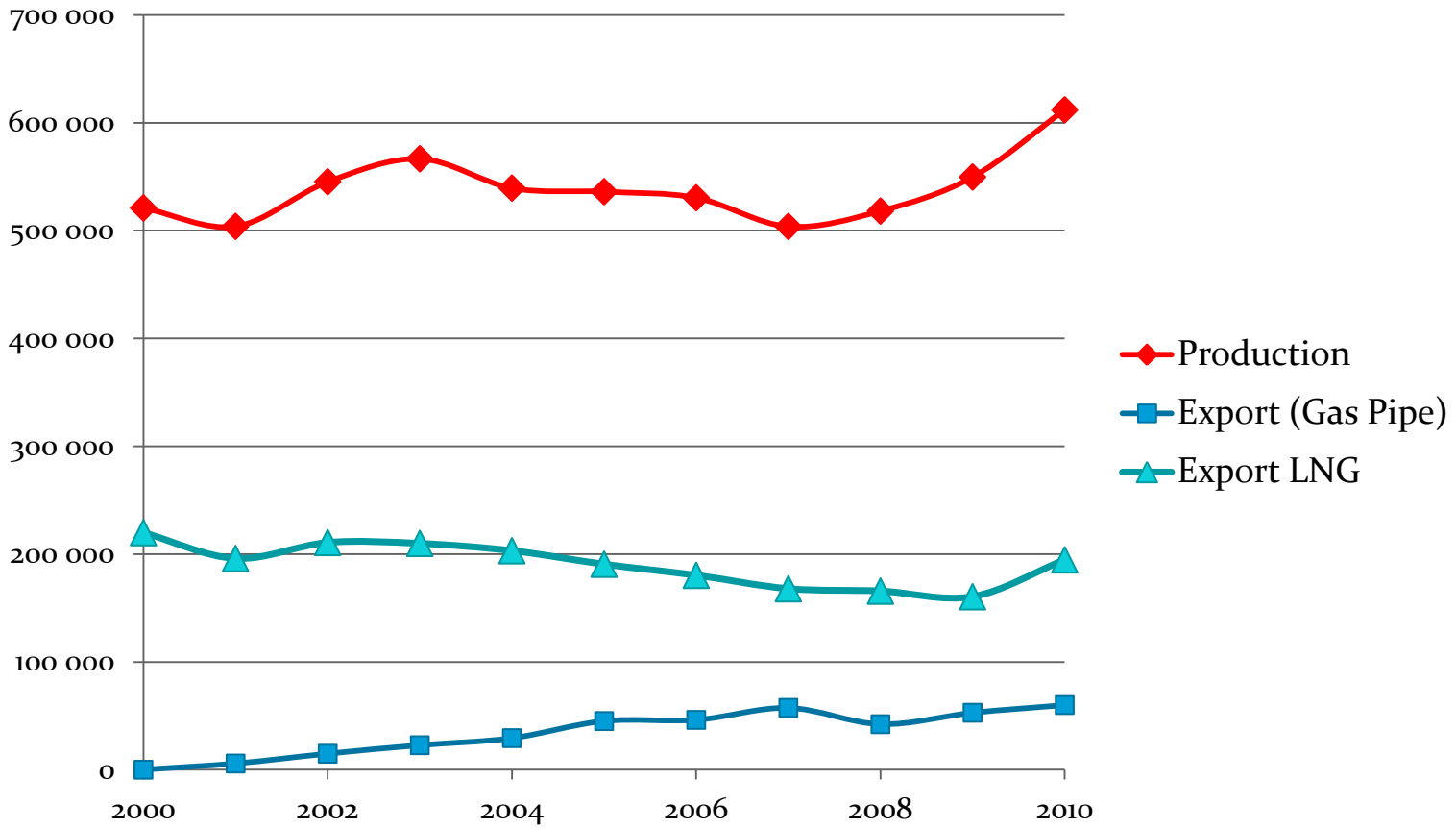
Source: Handbook of Energy & Economic Statistics of Indonesia 2011

Export-Import Crude Oil (Thousand Barrel)



Source: Handbook of Energy & Economic Statistics of Indonesia 2011

Export-Import Natural Gas (MBOE)

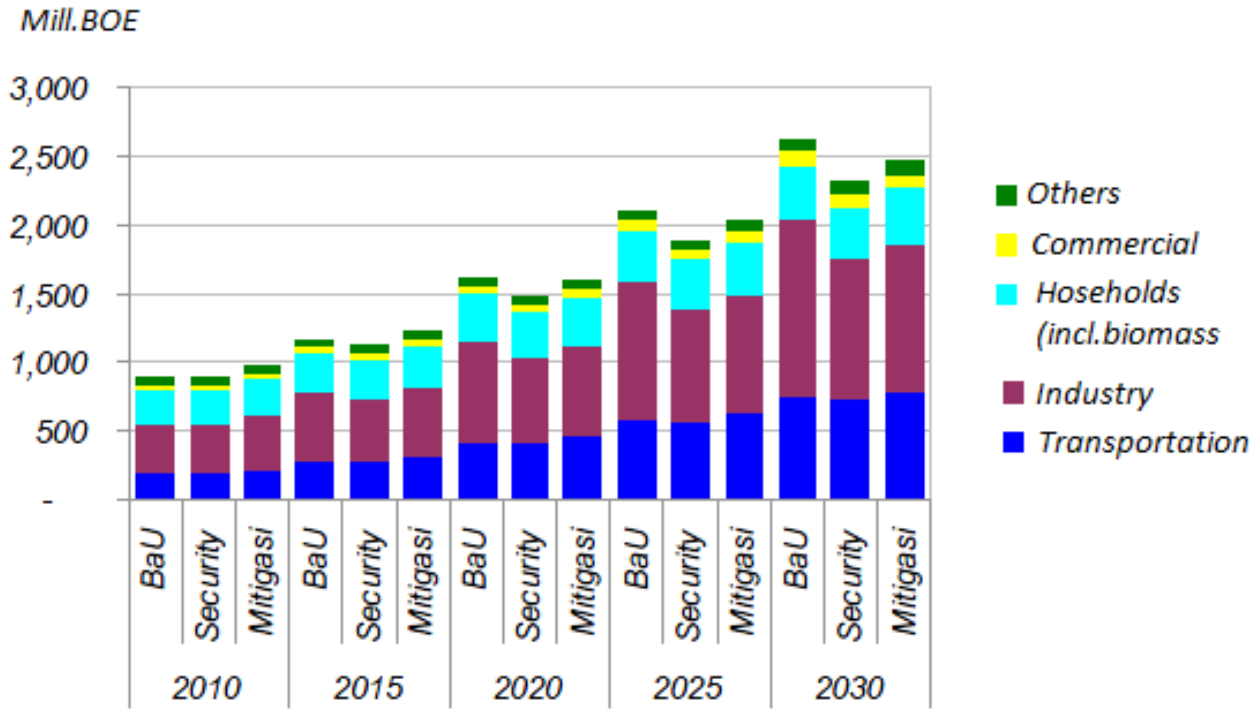


Source: Handbook of Energy & Economic Statistics of Indonesia 2011

INDONESIA ENERGY OUTLOOK 2010-2030

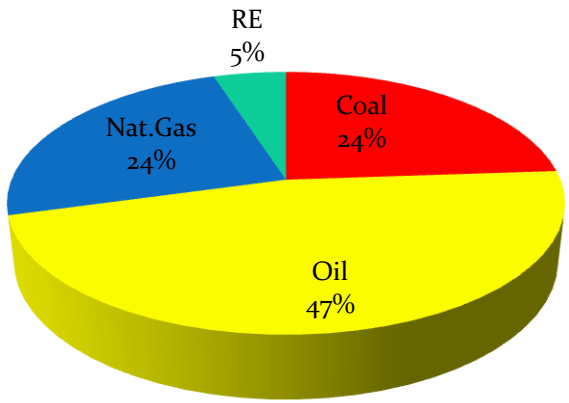
Energy and Electricity

Projection of Final Energy Demand by Sector

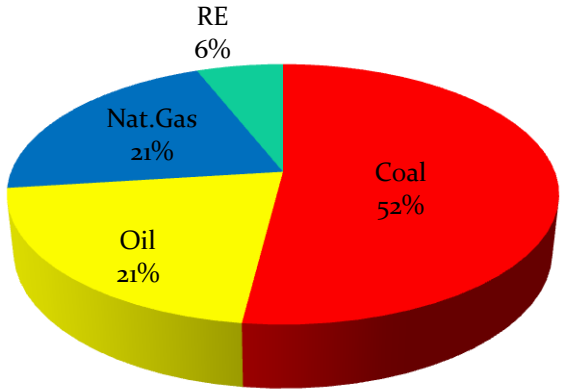


Projection of Primary Energy Supply by

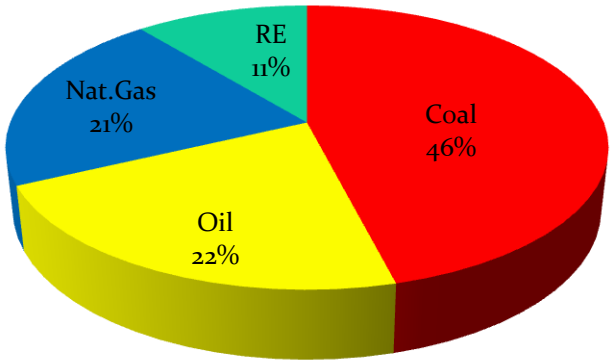
Primary Energy Supply (2010)



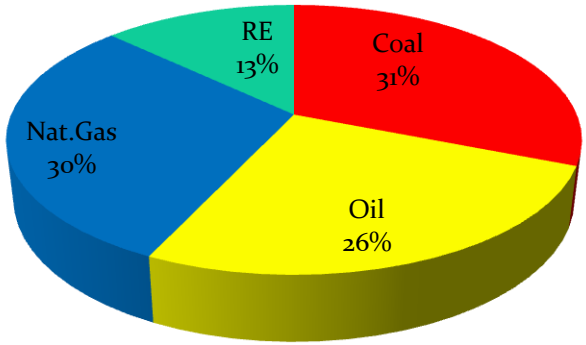
BaU Scenario (2030)



Security Scenario (2030)



Mitigasi Scenario (2030)



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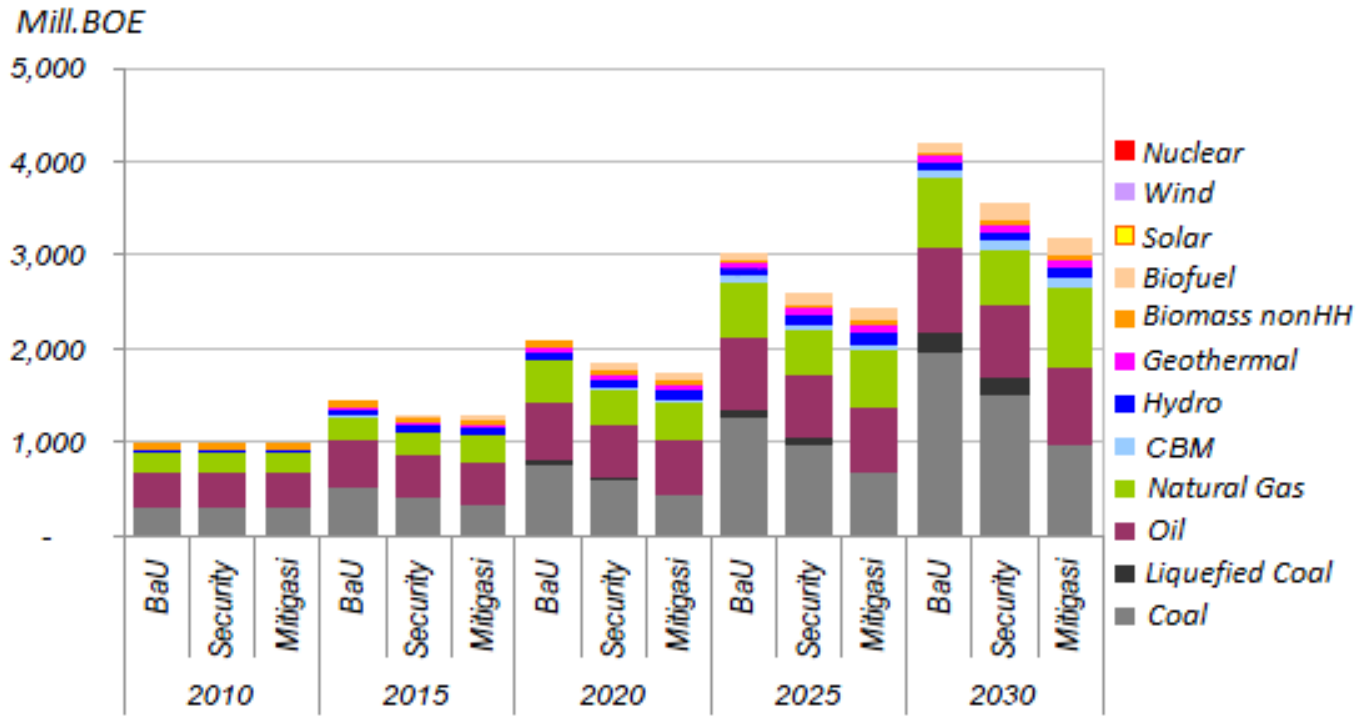
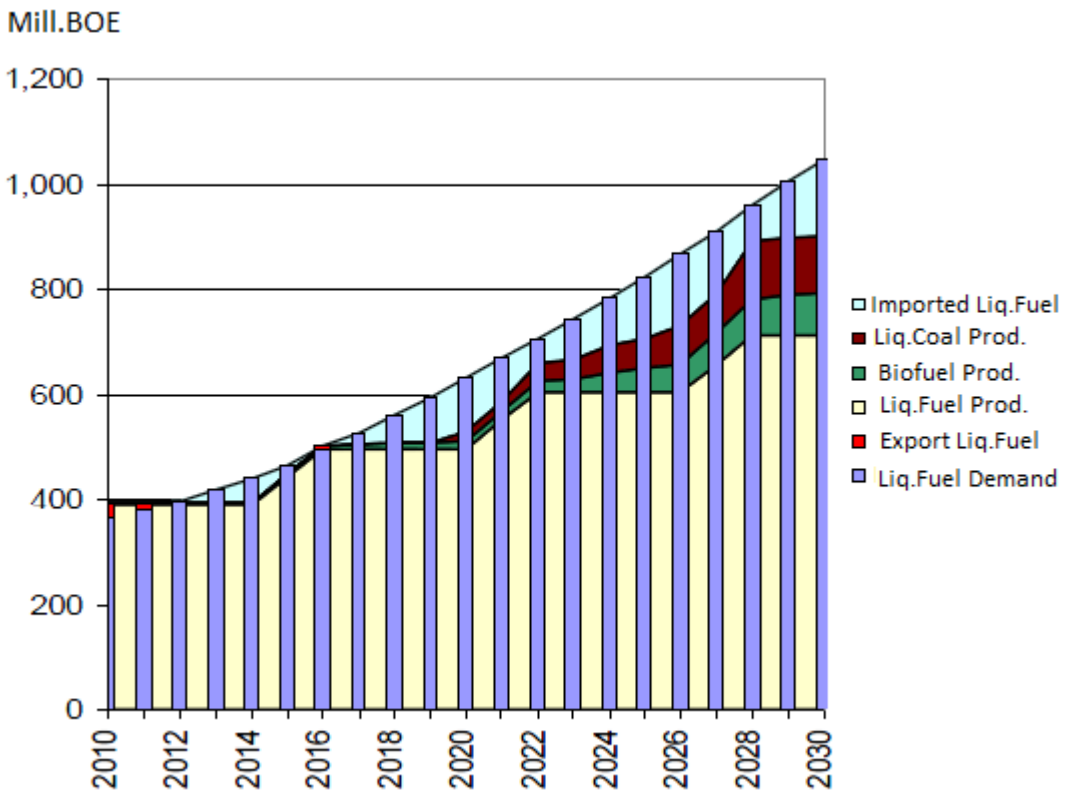
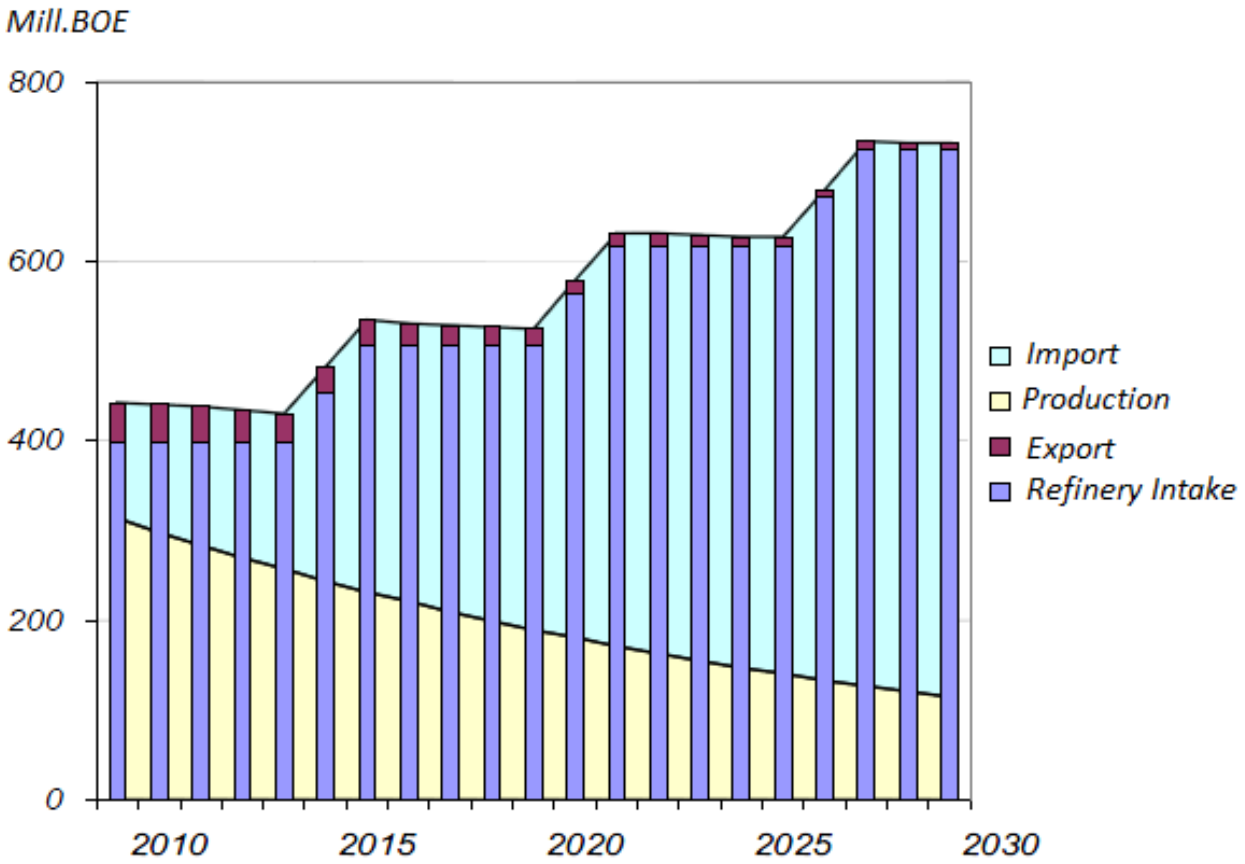
Projection of Primary Energy Supply by Type



Projection of Liquid Fuel Consumption



Projection of Crude Oil Supply



CLEAN ENERGY AND R&D NEEDS

Some Highlights in Energy Sector

- Oil, gas and coal are important commodities in Indonesia Energy Sector, both as energy resources and as nation income resources.
- Despite coal is predicted to replace oil as dominant primary energy supply due to the decreased in oil production, the supply of oil still could be increased from 422 Million BOE in 2010 to 997 Million BOE in 2030 (BaU Scenario). Even with more persistent scenario (vigorous measures in energy conservation and clean energy implementation), the supply of oil might be increased to 909 Million BOE in 2030
- Estimate demand of liquid fuel in 2030 is 167 Million kL, as results, the imported crude oil could reached 98 Million kL, while in 2010 is only approx. of 16 Million kL
- The share of renewable energy seems will remains minor, although it is significantly increased in quantity
- Transportation and Industrial sector remain the most energy consumptive sector

Barriers in Energy Conservation and Clean Energy (technological prespective)

- Most of technology in energy conservation and clean energy need high capital cost, and considered as high risks. Unattractiveness become more pronounced when the existing energy is heavily subsidized
- Applicability of some EE technology need to be well understood by both side the user and the provider. Inappropriate design/application of energy conservation system, that happened sometimes due to lack of knowledge, will reduce not only financial benefits (if not yet become financial loss), also could wash out the confidence of other potential users
- Deployment of immature clean technologies usually lead to lack of its infrastructures (maintenance and spare parts availability)
- Indonesia resource potential of renewable energy is spread out across the archipelago that include hundreds of small islands or under-developed regions. The challenges, such as lower energy demand, lack of skilled operator, socio-economic and geographically hurdles, still need to be addressed by many available RE technologies
- Local manufacture industries on EE and CE are very limited, narrowing job creation and economic activities that actually should be generated as national benefits

R&D Gaps

- Development of EE and CE technologies varied widely and compete each other. For the country with limited resources (such as budget, scientists, industrial partners) insightful analysis to select the R&D priorities need to be done

- Imported technologies are not always suitable for the available resources or other local conditions, however, the role of R&D in deployment of new technology rarely taken, usually it is due to business nature of the deployment

- Lack of interest from industry to do research or partnering in EE and CE R&D activities

- Most of R&D institutions is owned by government, where the administration system is not well adaptable with the R&D dynamics.

Innovation and Advanced Technology

- Industrial sector needs to implement energy conservation that covers not only high energy efficient machinery/equipment, also adoption of high efficient integrated energy conservation system that can give significant financial and environmental benefit
- In another 20 years ahead, transportation sector in Indonesia is predicted still needs liquid fuel. Synthetic liquid fuel from coal and biomass could be one solution, beside other alternative biofuels resource, such as algae biofuels
- Electricity technology using local fuels, smaller scale, robust performance with high maturity in infrastructure, and simple operation could be an answer for electricity demand in remote or under-developed regions

Expected Cooperative R&D Model

- Continuous Platform for information exchange in R&D activities
- Internship (researcher exchange) in EE and CE R&D that could be come from different areas, as long as can produce mutual benefits from both sides
- International Exhibition of R&D Equipments, instruments, materials and others that related to EE and CE R&D needs
- Pilot/Demonstration Project of technology that is developed by all parties involved

Thank You

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