The 18th AIM International Workshop
National Institute for Environmental Studies - Japan

Indonesia Low Carbon Emission Development Strategy Scenario 2020 & 2050 in Energy Sector

14-16 December, 2012

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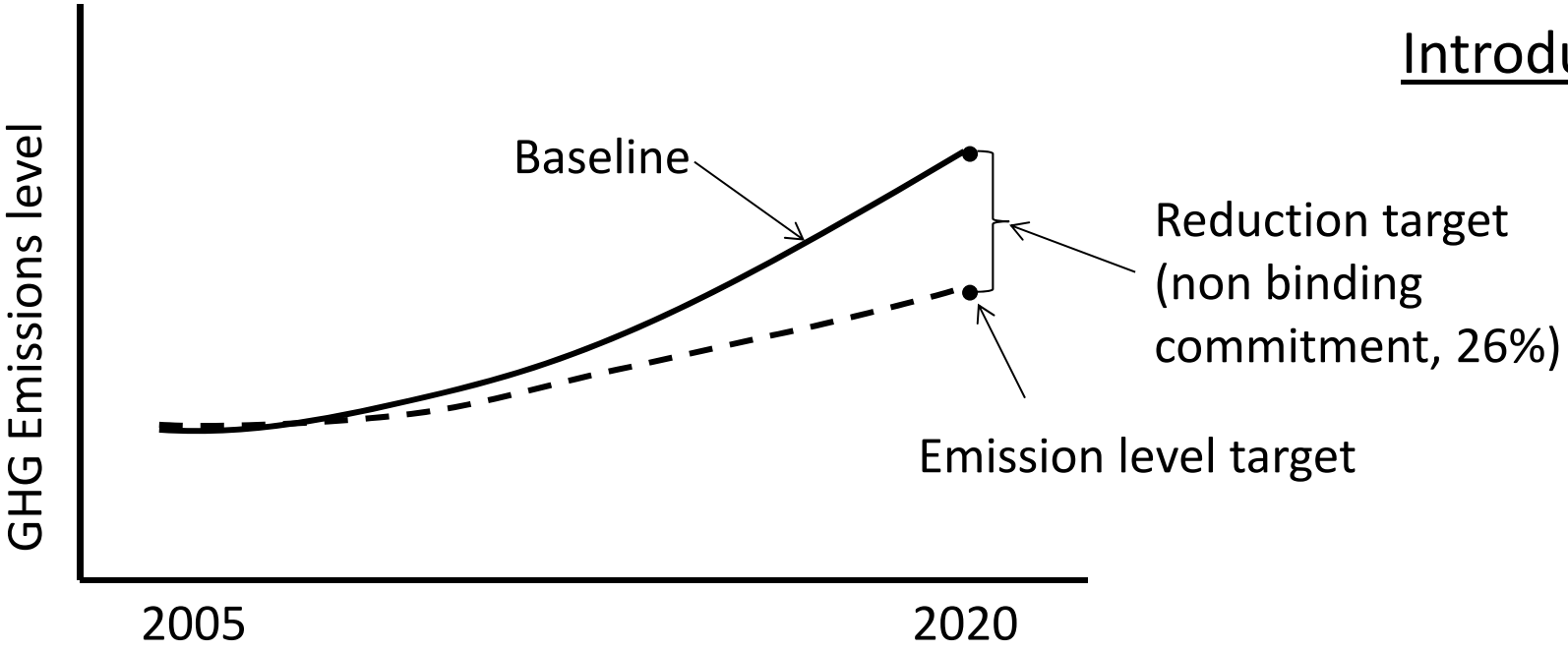
Outline

- Introduction
- Development of The Scenario
- Simulation Results
- Policy Gap Analysis
- Concluding Remarks

Introduction

- This presentation discusses LCEDS in Energy Development Scenario 2020 & 2050
- LCEDS is usually intended to assess long-term vision. Particular emphasis of this discussion is to be the short-term scenario (up to 2020) to address the options for achieving GHG emission reduction target in conjunction with National Action Plan for GHG emissions reduction to meet the GOI non-binding commitment to reduce emissions 26% below Indonesian baseline projection in 2020 of the SNC.
- Power generation sector is discussed in more detailed as there is a new plan that intends to revise power development plan (more coal compared to previous plan (RUPTL 2009-2018) will be deployed gradually by 2020).
- The baseline of power sector in the SNC is projected based on RUPTL 2009-2018. It is necessary to investigate the impact of this revised plan, if implemented, to the achievement of emission reduction target of energy sector set in National Action Plan and mitigation actions need to be undertaken to achieve the target.
- Policy gap analysis and recommendation relevant to the achievement of the RAN GRK target are also addressed in this study.

Introduction



Sector	Emission Reduction (Giga ton CO2e)		Total (41 %)
	26%	15%	
Forestry and Peatland	0.672	0.367	1.039
Waste	0.048	0.030	0.078
Agriculture	0.008	0.003	0.011
Industry	0.001	0.004	0.005
Energy	**0.038**	**0.018**	**0.056**
Total	**0.767**	**0.422**	**1.189**

Development Scenario

- Business as Usual (BAU) Scenario and Mitigation (M) Scenarios
- The BAU 2050 scenario is the projection of snapshot of what would happen and be achieved in 2050 as the results of future energy sector development up to 2050.
- The BAU assumes that the existing society orientation, technology deployment, and economic condition will continue until 2050.
- The BAU 2020 scenario assumes that the current trend in economy, social orientation as well as technology deployment in energy sector will continue until 2020.
- The mitigation scenarios for the BAU 2020 i.e. the M1 and M2 scenarios, assume that there will be changes in technology deployment orientation in the future.

- There is new plan to attempt to improve the economics of power generation by revising the master plan by installing more coal power (share of coal would increase to 65% in 2018 from 53% according to previous plan that is used as baseline in the SNC).
- Adding more coal plants obviously will lead to higher GHG level, which is in-opposite with national mitigation action plan objective.
- As energy sector has already had a target of GHG emission levels (0.038 Gton) in 2020 from the baseline. The baseline of power sector in the SNC is projected based on the RUPTL 2009-2018.
- The new plan to revise the RUPTL 2009-2018 may alter the estimates of GHG emission level of the 2020 baseline of the SNC.

Socio Economic Assumptions

Population: 219 million (2005), increase with 1.03%/year (2005-2020); and 0.89%/year (2020-2050).

GDP growth: 6% (2005–2010), 6,5% (2010-2020), 7% (2020-2050).

Socio Economic Parameter	Base Year 2005	Target Year 2020	Target Year 2050
Population, Million	219	261	327
Person per household	3.68	3.68	3.3
GDP (at constant price 2000), trillion IDR	1,787	4,572	30,244
GDP per capita, million IDR	8.152	17.519	92.508
Gross output, trillion IDR	3,533	10,657	70,490.1
- Primary	329	629	4,157
- Secondary	1,953	4,506	29,807
- Tertiary (commercial)	1,251	5,522	36,525
Passenger Trip Generation (Ptg), trips	3.6	3.6	3.3
Passenger-transport demand, billion psg km	1,763	2,145	2,463
Freight-transport demand, billion ton km	274	1,062	7,022

Mitigation Scenarios

For long term (2050), mitigation options are generally relatively wide (efficiency measures to deployment of advanced technology such electric cars fueled using renewable sources ,etc.)

This study is emphasized for relatively short (snapshot in 2020), the mitigation actions to be included in the study are those options that are likely readily applicable and deployable in the near future such as energy efficiency measures.

M1 scenario: energy efficiency measures at the end-user sides.

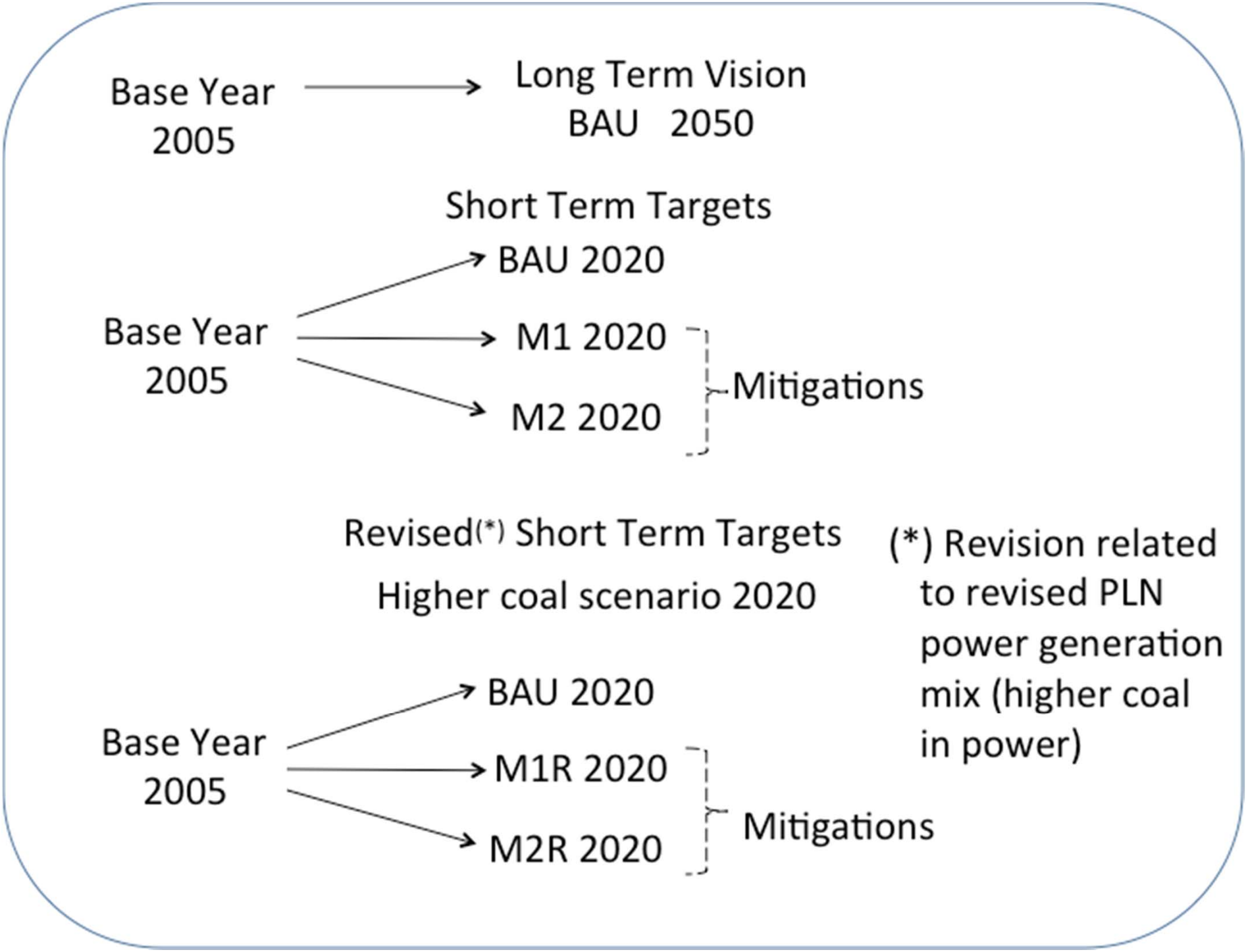
M2 scenario: energy efficiency measures at the end-user sides + EE measures at the supply sides (generator and T&D network).

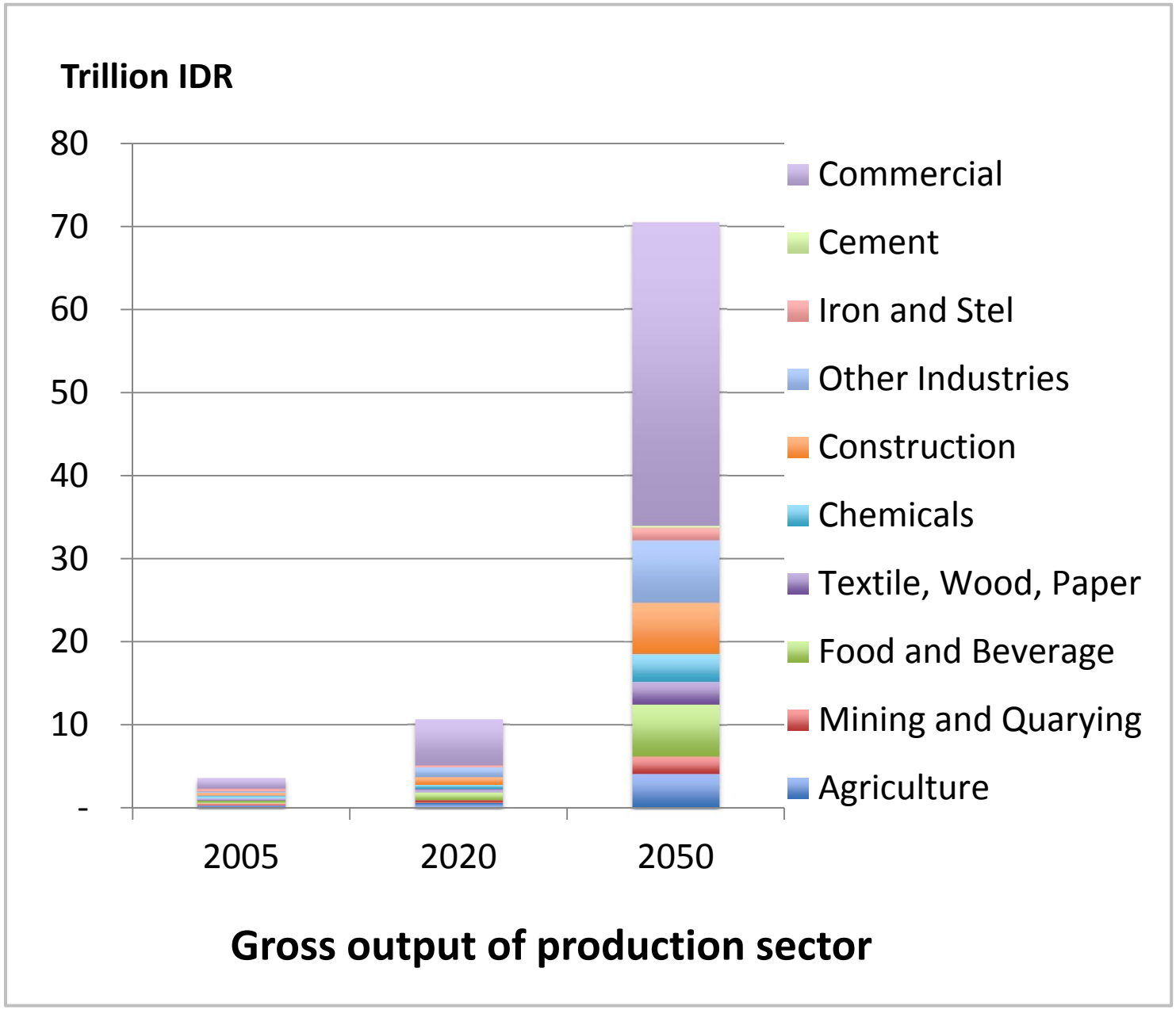
End-user energy efficiency measures, applied in M1 and M2

Sector	Penetration share of BAT	Efficiency improvement of BAT compared to existing device	Remarks
Industry	30%	10 – 30%	In the model this efficiency improvement varies, depend on the type of device (not sectoral aggregate)
Commercial	15%	20 - 30%	
Residential	10%	10 - 20%	

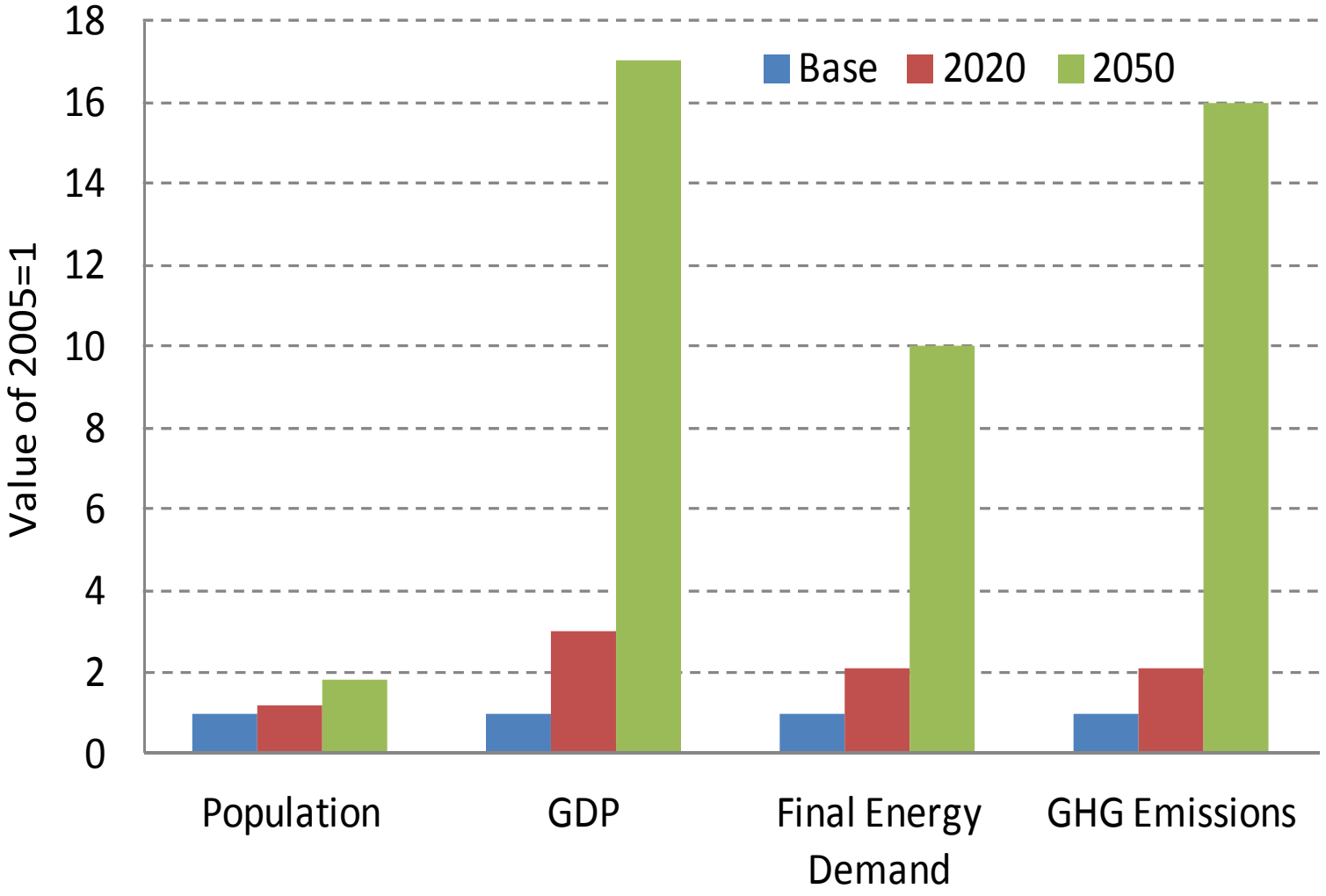
Note: Penetration share of BAT in industry sector 30% means that in 2020 the technology (devices) used in the industry activities will comprise 30% BAT and 70% existing technology (less efficient).

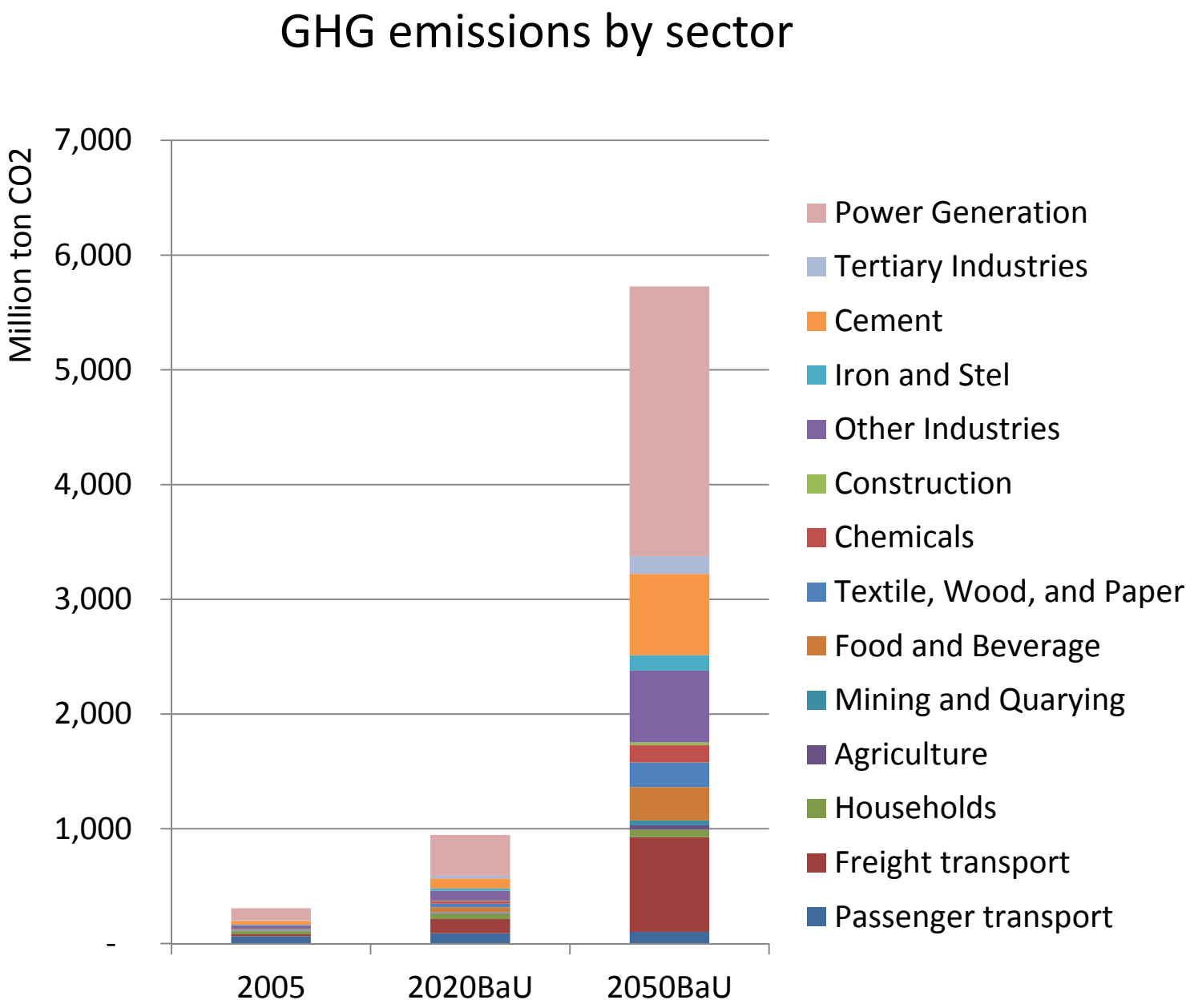
Simulation Results


Base Year
2005
Long Term Vision
BAU 2050
Short Term Targets
BAU 2020
Base Year
2005
M1 2020
M2 2020
Mitigations
Revised(*) Short Term Targets
Higher coal scenario 2020
(*) Revision related to revised PLN power generation mix (higher coal in power)
BAU 2020
Base Year
2005
M1R 2020
M2R 2020
Mitigations

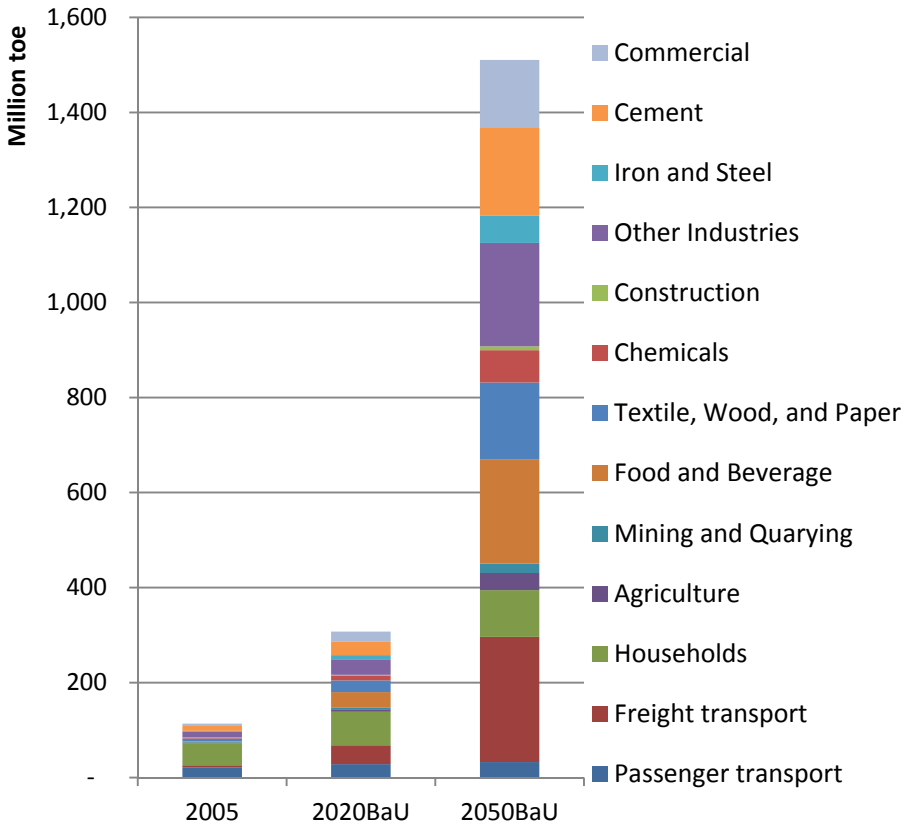

Trillion IDR
80
70
60
50
40
30
20
10
-
2005
2020
2050
Commercial
Cement
Iron and Stel
Other Industries
Construction
Chemicals
Textile, Wood, Paper
Food and Beverage
Mining and Quarying
Agriculture
Gross output of production sector

Snapshots of population, GDP, energy demand and GHG emissions development (BAU)

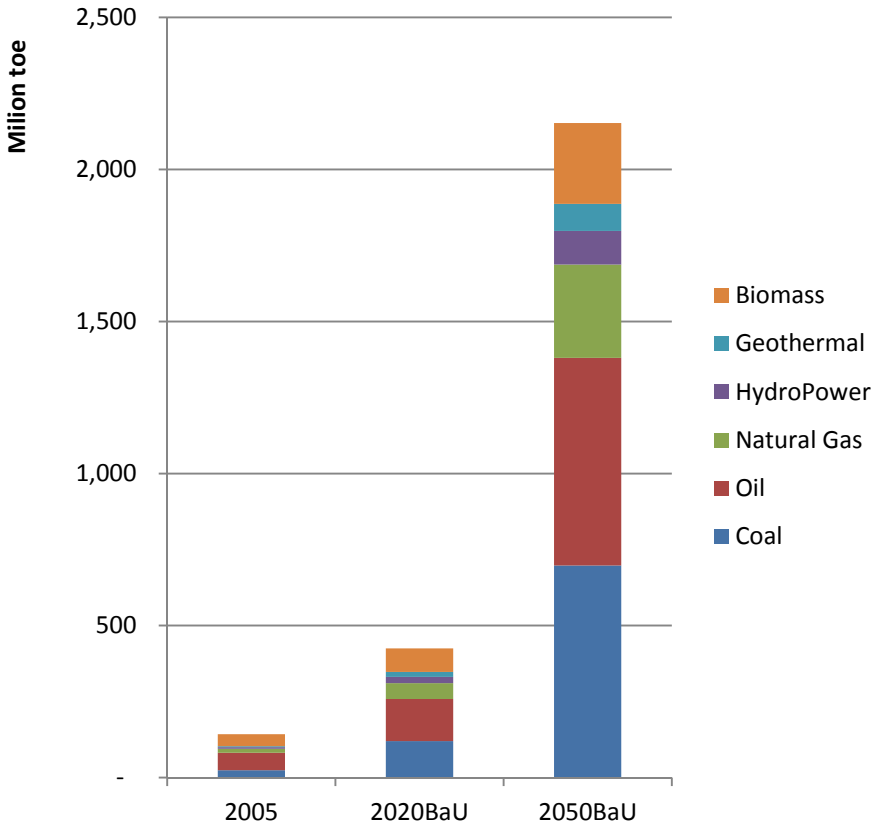



GHG emissions by sector
Million ton CO2
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
2005
2020BaU
2050BaU
Power Generation
Tertiary Industries
Cement
Iron and Stel
Other Industries
Construction
Chemicals
Textile, Wood, and Paper
Food and Beverage
Mining and Quarying
Agriculture
Households
Freight transport
Passenger transport

Scenario 2050

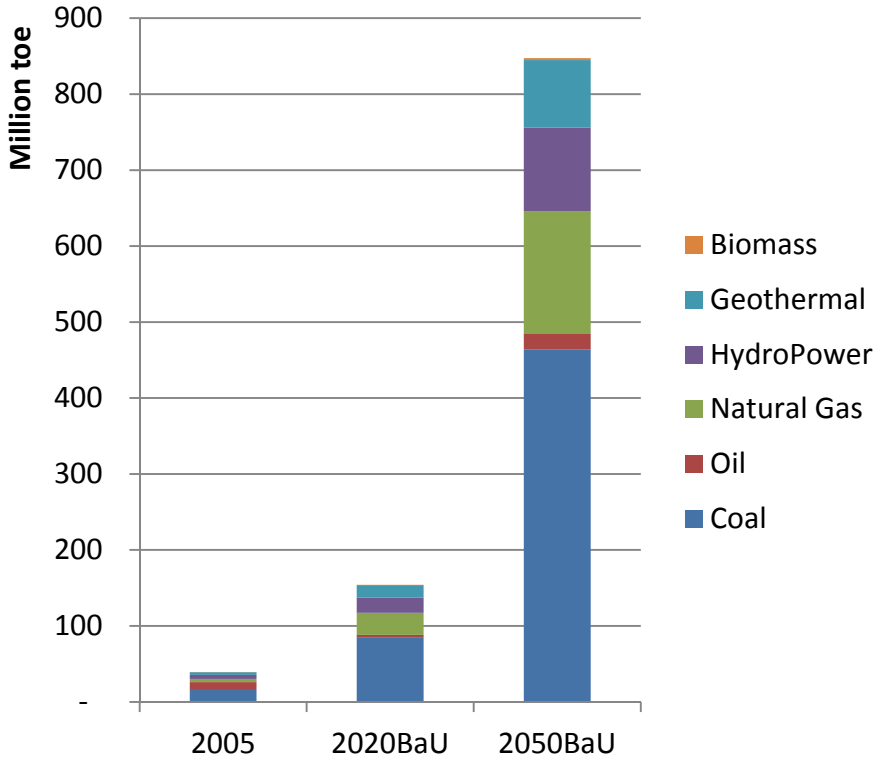


Final energy demand projection

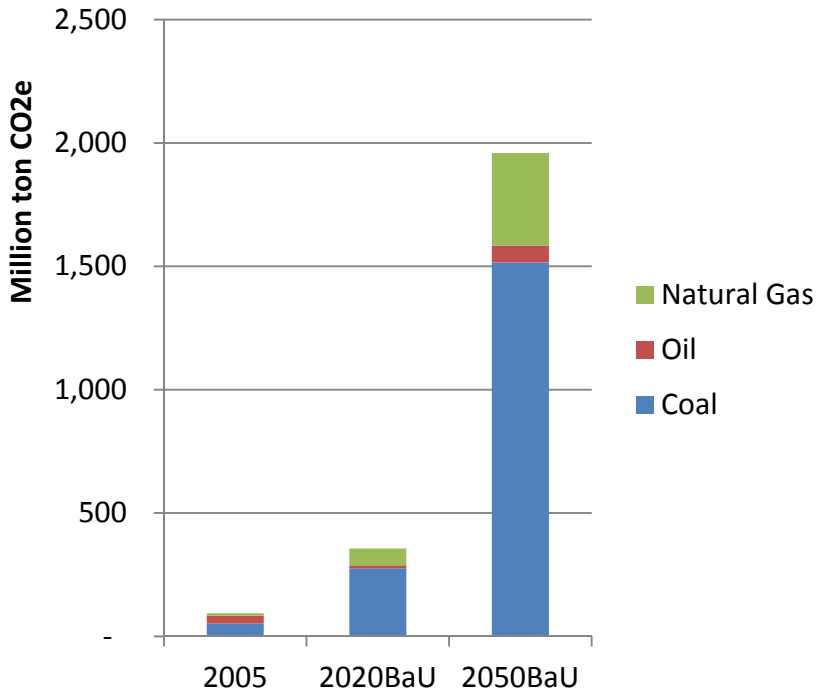


Primary energy supply mix

Scenario of 2050 for Power generation



Power generation by fuel type



GHG emissions of power sector

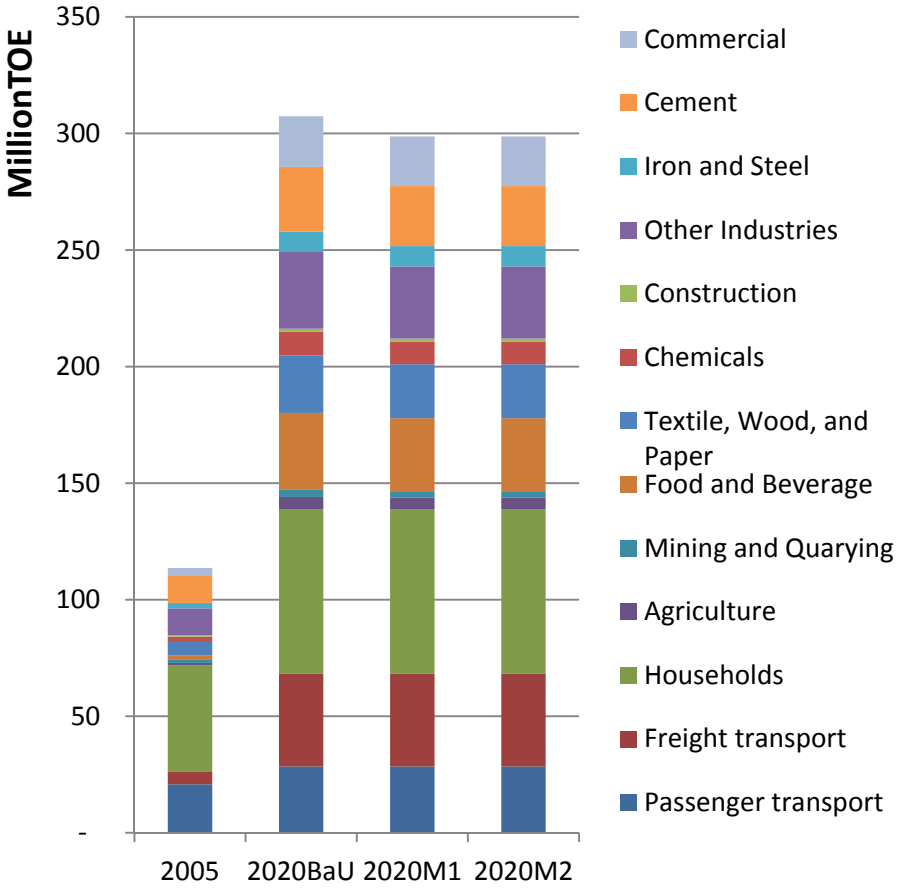
Scenario 2020

Table 1. Simulation results of the effect of 'higher coal power' to the SNC scenarios

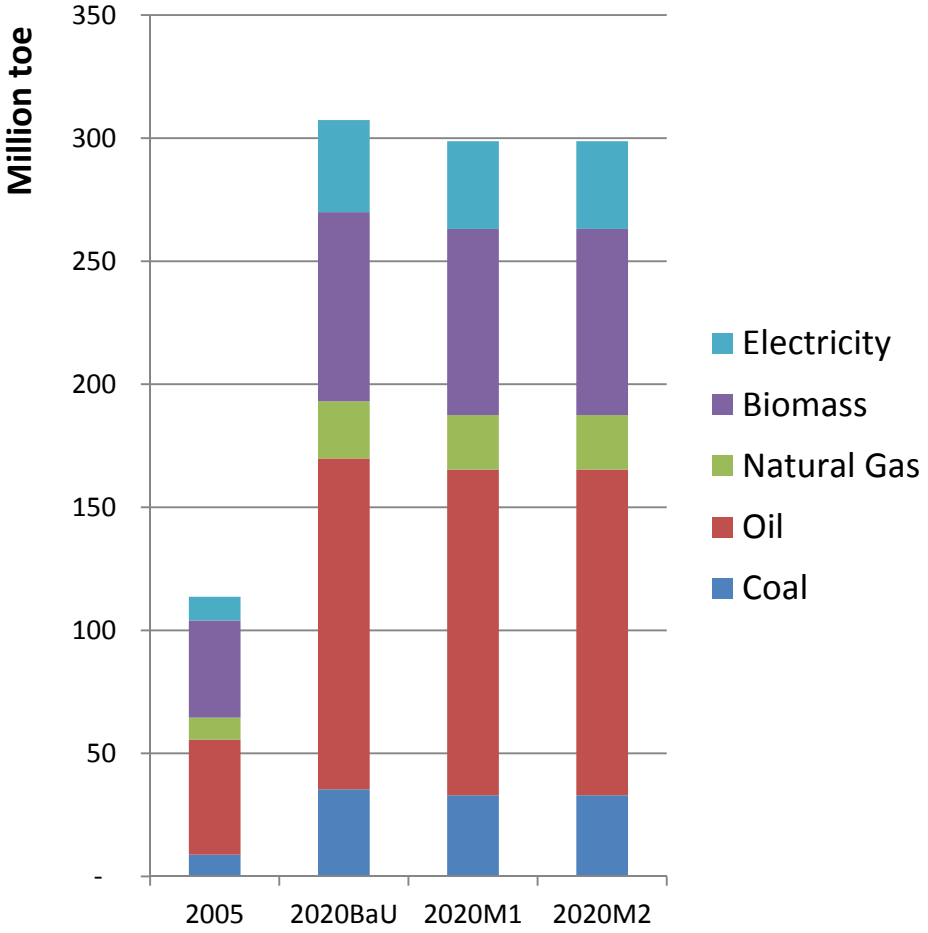
Parameter	2005	2020 (SNC projection)			Effect of higher coal in 2020		
	Base Year	BaU	M1	M2	BaU	MR1	MR2
GDP (trillion IDR)	1,787	4,572	4,572	4,572	4,572	4,572	4,572
Population (million)	219	261	261	261	261	261	261
Energy demand (million toe)	115.3	307	299	299	307.3	298.7	298.7
Energy demand per capita (toe)	0.5	1.2	1.1	1.1	1.2	1.1	1.1
Energy intensity (toe/million IDR)	63.6	67.2	65.3	65.3	67.2	65.3	65.3
Energy Elasticity		1.06	1.03	1.03	1.06	1.03	1.03
CO_2 emission (million ton-CO_2)*	290	949	915	897	977	915	906
Carbon Intensity							
- Ton CO_2 per capita	3.6	3.6	3.5	3.4	3.7	3.5	3.5
- Ton CO_2 per million IDR	208	208	200	196	214	200	198

*It does not include CO_2 emission from fugitives

Final Energy Demand 2020

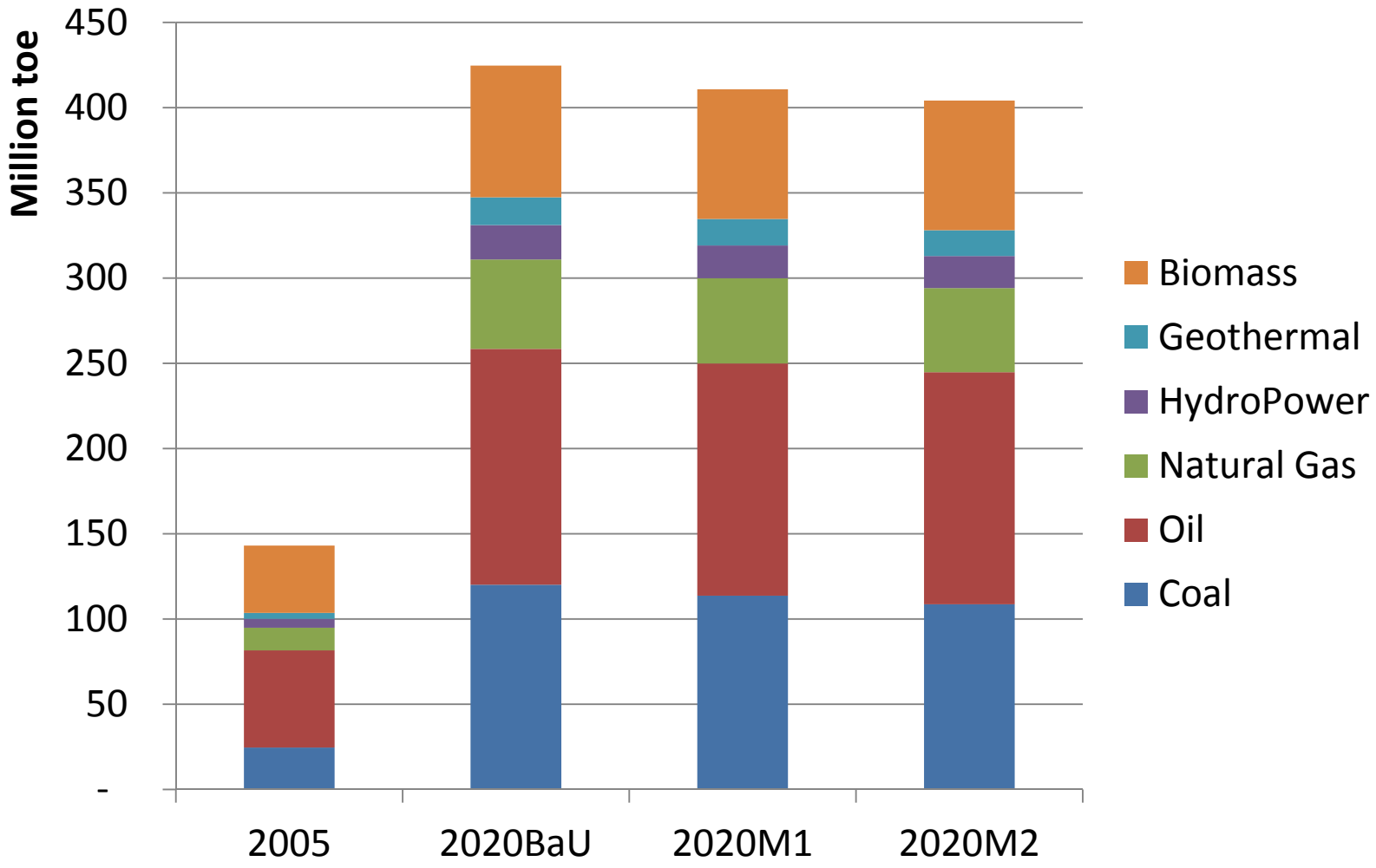


by Sector

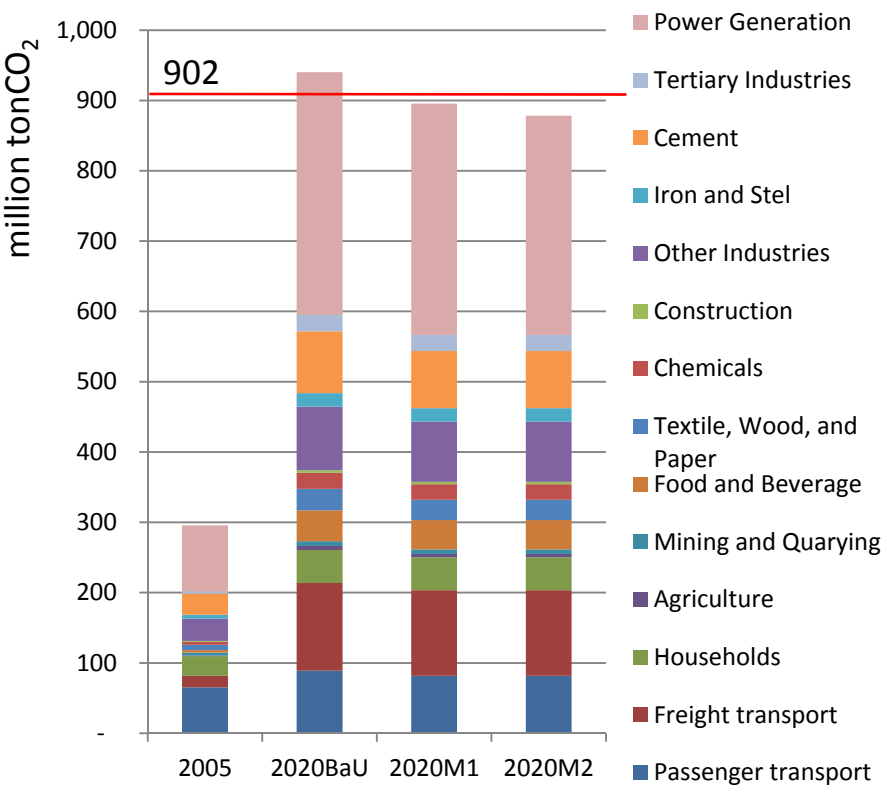


by Fuel Type

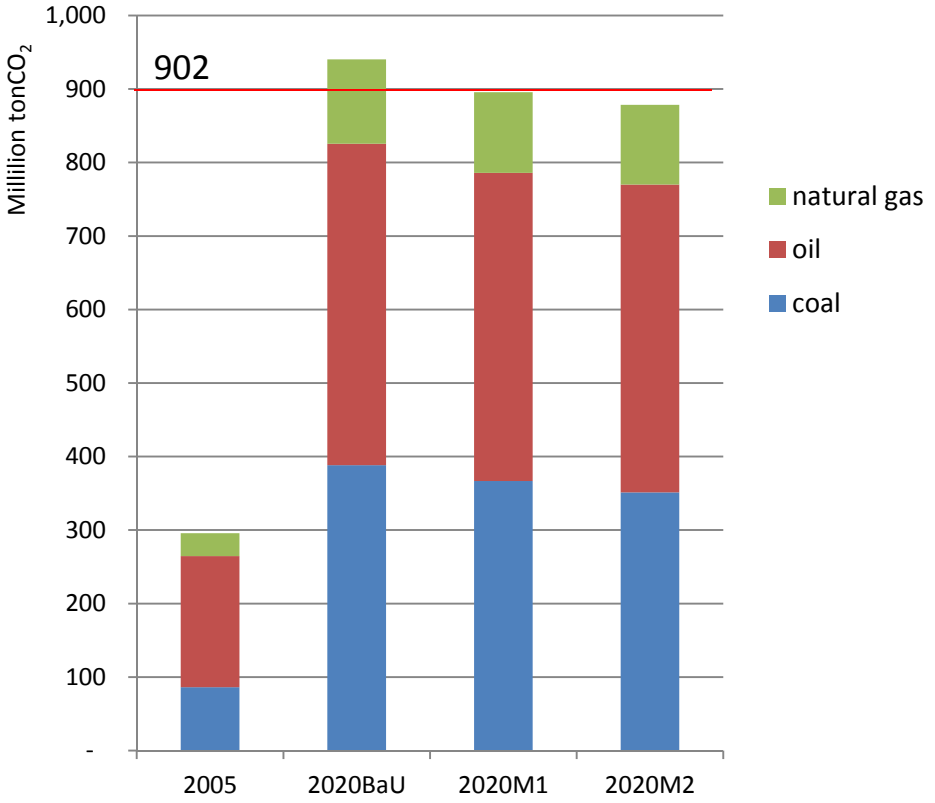
Primary Energy Supply by Type of Energy



CO2 Emission 2020

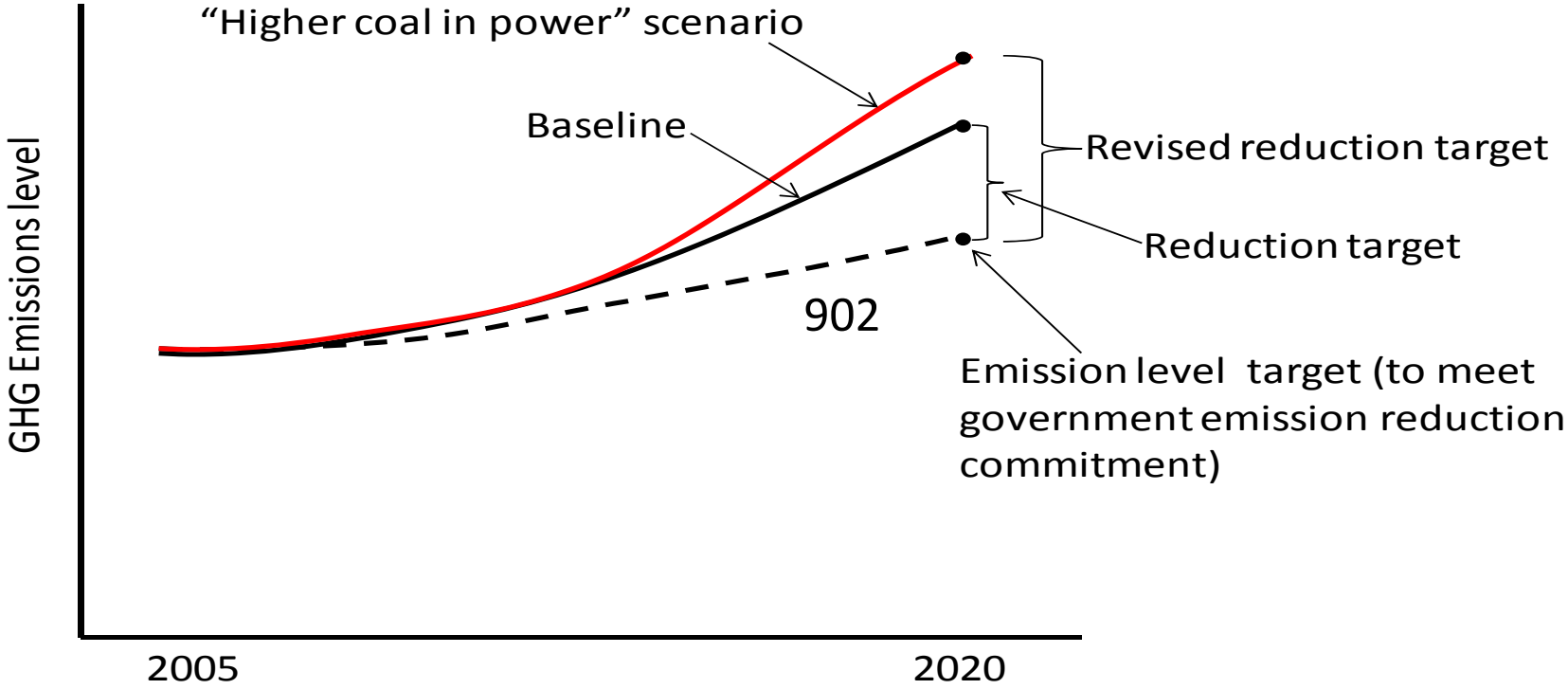


CO_2 Emissions by Sector



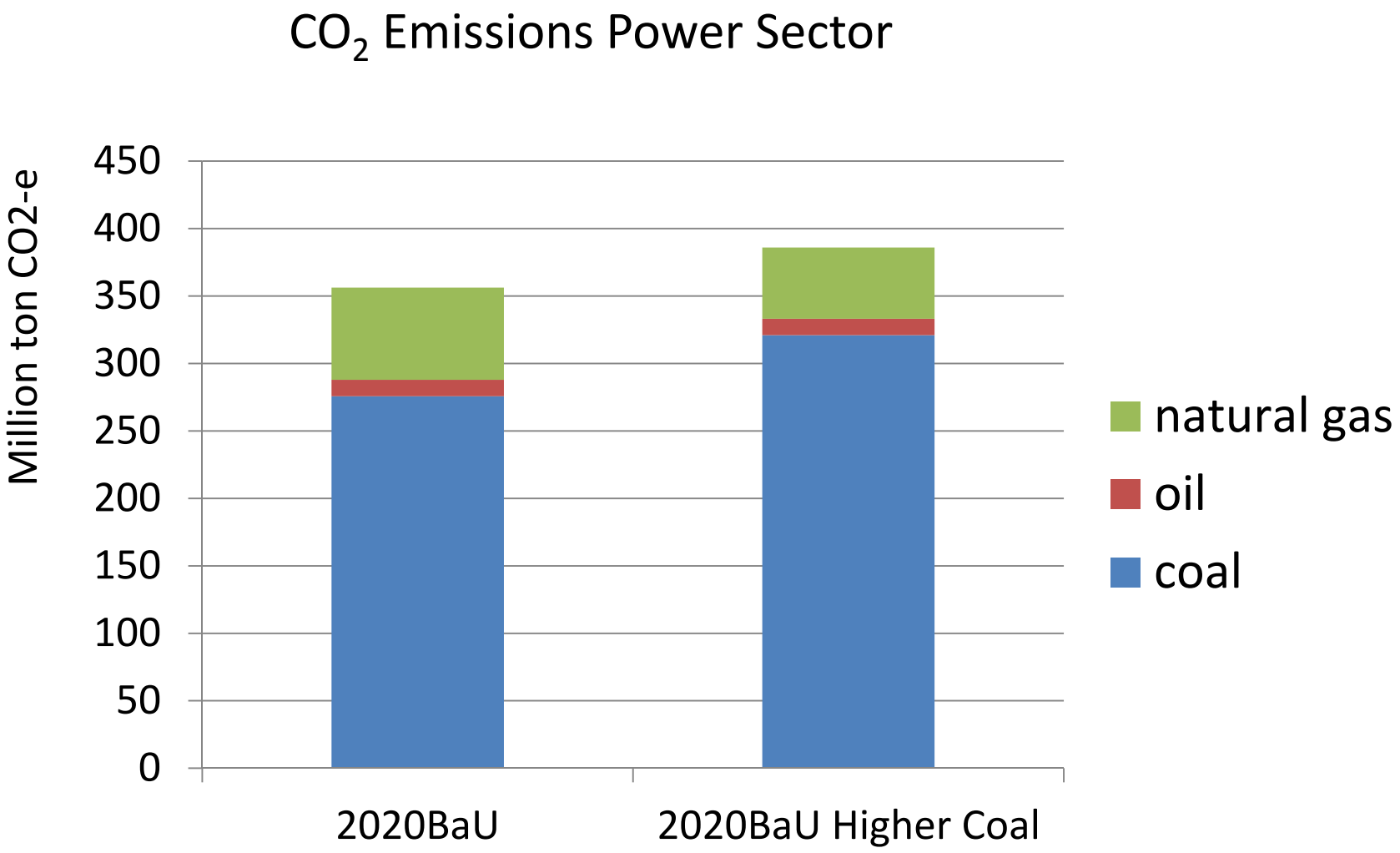
CO_2 Emissions by Fuel Type

Effect of the revised power development plan to the amount of GHG that have to be reduced from the “higher coal in power” scenario



Type of energy	Base year 2005	RUPTL 2009-2018	Revised PLN plan*
Coal	40.7%	53%	65%
Oil	30.6%	4%	3%
Natural gas	15.1%	26%	20%
hydro	8.4%	10%	5%
geothermal	5.2%	7%	7%

Revised PLN Plan



Mitigation Scenarios for “Higher Coal Power”

Efficiency measures (end-user and supply sides
+
transport mode shift

End-user energy efficiency measures, applied in M1 and M2

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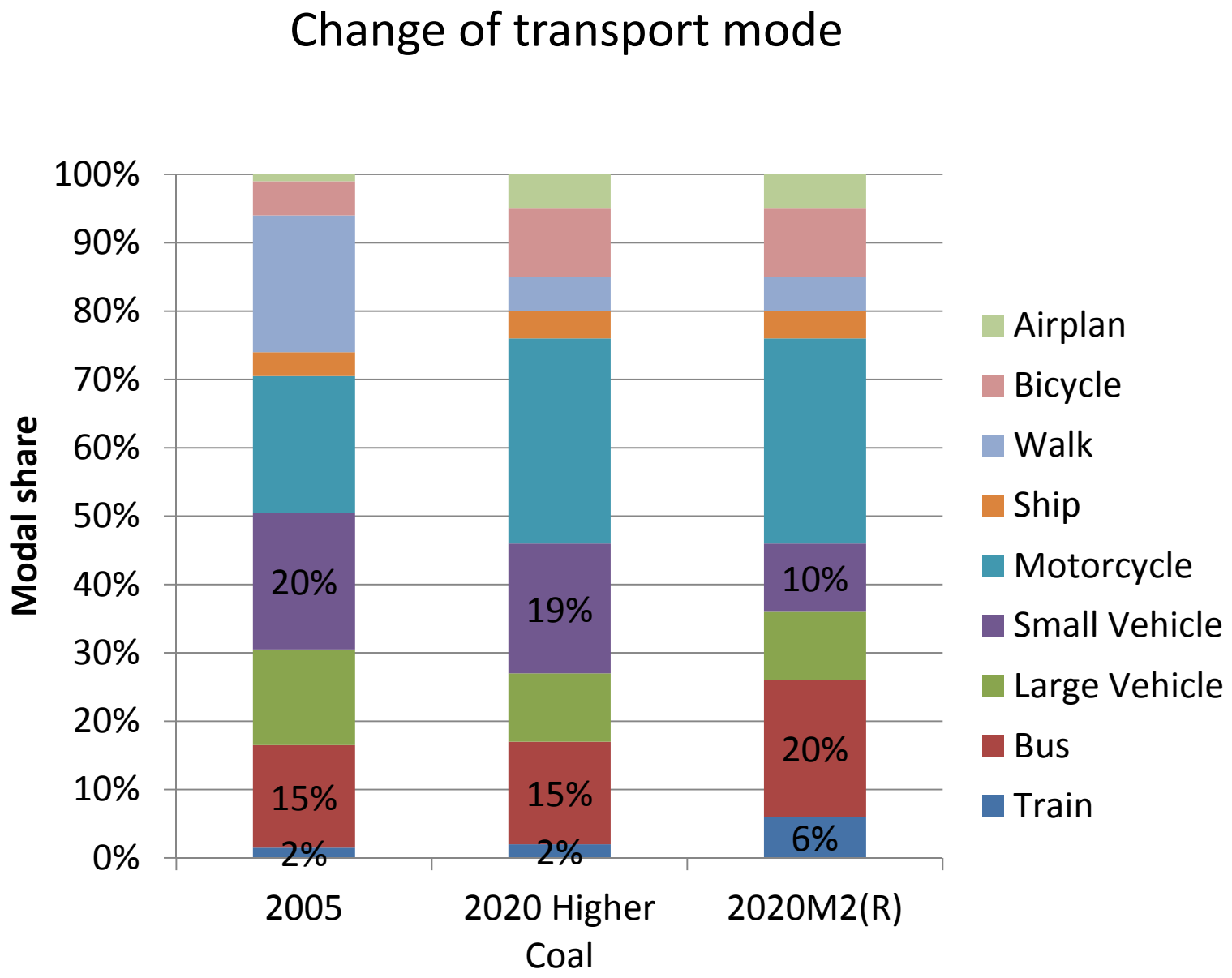
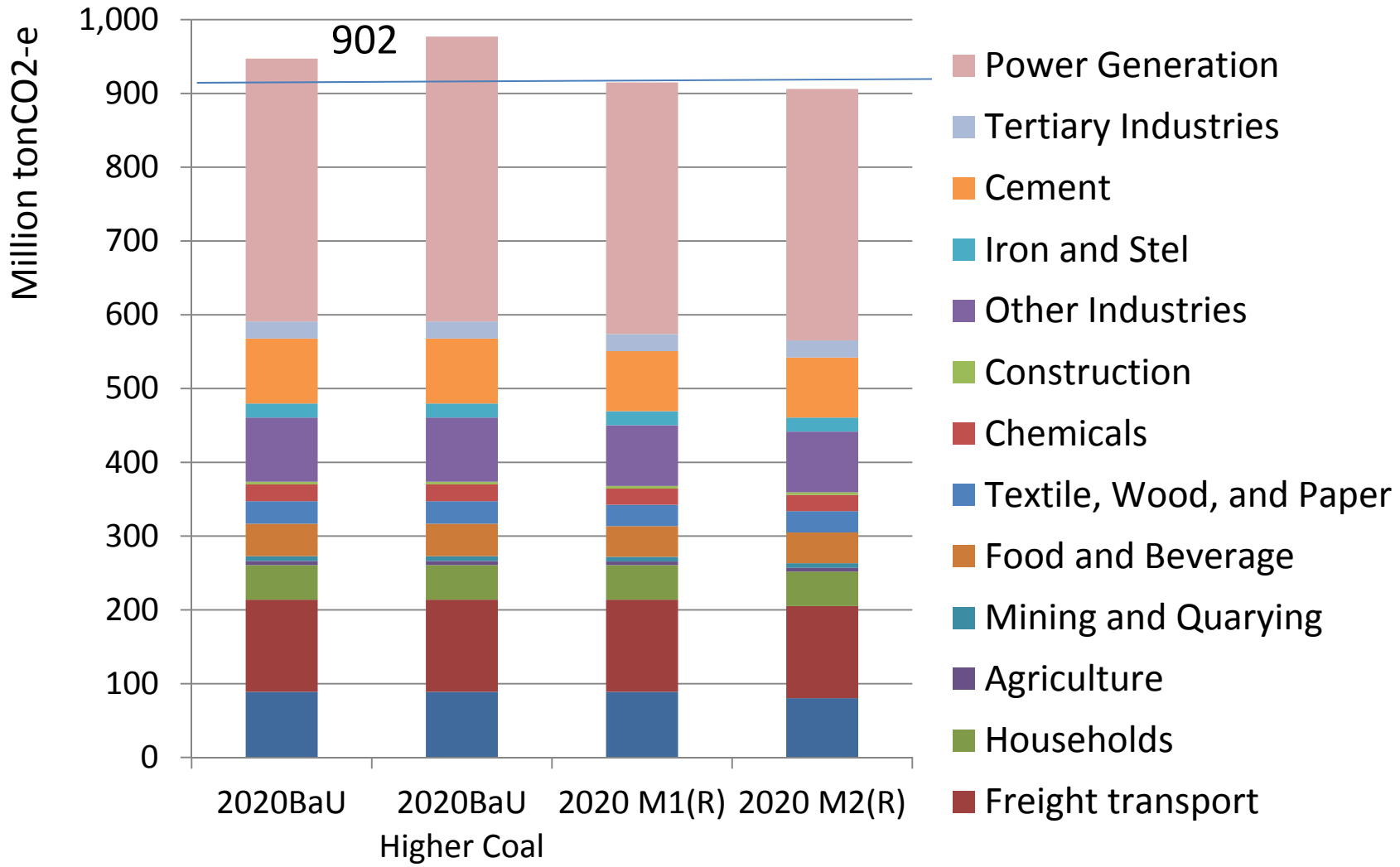

Change of transport mode
Modal share
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
20%
15%
2%
19%
15%
2%
10%
20%
6%
2005
2020 Higher Coal
2020M2(R)
Airplan
Bicycle
Walk
Ship
Motorcycle
Small Vehicle
Large Vehicle
Bus
Train

GHG emissions 2020, Higher Coal and Mitigations



Policy Gap Analysis

The target of National Action Plan For Reducing GHG Emissions could be achieved through Energy Efficiency (EE) measures in supply/demand side.

Demand side EE could be implemented when following conditions prevail:

- Efficient appliances are available and relatively easy to access
- Producers have technical & financial capability to produce eff. appliances
- Producers have the needed drive to produce efficient appliances (there is a market demand of their product)
- Energy users have the drive to safe energy.
- Energy consumers have financial capacity to acquire efficient appliances (usually expensive)

Supply side EE could be implemented when following conditions prevail:

- There is an economic drive or stimulant for power generators to improve efficiency. Under current subsidy system such drive may not exist
- Strict regulation that prevent construction of less efficient power plant. The GOI should set minimum thermal efficiency for new power plants

Gap of policy to implement energy efficiency measures exists. To close the gap, the following recommendation may be considered:

In demand side, the following policy/regulations are recommended:

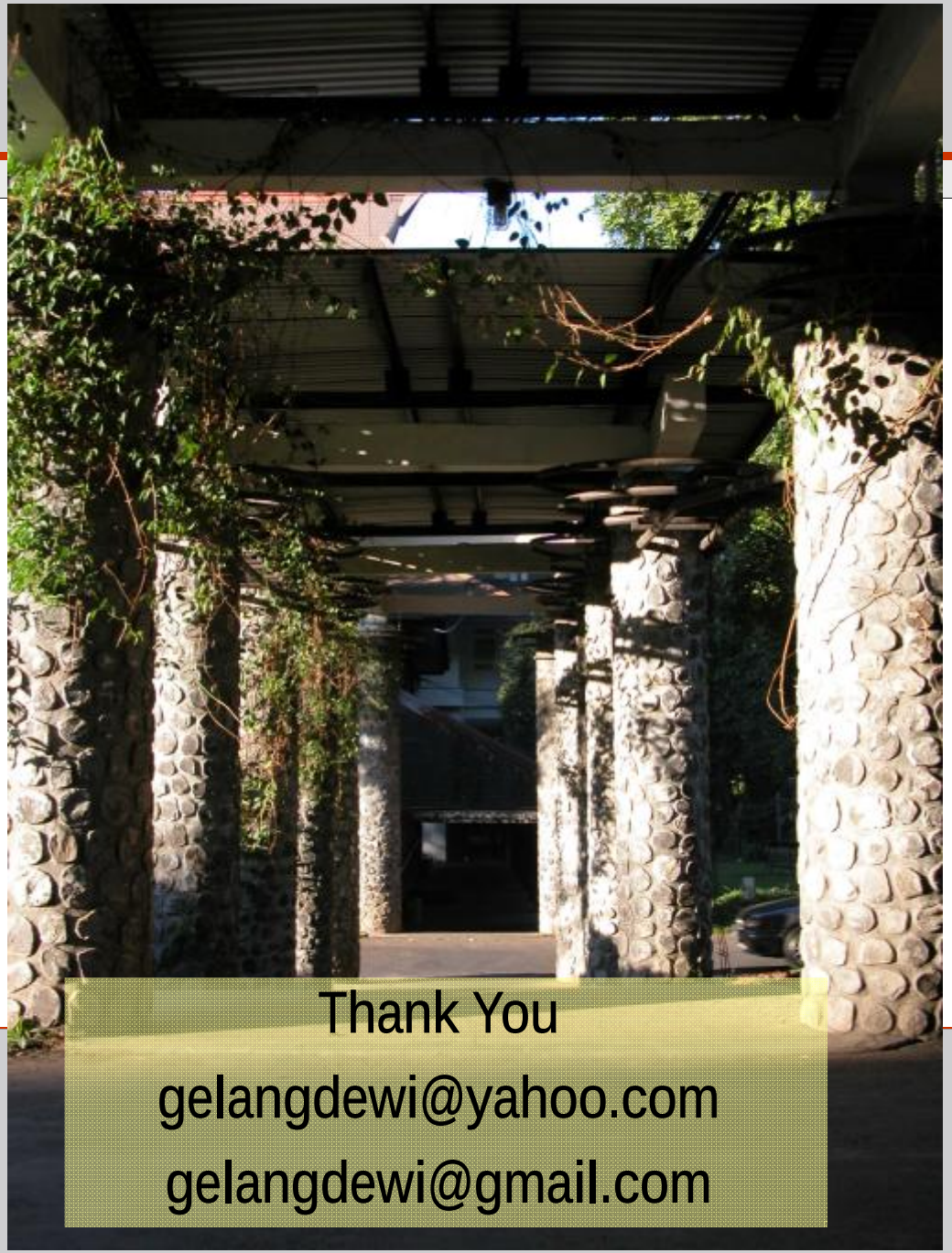
- To ensure the use of efficient energy appliances, introduce incentive packages for energy consumer such as help for financing of expensive but efficient appliances.
- Introduce building codes that promote energy efficiency: make the use of efficient appliances & energy efficient design as requirement for construction approval.
- Introduce EE as a major criteria in rating of industrial environmental compliance
- Strengthen capacity of government officials in EE arena such as in evaluating and inspecting the efficiency of energy systems and energy audit document reported by industry&building sector; the government officials that need to be strengthen is not limited to energy ministry but also for officers at other ministry that deals with energy related issues such as ministry of environment, ministry of public works, ministry of industry, ministry of finance etc.
- Introduce energy pricing policy that promotes energy efficiency: gradual removal electricity and oil subsidies.

In the supply side, the following policy/regulations are recommended:

- Introduce regulations for power sector that will increase the efficiency of power plant by making a mandatory to use best available technology in new coal power plant construction; new coal power plants options include circulated coal fluidized bed combustion (CFBC), sub- or super-critical coal power plants; stoker-type coal power system may need to be phased out; this regulation should apply to PLN and IPP as well as to industry that generate their own electricity
- Introduce regulations that would force the electricity company continuously to reduce technical losses at their transmission and distribution systems e.g. by using higher voltage transmissions lines and improvement of transformer at the power substations.

Concluding Remarks

- This study shows long term BaU scenario of what would be happen in 2050 as the results of future energy sector development up to 2050.
- The increase of GHG emission due to revised plan in power generation would be in opposite direction to the GOI commitment to reduce GHG emission in 2020 as stated in National Action Plan
  → "higher share of coal power" would result in emission level of 0.975Gton CO2 (2020), which is 0.028Gton higher than the emission in 2020.
  → To achieve GHG emission reduction target of 0.038 Gton in 2020 more emission reduction efforts have to be made.
- Next research plan is to complete the development of:
  → Mitigation scenario for 2050 by considering new plan in power sector
  → End use model for 2020, to identify required technology and cost to meet national mitigation action plan, if higher share of coal power is implemented
  → CGE model for 2020 and 2050 scenario to shows short term and long term impacts of mitigation actions to the economic conditions of Indonesia


Thank You
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