



**17<sup>th</sup> AIM International Workshop**  
**Low-Carbon Society in Asia**  
**LCS Activities in Thailand**

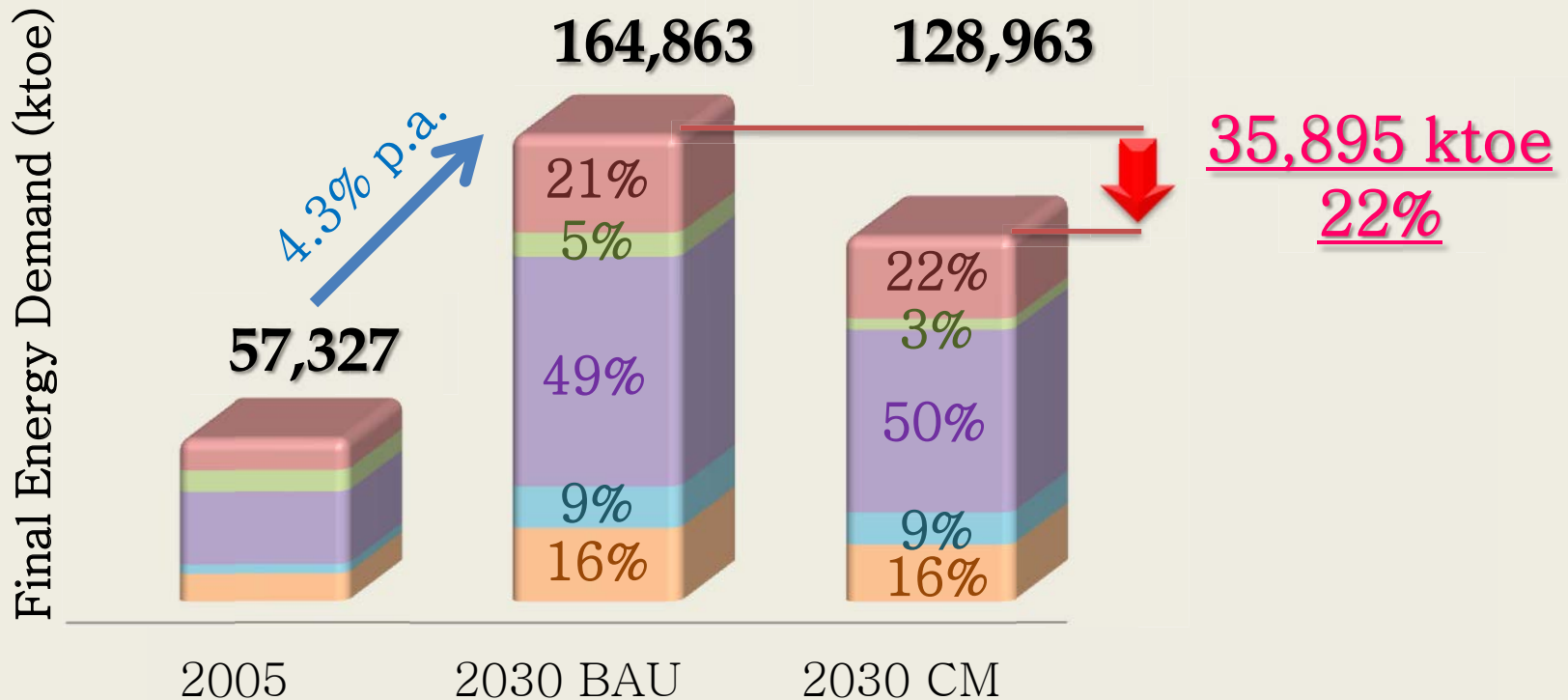
**National Institute for Environmental Studies (NIES), Japan**  
**February 17-19, 2012**

**Bundit Limmeechokchai<sup>1</sup>, Ram M Shrestha<sup>2</sup>, Panida Thepkhun<sup>1</sup>**  
**Pornphimol Winyuchakrit<sup>1</sup> & Artite Pattanapongchai<sup>1</sup>**

**<sup>1</sup> Sirindhorn Inter'l Inst. of Technology, Thammasat University**  
**<sup>2</sup> Asian Institute of Technology**

# STRUCTURE OF FINAL ENERGY DEMAND

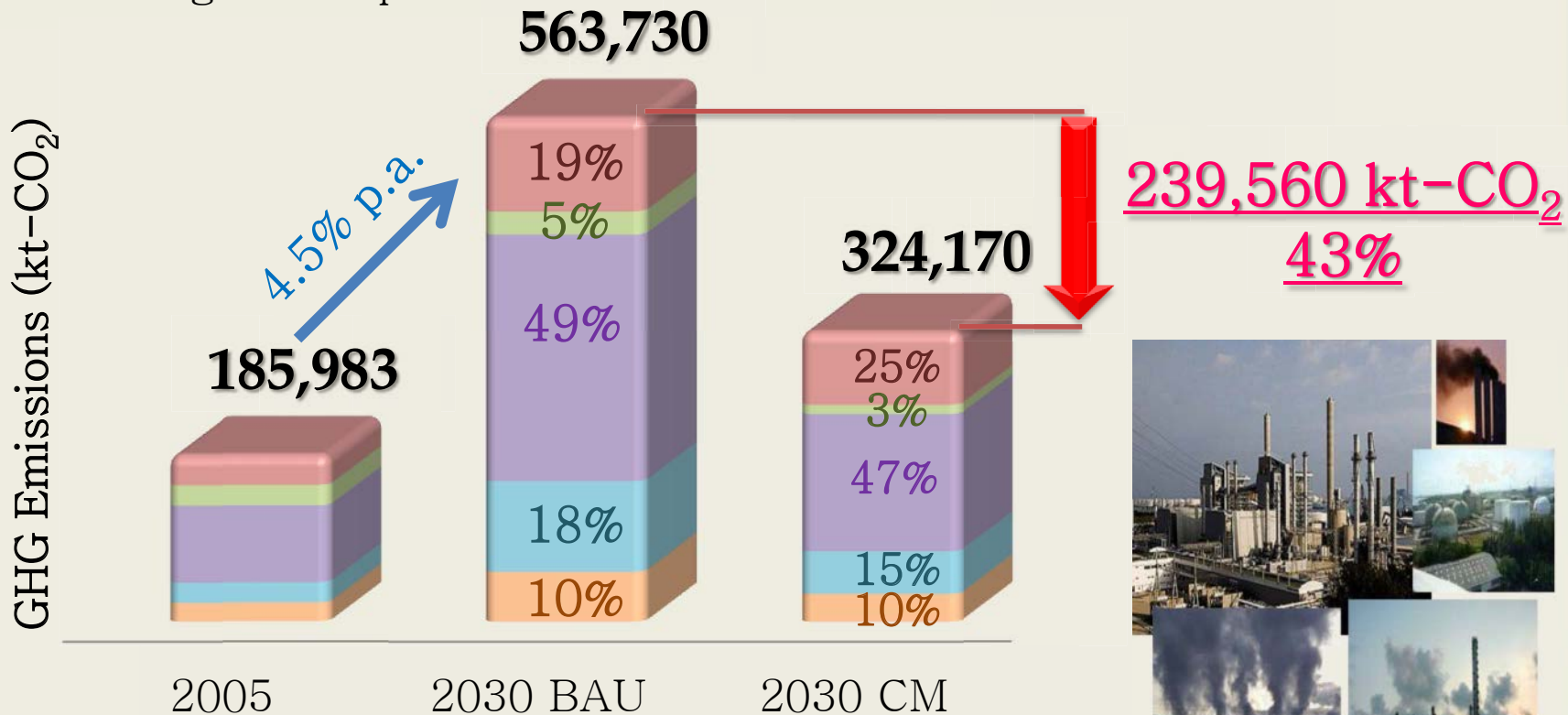
- Residential
- Commercial
- Industry
- Passenger transport
- Freight transport



Remarks: BAU: Business as Usual  
CM: Countermeasure

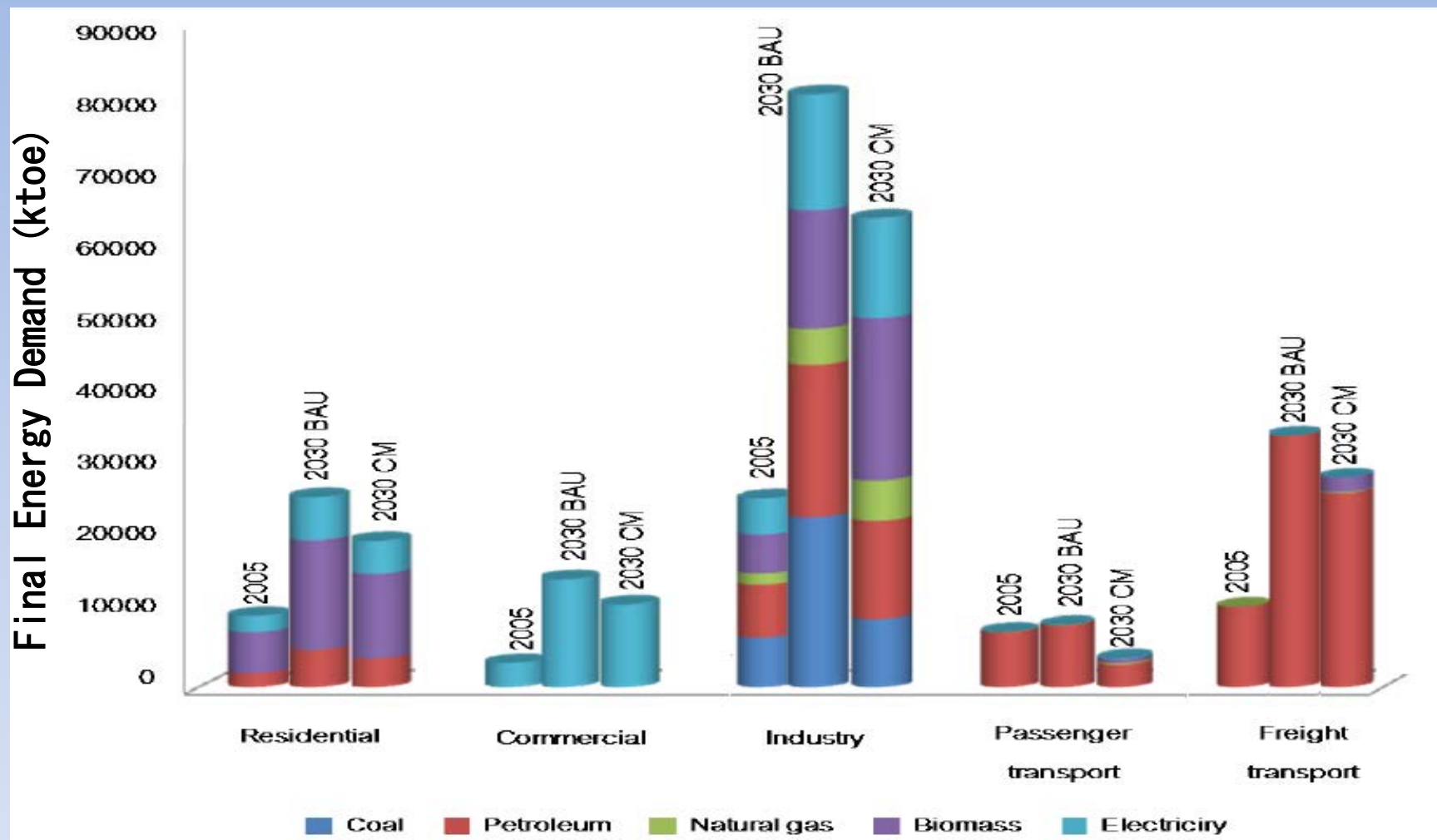
# SECTORAL CONTRIBUTIONS IN GHG EMISSIONS

- Residential
- Commercial
- Industry
- Passenger transport
- Freight transport



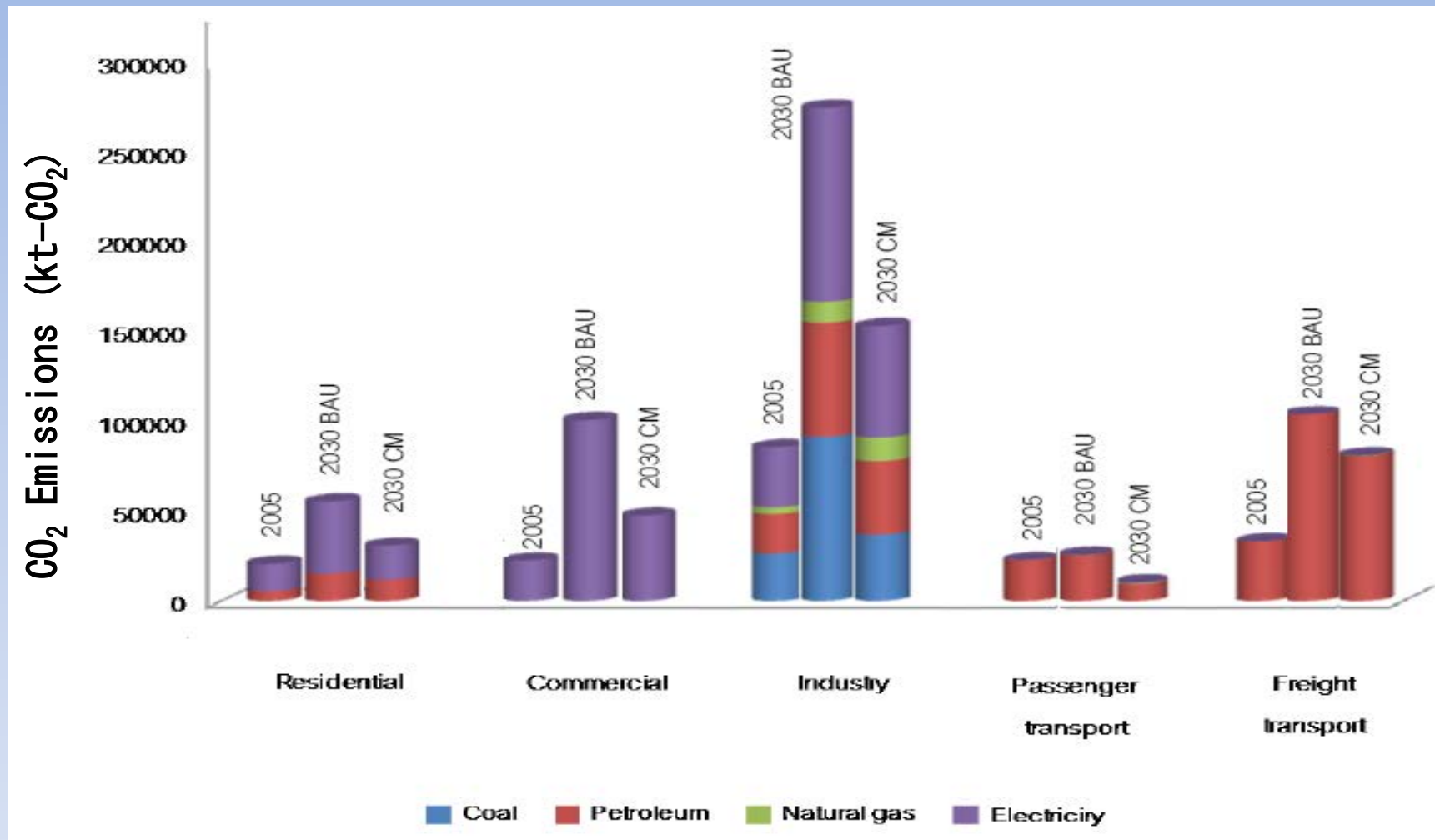
**Remarks:** BAU is Business as Usual  
CM is Countermeasure

# Final Energy Demand by sectors



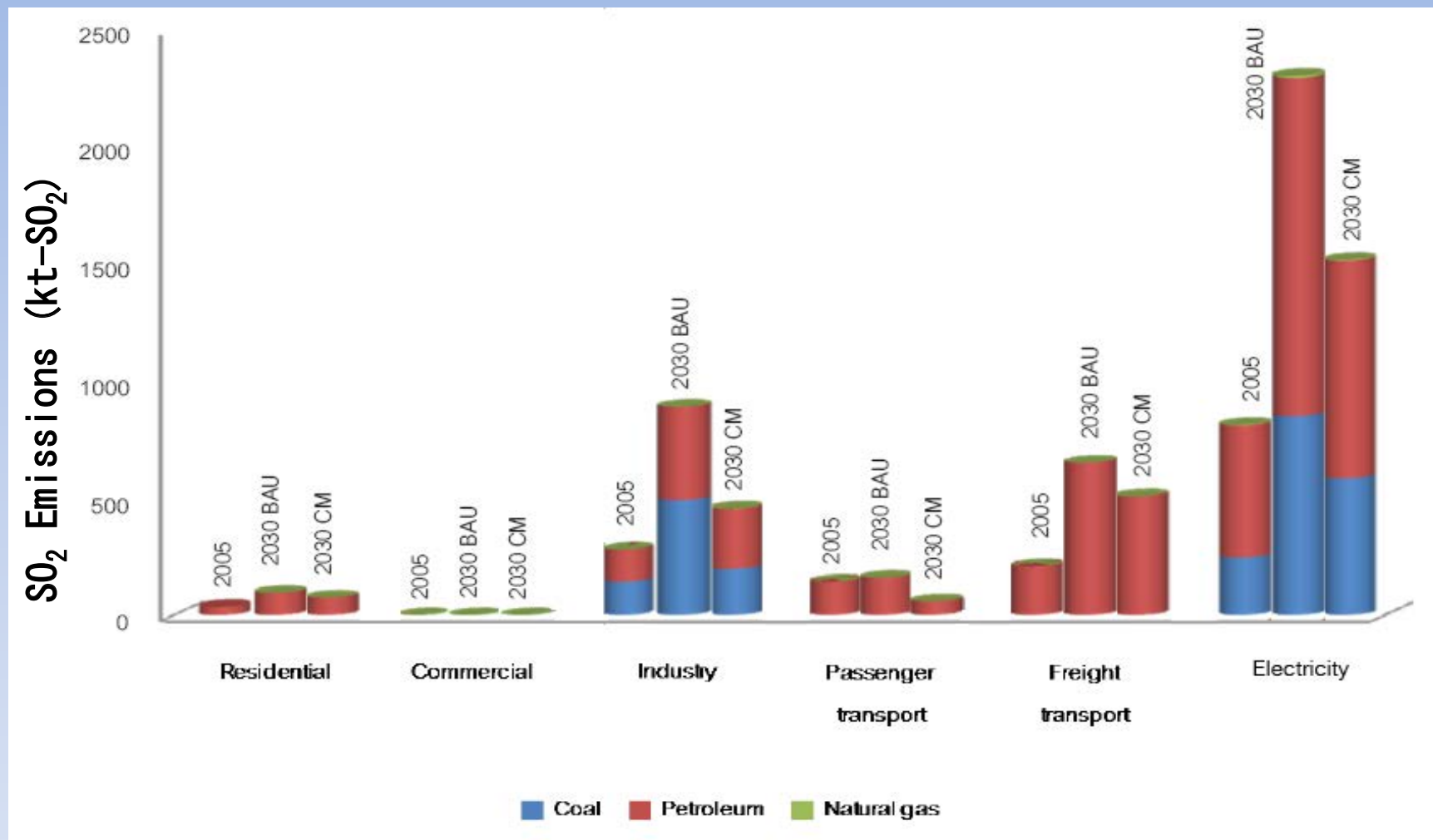
Remarks: BAU is Business as Usual  
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# CO<sub>2</sub> Emissions/Reductions



**Remarks:** BAU is Business as Usual  
CM is Countermeasures

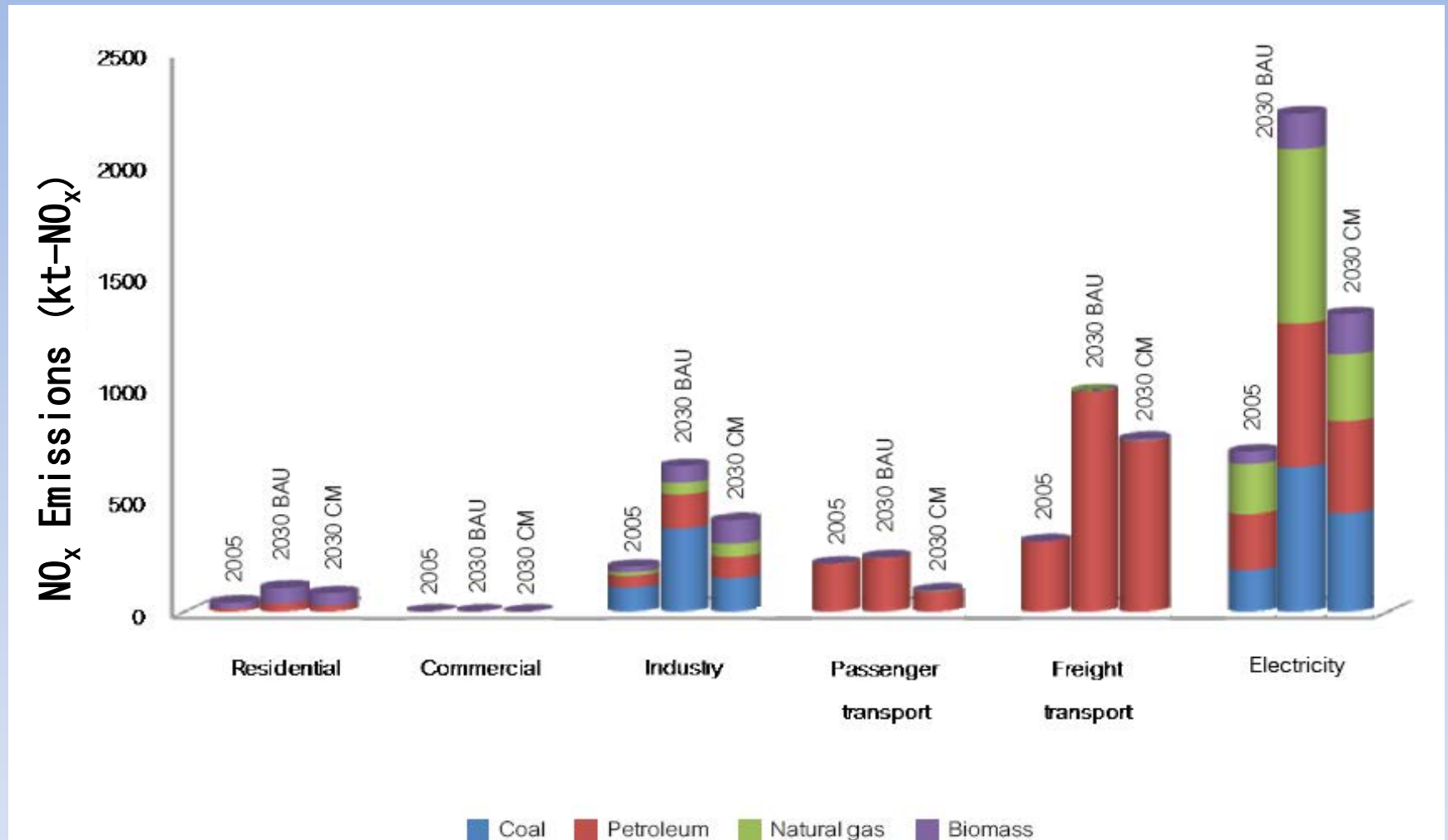
# Co-benefits of GHG mitigation (SO<sub>2</sub> emissions)



Remarks: BAU is Business as Usual  
CM is Countermeasures

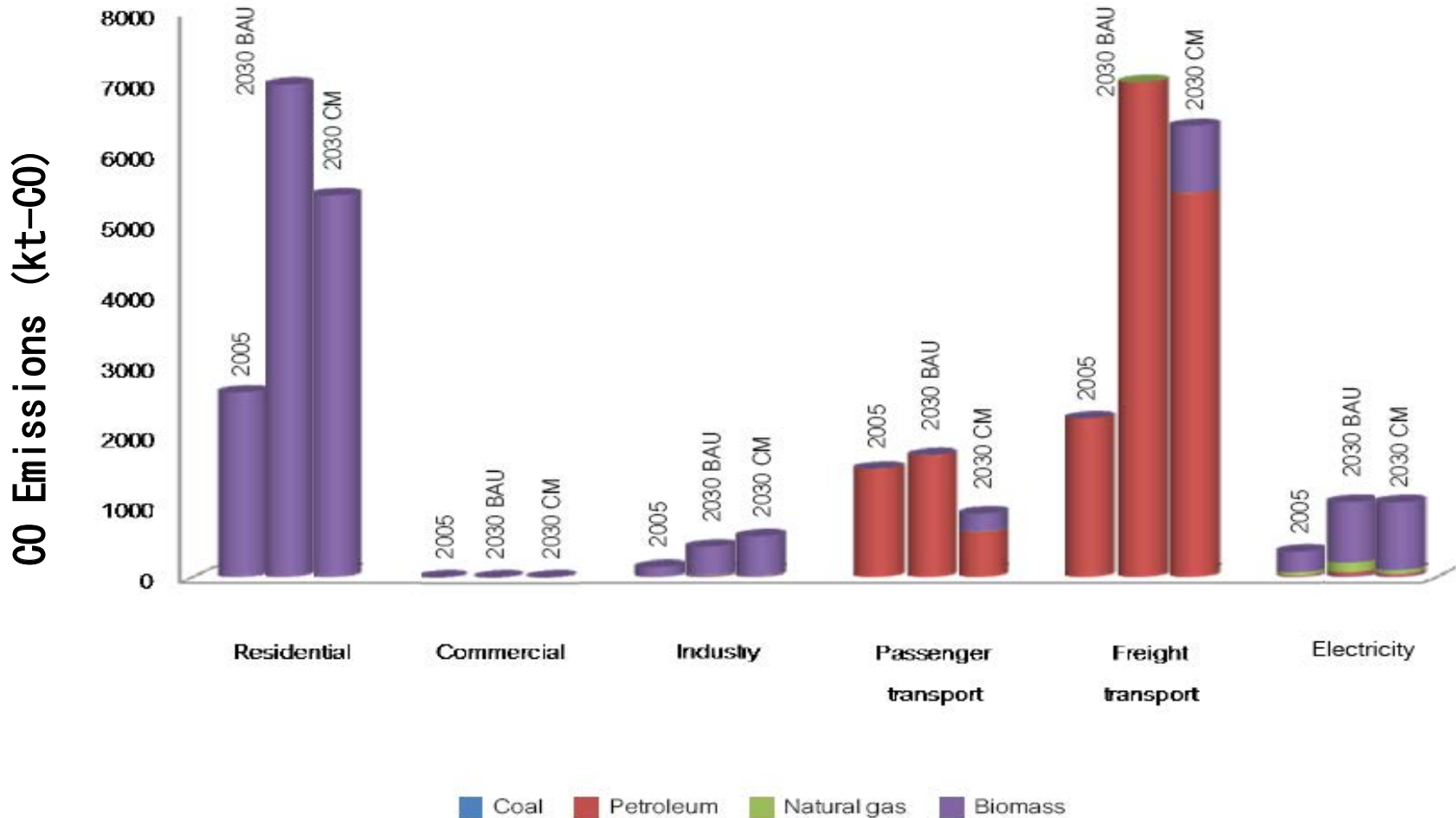


# Co-benefits of GHG mitigation (NO<sub>x</sub> emissions)



Remarks: BAU is Business as Usual  
CM is Countermeasures

# Co-benefits of GHG mitigation (CO emissions)



Remarks: BAU is Business as Usual  
CM is Countermeasures



# Co-benefits of GHG mitigation

## Energy Security

Year	DoPED	Oil Intensity (toe/1000 USD)	Gas Intensity (toe/1000 USD)	Energy Intensity (toe/1000 USD)	CO2 emissions intensity (t-CO2/USD)
2005	68.82	0.111	0.079	0.280	0.6960
2030BAU	70.08	0.074	0.072	0.220	0.5490
2030CM	84.90	0.048	0.028	0.155	0.3157

# LCS Activities (Thailand) in 2011

1. Develop Low-Carbon Technologies & Management curriculum at SIIT-TU for graduate study.
2. Resource person to TGO on CO<sub>2</sub> mitigation in energy system.
3. Revised Thailand's LCS brochure (AIM/ExSS) to include co-benefits of GHG mitigation and energy security.
4. Supported IGES (Kitakyushu), Kyushu Univ & BMA in organising LCS workshop in Bangkok, Aug 2011.

# LCS Activities (Thailand) in 2011

5. Support TGO in development of Thailand's NAMAs in Power, Industries and Waste to Energy.
6. Resource person to TGO in workshop on "GHG reduction target in energy sector under Thailand's NAMAs", 6 Feb 2012.
7. Resource person to ONEP and TGO in workshop on "Improvement of Thailand's GHG Inventory", 3 Feb 2012.
8. LCS networking with AIT (Energy & Environment)

# **Workshop on THAILAND's NAMAs**

**Power, Industries & Wastes to energy**

**Analysis of CO<sub>2</sub> Mitigation by using AIM/Enduse**

**30 January 2012**

**TGO**

**Bundit Limmeechokchai, Artite P., Pornphimol W., Prachuab P.**

**Ram M. Shrestha\***

**Sirindhorn International Institute of Technology, THAMMASAT UNIV**

**\*Asian Institute of Technology, Thailand**

# Workshop on THAILAND's NAMAs

Power, Industries & Wastes to energy (30 Jan 2012)



**Mr Sirithan, TGO Director**



**Dr Chaiwat, TGO Deputy Director**



**Prof Ram M Shrestha, Dr Bundit Lim**



**Stakeholders, and Senate member**



# Workshop on THAILAND's NAMAs

Ministerial Administrators: Ministry of Energy (6 Feb 2012)



**Chair, TGO Board**



**DEDE Director, and Permanent Sec, MoEN**

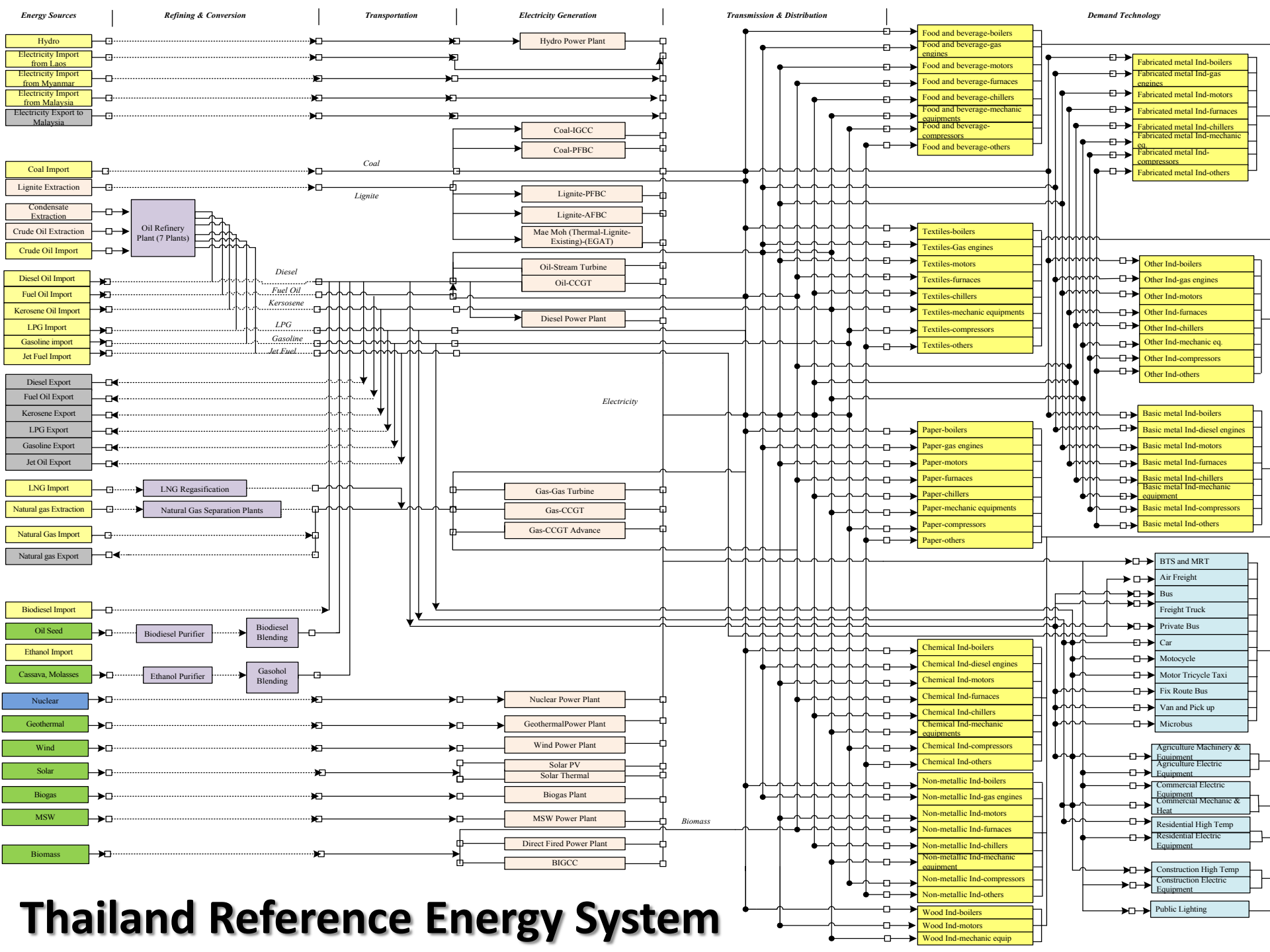


**Three TOG Executives**



**SIIT-TU Doctoral, Dr Natarika, Dr Bundit L.**





# Thailand Reference Energy System

## Potential of Thailand's Domestic NAMAs

<b>NAMAs</b>	<b>CO<sub>2</sub> countermeasure</b>	<b>Incremental Abatement cost (\$/t-CO<sub>2</sub>)</b>	<b>CO<sub>2</sub> Mitigation (kt-CO<sub>2</sub>) by 2020</b>
<b>Domestic NAMAs</b>	Biogas	<b>0.02</b>	<b>573</b>
	Hydro (small)	<b>0.76</b>	<b>1,593</b>
	Biomass	<b>2.67</b>	<b>21,533</b>
	Lighting (EE)	<b>0.04</b>	<b>2,751</b>
	Cooling Equipment (EE)	<b>0.11</b>	<b>3,150</b>
	Motor (EE)	<b>2.47</b>	<b>3,967</b>
	Furnace (EE)	<b>10.33</b>	<b>28,373</b>
<b>Total</b>			<b>61.94 Mt-CO<sub>2</sub></b>

## Potential of Thailand's Internationally Supported NAMAs

NAMAs	CO <sub>2</sub> countermeasure	Incremental Abatement cost (\$/t-CO <sub>2</sub> )	CO <sub>2</sub> Mitigation (kt-CO <sub>2</sub> ) by 2020
Internationally Supported NAMAs	Wind	51.88	45
	Solar	102.81	499
	Efficient Kiln	20.39	10,588
	Efficient Boiler	37.73	36,414
	Low carbon fuel switching	75.97	26,588
	New Kiln	190.90	5,137
	New Furnace	315.04	11,372
	New Boiler	532.52	22,086
	Local Landfill	32.85	246
	MSW-INC	140.63	56
	MSW-BGS	164.73	35
MSW-Controlled Landfill	395.32	0	
<b>Total</b>			<b>113.06 Mt-CO<sub>2</sub></b>

# CO<sub>2</sub> Mitigation Model of Power Plants with CCS in Thailand (2011)

*International Journal of Sustainable Energy*  
iFirst, 2011, 1–20



## CO<sub>2</sub> mitigation model of future power plants with integrated carbon capture and storage in Thailand

Artite Pattanapongchai and Bundit Limmeechokchai\*

*Sirindhorn International Institute of Technology, Thammasat University, PO Box 22, Thammasat Rangsit  
Post Office, Pathumthani 12121, Thailand*

*(Received 20 May 2010; final version received 9 November 2010)*

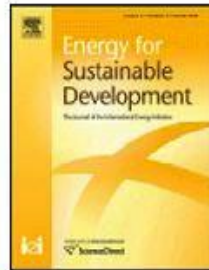
**Keywords:** CO<sub>2</sub> mitigation; carbon dioxide capture and storage; MARKAL; least-cost planning; renewable energy; incremental cost; clean development mechanism

# 1. Thailand's Low-Carbon Scenario 2030: Analyses of Demand-Side CO<sub>2</sub> Mitigation Options (2011)



Contents lists available at [SciVerse ScienceDirect](#)

Energy for Sustainable Development



Thailand's low-carbon scenario 2030: Analyses of demand side CO<sub>2</sub> mitigation options

Pornphimol Winyuchakrit <sup>a</sup>, Bundit Limmeechokchai <sup>a,\*</sup>, Yuzuru Matsuoka <sup>b</sup>, Kei Gomi <sup>b</sup>, Mikiko Kainuma <sup>c</sup>, Junichi Fujino <sup>c</sup>, Maiko Suda <sup>c</sup>

<sup>a</sup> *Sirindhorn International Institute of Technology, Thammasat University, P.O. Box 22 Thammasat Rangsit Post Office, Patumthani 12121, Thailand*

<sup>b</sup> *Graduate School of Engineering, Kyoto University, Katsura, Nishikyo-ku, Kyoto 615-8510, Japan*

<sup>c</sup> *National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba 305-8506, Japan*

## 2. CO<sub>2</sub> Mitigation in Thailand's Low-carbon Society: The Potential of Renewable Energy (accepted 2011; Energy Sources Part B, Economics, Planning & Policy)

# 3. Subsidy for Clean Power Generation and CO<sub>2</sub> Mitigation in Thailand: The AIM/Enduse Modeling (2011)

*A. Pattanapongchai et al. / GMSARN International Journal 5 (2011) 189 - 194*



## Subsidy for Clean Power Generation and CO<sub>2</sub> Mitigation in Thailand: The AIM/Enduse Modeling

Artite Pattanapongchai, Bundit Limmeechokchai, Yuzuru Matsuoka, Mikiko Kainuma, Junichi Fujino, Osamu Akashi, and Yuko Motoki



## 4. Analyses of Thailand's LCS towards 2050 using AIM/CGE: The case of CO<sub>2</sub> Mitigation and Renewable Energy Policy (2012)

### Analyses of Thailand's LCS towards 2050 using AIM/CGE: The case of GHG mitigation measures and renewable energy sources

Panida Thepkhun<sup>1</sup>, Bundit Limmeechokchai<sup>1,\*</sup>  
Shinichiro Fujimori<sup>2</sup>, Toshihiko Masui<sup>2</sup>, and Ram M Shrestha<sup>3</sup>

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P.O. Box 22 Klongluang, Pathumtani 12121, Thailand

<sup>2</sup>National Institute for Environmental Studies, Tsukuba, Japan

<sup>3</sup>Asian Institute of Technology, Pathumtani, Thailand

\*Corresponding author E-mail: [bundit@siit.tu.ac.th](mailto:bundit@siit.tu.ac.th)

**Keywords :** GHG mitigation, energy system, computable general equilibrium model, AIM/CGE, Thailand

## 5. The 3<sup>rd</sup> International Association of Energy Economics (IAEE), Kyoto, 20-22 Feb 2012

## 6. CO<sub>2</sub> Mitigation in Thailand's NAMAs: Policy Analyses of Power Generation (2011)

THE INTERNATIONAL CONFERENCE & UTILITY EXHIBITION 2011 (ICUE 2011)  
on Power and Energy Systems: Issues and Prospects for Asia  
28-30 September 2011, Thailand

# CO<sub>2</sub> Mitigation in Thailand's Nationally Appropriate Mitigation Actions (NAMAs): Policy Analyses of Power Generation

N. Sritong, *Master Student*, A. Pattanapongchai, *Doctoral Candidate*, P. Winyuchakrit, *Doctoral Candidate*, P. Peerapong, *Research Assistant*, B. Limmeechokchai, *Associate Professor*, SIIT-TU

# LCS (Thailand) invited papers in 2011

7. Invited paper on “Thailand’s LCS Scenarios and Actions: The ExSS Modeling Experience”, in the workshop “*Symposium on Low Carbon Asia Research*”, JB, Malaysia, July 2011.
8. Invited paper on “Overview of LCS Development in Thailand” in the workshop on “*Policy and Measures for Development of Low-Carbon Society in the Cities of Thailand*”, organised by IGES, Kyushu Univ and SIIT-TU, Aug 2011.
9. Invited paper on “LCS in Thailand’s Transport Sector” in “*4th ATRANS Symposium - "Toward Low Carbon Transportation for Sustainable Society: Bangkok Vision (250th Anniversary)"*”, organised by Prof Fukuda, Nihon Univ, Aug 2011.



# **Policy and Measures for Development of LCS for the Cities of Thailand**

## **Overview of LCS Development in Thailand**

**Bangkok, Thailand**  
**August 10, 2011**

**Bundit Limmeechokchai<sup>1</sup>, Ram M. Shretha<sup>2</sup>**

**Pornphimol Winyuchakrit<sup>1</sup>**

**Artite Pattanapongchai<sup>1</sup>**

<sup>1</sup>Sirindhorn International Institute of Technology, Thammasat Univ

<sup>2</sup>Asian Institute of Technology, Thailand





**4<sup>th</sup> ATRANS Symposium - "Toward Low Carbon  
Transportation for Sustainable Society: Bangkok Vision  
2032 (250th Anniversary)"**

**LCS in Thailand's Transport Sector**

**Bangkok, Thailand**

**August 26, 2011**

**Bundit Limmeechokchai<sup>1</sup>, Ram M. Shretha<sup>2</sup>**

**Pornphimol Winyuchakrit<sup>1</sup>**

**Artite Pattanapongchai<sup>1</sup>**

**<sup>1</sup>Sirindhorn International Institute of Technology, Thammasat Univ**

**<sup>2</sup>Asian Institute of Technology, Thailand**

# LCS Activities (Thailand) in 2011

10. Invited paper on “Low Carbon Scenario 2030 Development in Thailand” in the “*1st LCS seminar*” organised by Chulalongkorn Univ. and Tokyo Univ., Sept. 2011.



S-6, MOEJ



どうもありがとう  
THANK YOU



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ありがとう、がんばろう。日本・タイ