The 25th AIM International Workshop
National Institute for Environmental Studies

Climate Change Mitigation & AIM in Thailand

November 18, 2019

Sirindhorn International Institute of Technology
THAMMASAT University

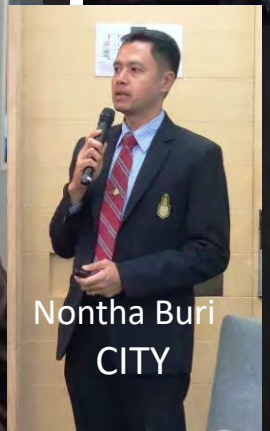
Unofficial High-level Workshop on Climate Policy and Assessment, 5 Jul 2019

Sharing of View on Climate Change Policies and Mitigation Actions in THAILAND

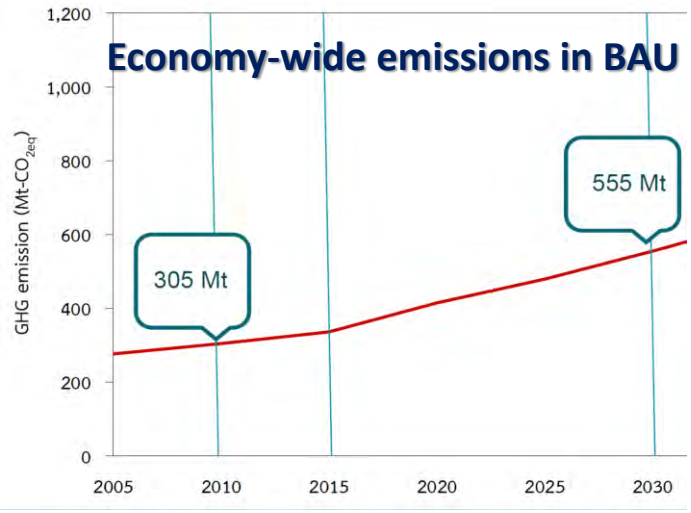
Pullman KingPower Hotel, BANGKOK, 30 October 2019

Climate Change Policies and Mitigation in THAILAND

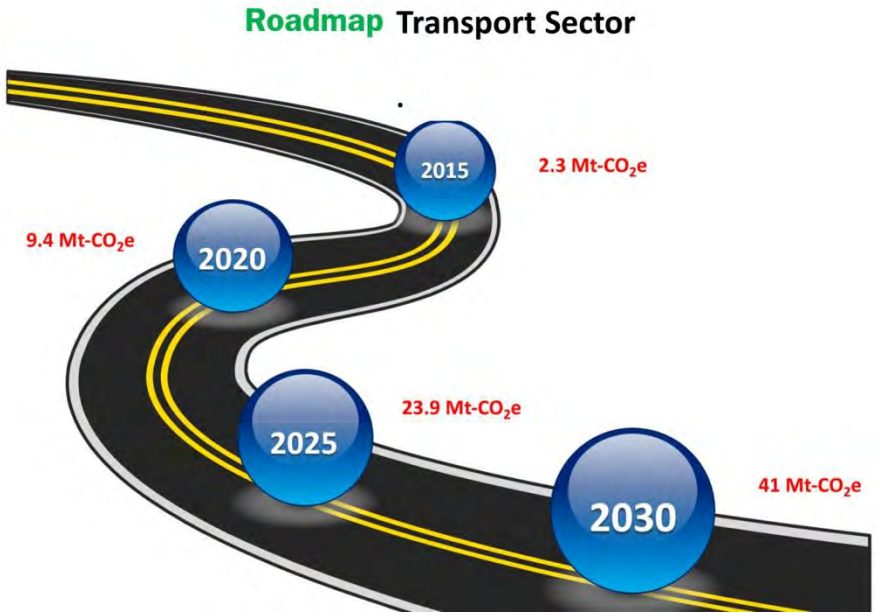
BANGKOK, 30 October 2019



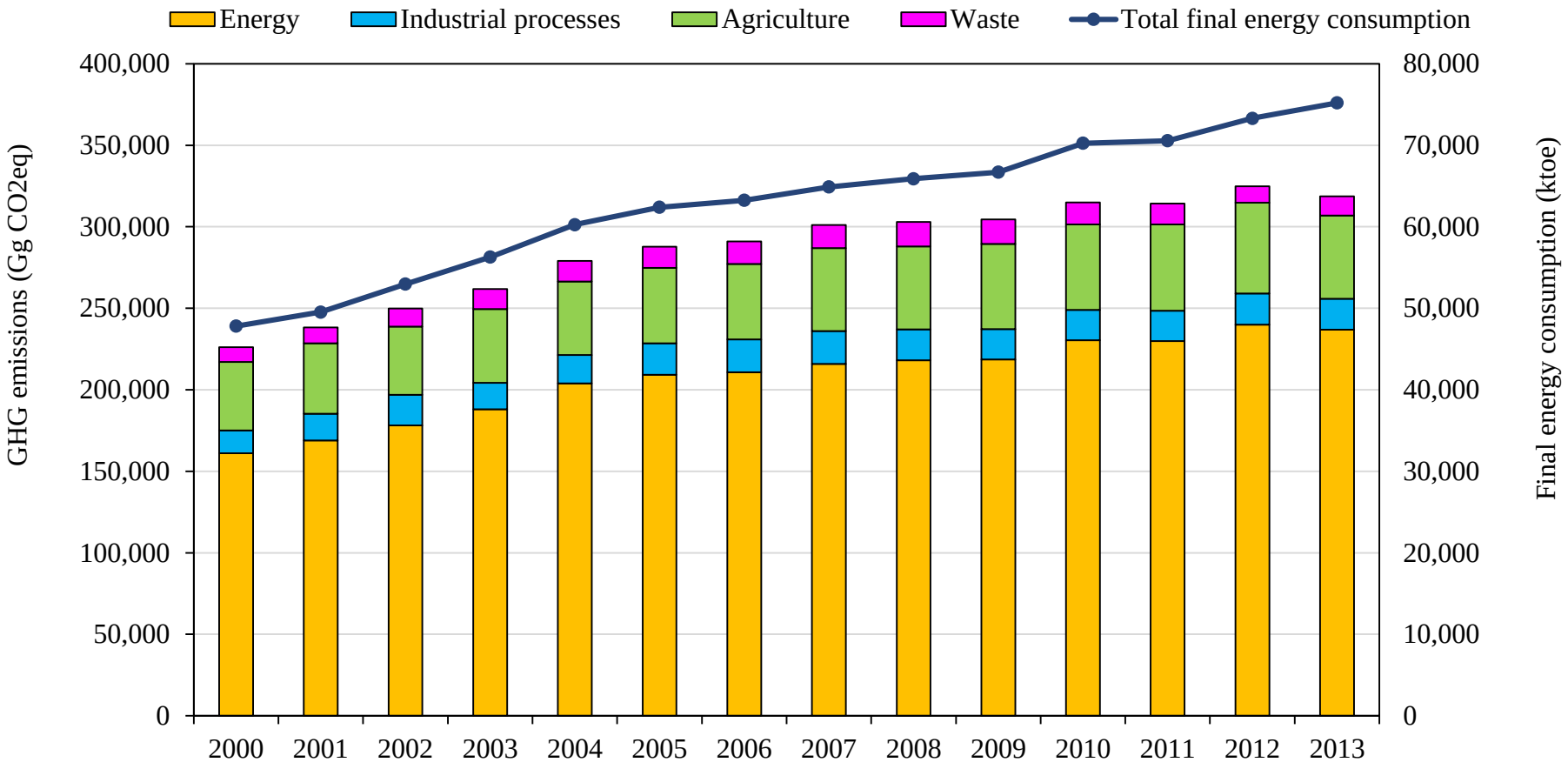
Thailand's PM Delivered National Climate Pledge at Paris Summit



"The 20% is a goal to be achieved by the country's resources alone while the additional 5% will require international support in terms of finance, knowhow and technology"

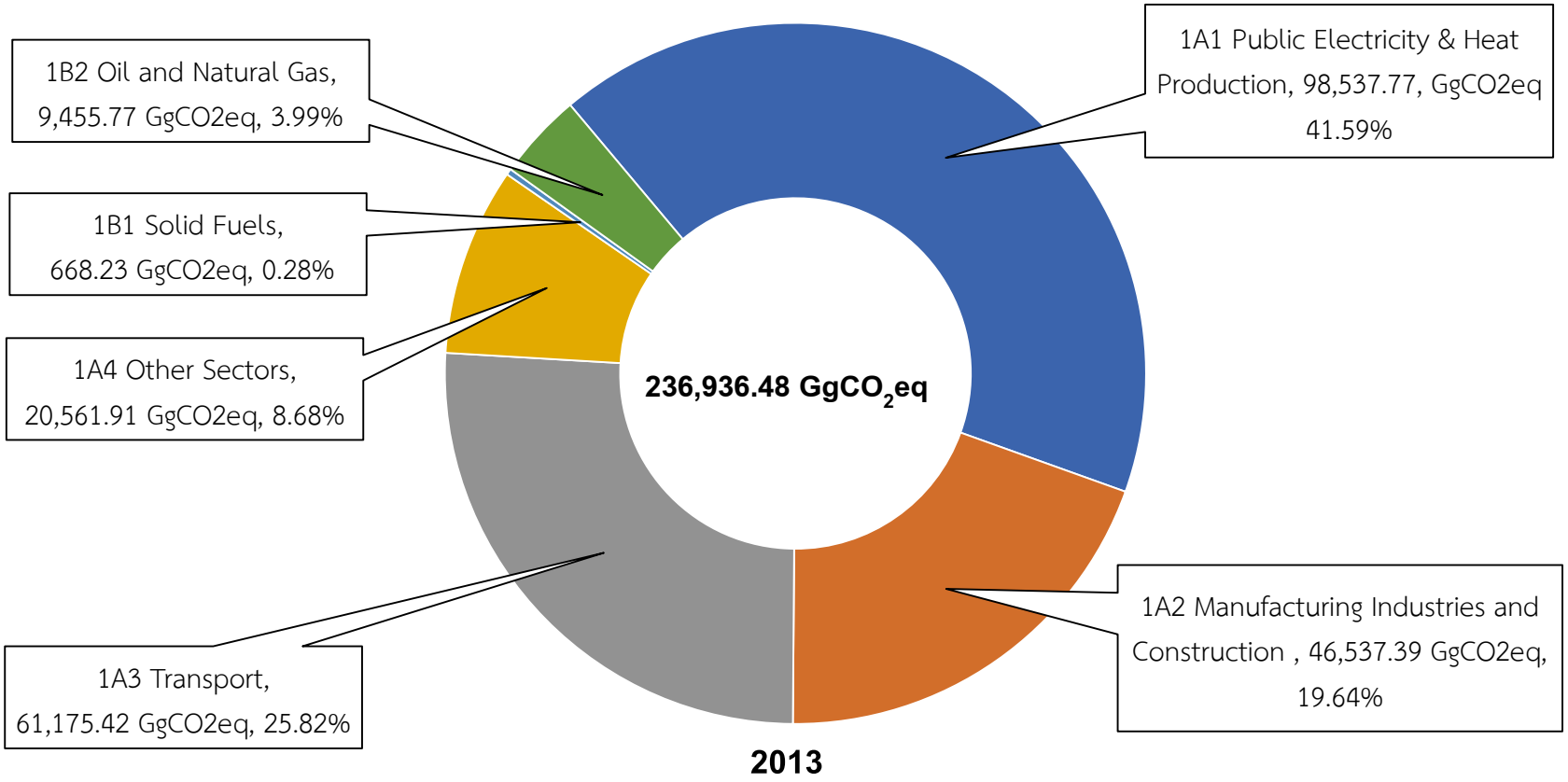


TRENDS OF GHG EMISSIONS AND TOTAL FINAL ENERGY CONSUMPTION: 2000-2013



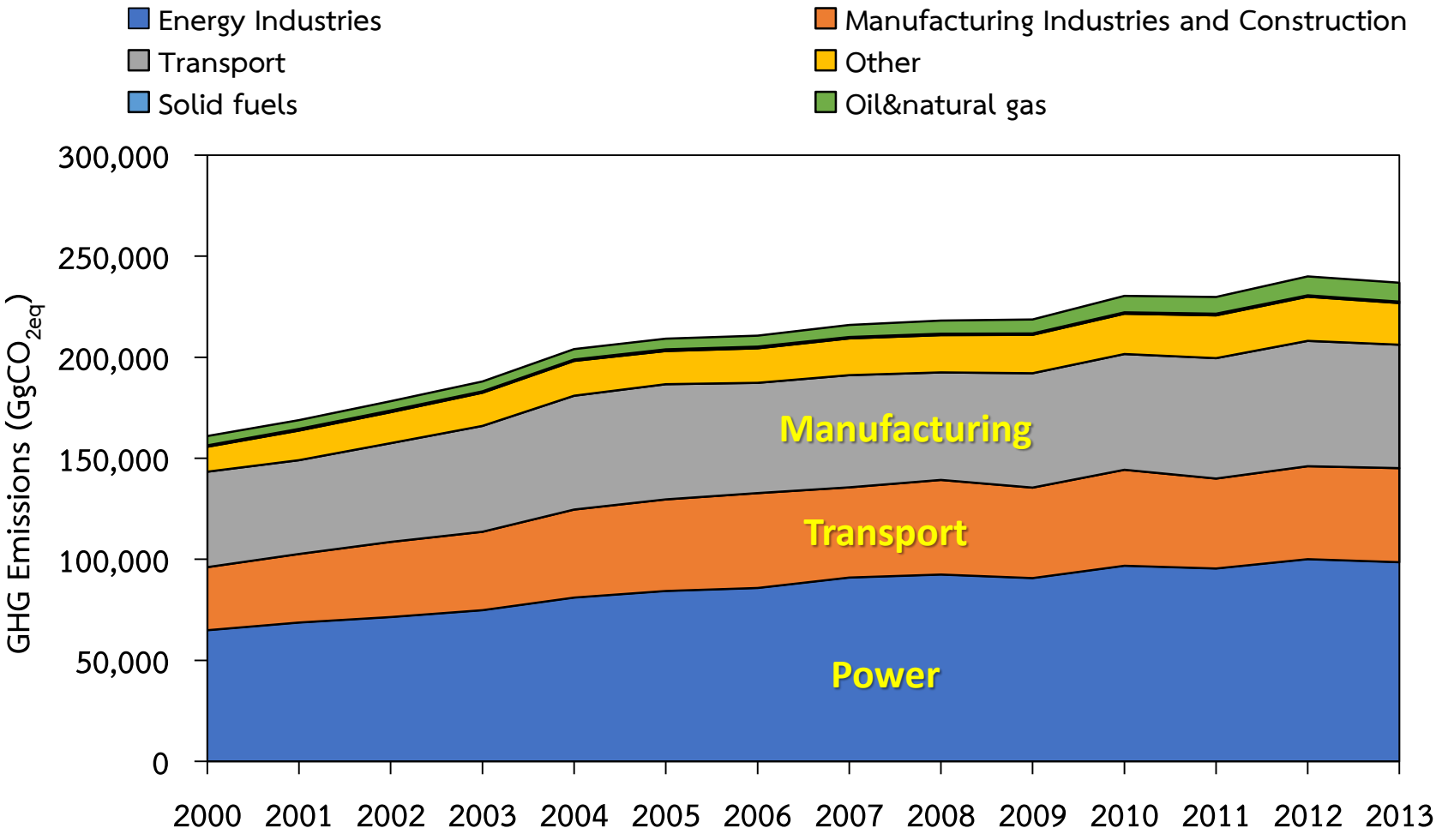
Source: Thailand's third national communication

GHG EMISSIONS IN THE ENERGY SECTOR: 2013



Source: Second BUR

TRENDS OF GHG EMISSIONS IN ENERGY SECTOR



Source: Second BUR

Present Policies and Technologies of THAILAND NDC

ALTERNATIVE ENERGY DEVELOPMENT PLAN 2018

RE Electricity (MW)	AEDP 2015		AEDP 2018		Difference 2018-2015
	Target	Existing	PDP2018	New Target	
Solar PV	6,000	2,849	12,725	15,574	9,574
Biomass	5,570	2,290	3,496	5,786	216
Wind	3,002	1,504	1,485	2,989	13
Biogas (Waste)	600	382	546	928	328
Municipal Solid Waste	500	500	400	900	400
Industrial waste	50	31	44	75	25
Mini-hydro	376	188	-	188	188
Large hydro (EGAT)	2,906	2,918	-	2,918	12
Biogas (Crop)	680	-	-	-	680
Total	**19,684**	**10,662**	**18,696**	**29,358**	9,674
RE electricity (%)	**20%**	**10%**	**20%**	**33%**	13%

Source: Ministry of Energy, 2019

Present Policies and Technologies of THAILAND NDC

- Climate Change Master Plan for **2015–**2050
- Power Development Plan (PDP) for **2015–**2036
- Thailand Smart Grid Development Master Plan for **2015–**2036
- Energy Efficiency Plan (EEP) for **2015–**2036
- Alternative Energy Development Plan (AEDP) for **2015–**2036
- Environmentally Sustainable Transport System Plan for **2013–2030**
- National Industrial Development Master Plan for **2012–**2031
- Waste Management Roadmap

- Renewable energy generation and consumption
- Freight and passenger transport (mass rapid transit lines, double-track railways, bus transit improvements)
- Waste-to-energy technologies

Present Policies and Technologies of THAILAND NDC

ENERGY EFFICIENCY PLAN 2015

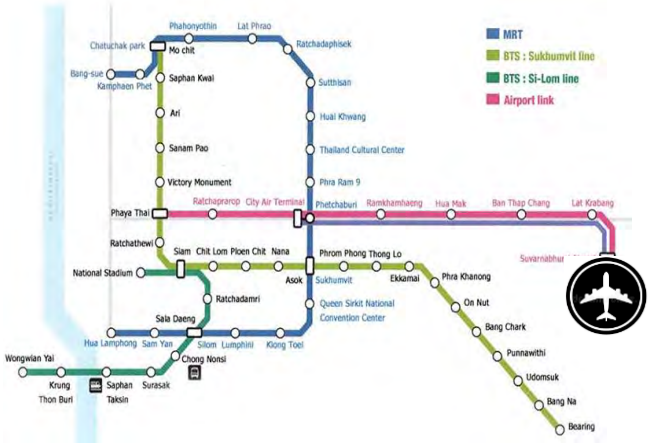
EE Measures	Energy Saving (ktoe)
	Target EEP 2015
Measure for designated factory and buildings management	5,156
Measure for building standard/building codes	1,166
Measure for energy efficiency standard and labeling	4,150
Measure on compulsory energy efficiency resource standards (EERS) for energy production	500
Measure for financial support	9,524
Measure on the use of LED	991
Measure on energy conservation in the transportation sector	30,213
Measure for promotion of education, research, technology development on energy conservation	-
Measure on personnel development in energy conservation fields	-
Measure to create public awareness on energy conservation	-

Source: Ministry of Energy, 2019

Present Policies and Technologies of THAILAND NDC

MASS RAPID TRANSIT IN BANGKOK

2019 Bangkok area

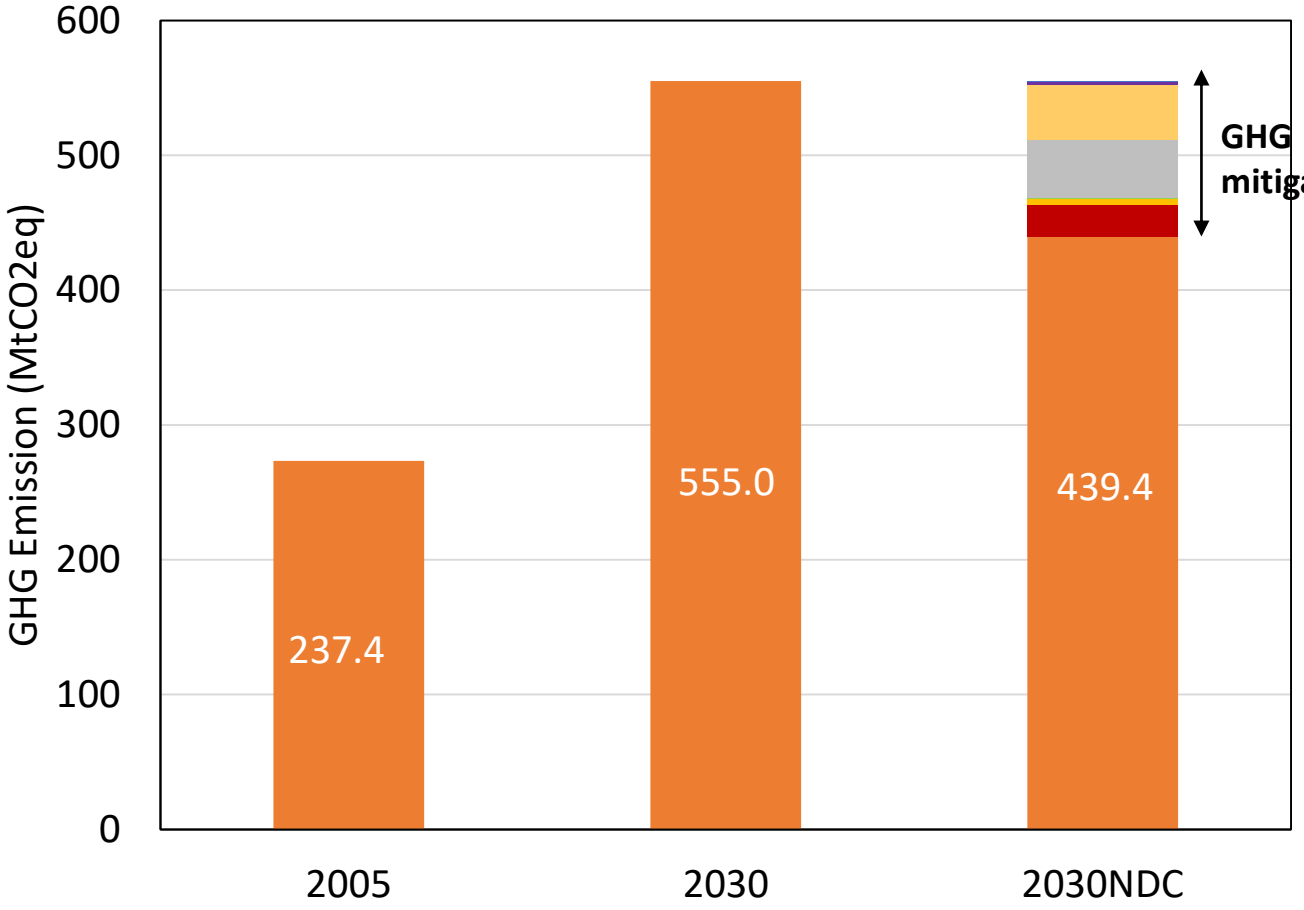


2021 Monorail, Government Complex

2025 Bangkok area

Source: Mass rapid transit authority of Thailand

THAILAND'S GHG EMISSION AND MITIGATION: NDC 2030



20%

GHG mitigation

- Power 24 $MtCO_{2eq}$
- Industry 43 $MtCO_{2eq}$
- Transport 41 $MtCO_{2eq}$
- Residential 4 $MtCO_{2eq}$
- Commercial 1 $MtCO_{2eq}$
- IPPU 0.6 $MtCO_{2eq}$
- Waste 2 $MtCO_{2eq}$

Total GHG mitigation

115.6 $MtCO_{2eq}$

Rajbhandari *et al. Energy, Sustainability and Society* (2019) 9:19
https://doi.org/10.1186/s13705-019-0200-9

Energy, Sustainability and Society

ORIGINAL ARTICLE

The impact of different GHG reduction scenarios on the economy and social welfare of Thailand using a computable general equilibrium (CGE) model

Salony Rajbhandari[1], Bundit Limmeechokchai[1*] and Toshihiko Masui[2]

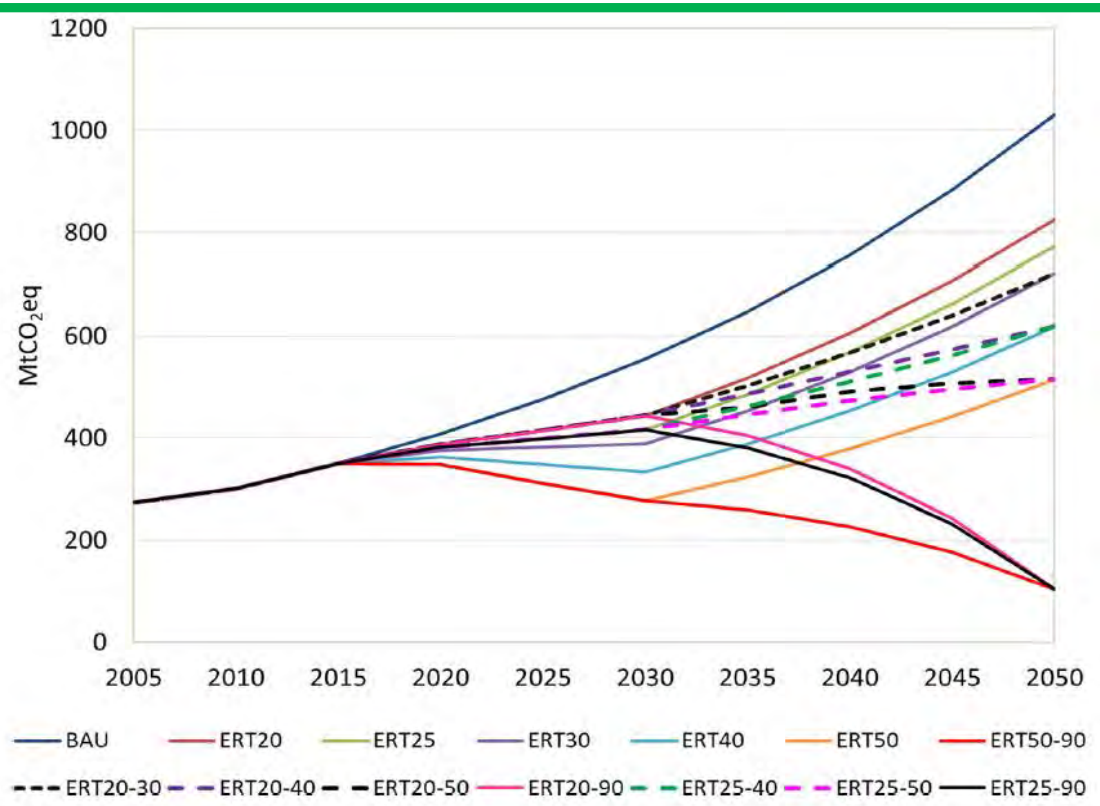


Fig. 5 GHG emission trajectories in all scenarios

CONCLUSIONS

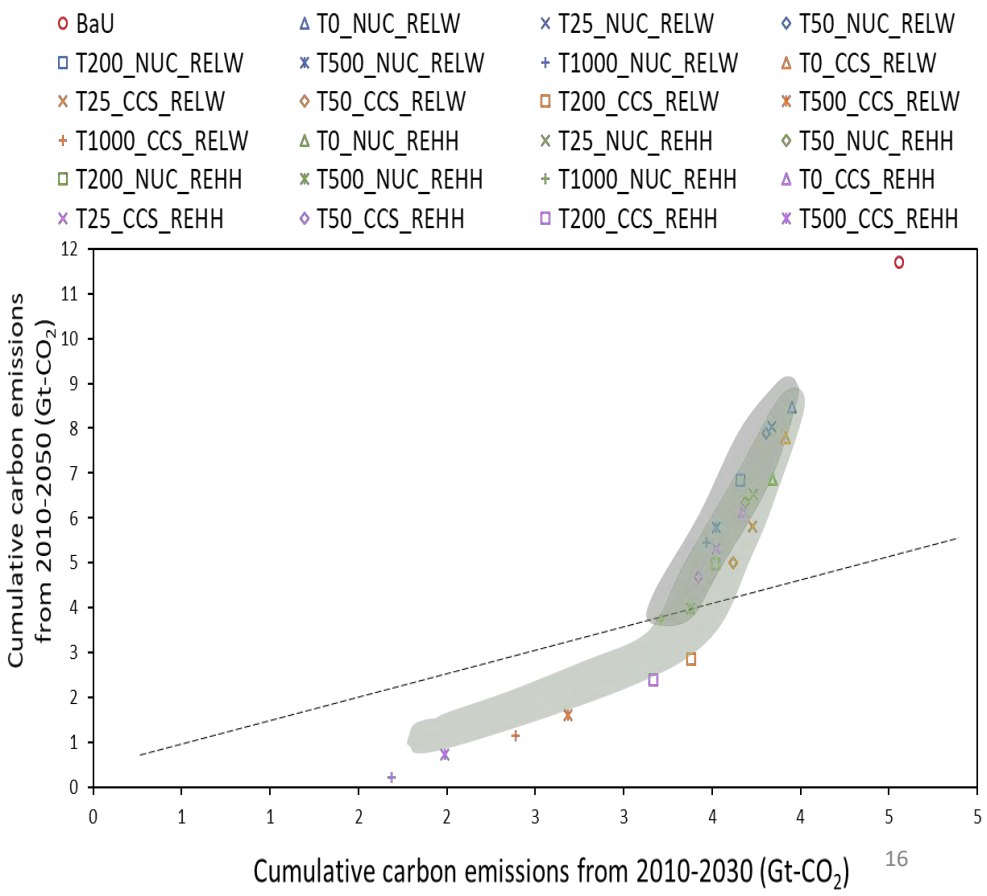
- The macroeconomic impacts of peak emission scenarios are assessed.
- An economic structural and energy system changes are required to avoid enormous costs in reducing GHG emissions to the targets.
- Lowering the activity level of the energy-intensive industries, improving end-use **EE**, switching fuel, deploying **CCS** technologies in the **power** and **industrial** sectors, and expanding **RE** technologies are identified to be important mitigation measures for Thailand in attaining emissions **peak by 2030** in order to contribute towards the **long-term goal** of the Paris Agreement.

CARBON MANAGEMENT
2018, VOL. 9, NO. 5, 515–531
https://doi.org/10.1080/17583004.2018.1536169

Thailand Energy System Transition to Keep Warming Below 1.5 Degrees

Puttipong Chunark and Bundit Limmeechokchai

- The figure suggests that early actions should be taken to achieve net zero CO_2 emissions.
- CO_2 emissions should peak in 2015 at US$1,000 /t$CO_2$ in the CCS_REHH scenario.
- Because of renewable energy deployment and fossil fuel based with CCS and BECCS, CO_2 emissions are completely removed from the power sector in the CCS_REHH scenario.



CONCLUSIONS

- Keeping net cumulative carbon emissions virtually zero can be achieved during 2030-2050.
- Zero CO_2 emissions strategies for THAILAND
  - CCS technologies (fossil-based fuel plants integrated with CCS and BECCS)
  - Stringent RE target
  - CO_2 emission taxes (US$500-US$1000 per tCO_2)
  - Climate change awareness
  - Capacity building for organizations, government and communities

Strategy 1

CCS & BECCS

- Electricity generation
- Manufacturing industry

Strategy 2

Stringent RE

- Electricity generation
- Vehicle

Strategy 3

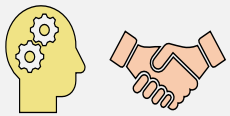
CO_2 emission taxes

Strategy 4

Climate change awareness

Strategy 5

Capacity building



Pradhan *et al. Carbon Balance Manage* (2019) 14:3
https://doi.org/10.1186/s13021-019-0119-7

Carbon Balance and Management

GHG mitigation in Agriculture, Forestry and Other Land Use (AFOLU) sector in Thailand

Bijay Bahadur Pradhan, Achiraya Chaichaloempreecha and Bundit Limmeechokchai*

GHG Emissions from AFOLU sector during 2015-2050 (Mt-CO_2e)

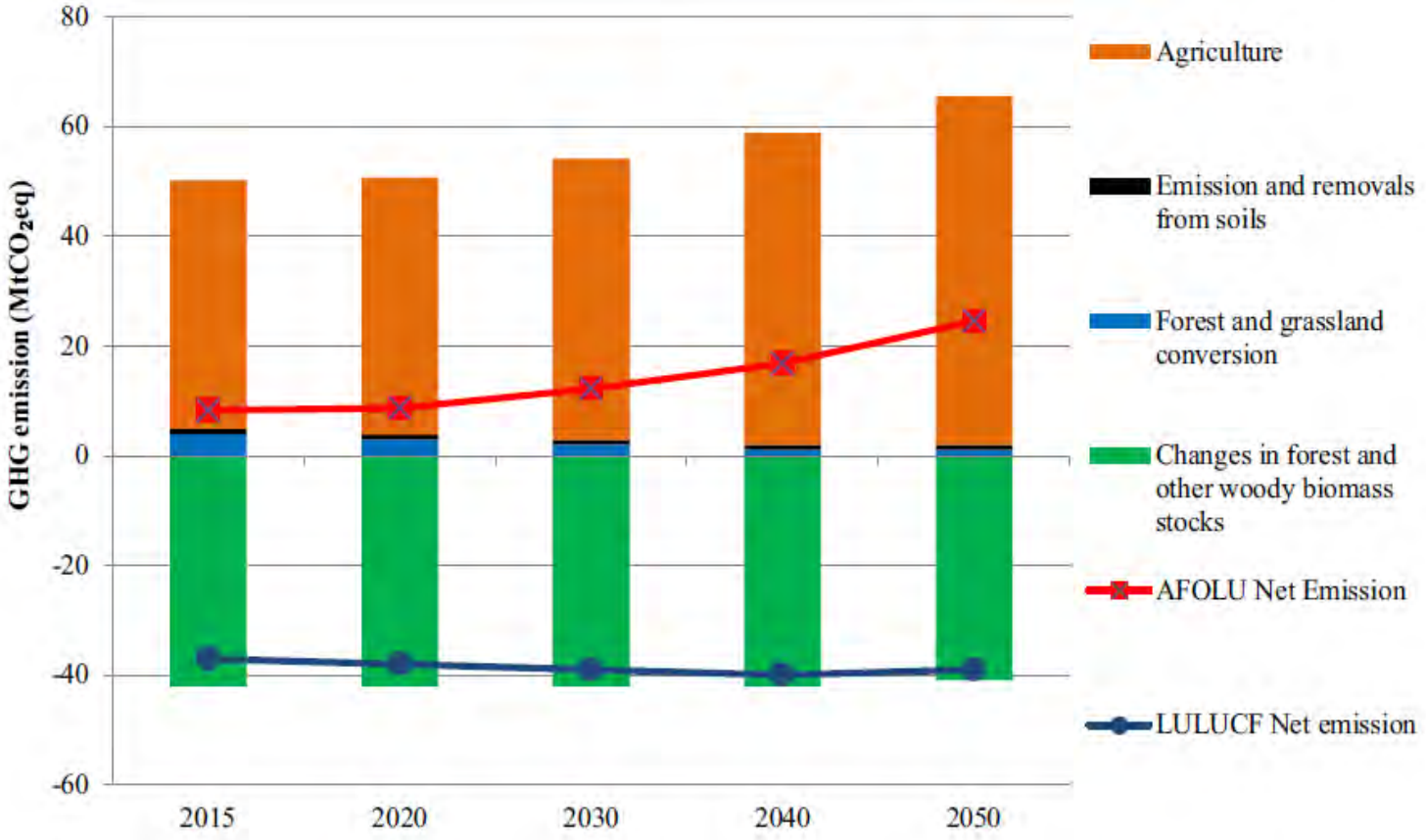


Fig. 7 Emissions from the AFOLU sector during 2015–2050

Table 2 Countermeasure in the Agriculture Sector Thailand

Emission Sources	Mitigation options	Unit	Cost/unit in 2010 US$	Mitigation tCO_2eq/unit/yr	Ref.
Enteric fermentation	Improved feeding (replacing roughage with concentrates)	Head	-21.2	0.45	[18,19]
	High genetic merit	Head	0	0.32	[32-34]
Manure management	Dome digester	Head[a]	44	0.62	[35]
	Daily spread manure	Head	2.2	0.33	[35]
Rice cultivation	Midseason drainage	Hectare	0	0.36	[9,32]
	Incorporation of off-season rice straw	Hectare	0	0.45	[9,32]
	Replace urea with ammonium sulphate	Hectare	1.5	0.12	[9,32]
Managed soils	High-efficiency fertilizer application	Hectare	32	0.65	[9]
	Slow-release fertilizer application	Hectare	2150	0.76	[35]
	Tillage and residue management	Hectare	5	0.08	[36]

[a] The dome digester cost has been converted into cost per head by dividing the cost by number of cows/buffaloes

Center for Applied Economic Research (CAER). Support to the development and implementation of the Thai climate change policy. Thailand: Kasetsart University; 2018.

Table 3 Countermeasure in the LULUCF Sector Thailand

Mitigation options	Cost (US$/ha/year)	Mitigation (tCO_2eq/ha/year)
Sustainable management of production forest areas[a]	15.4	11.3
Conservation of existing protection forests	23.0	11.1
Reforestation[b]	58.1	13.6
Planting long-rotation large timber trees[a]	9.3	19.6
Growing long-rotation non-timber product forest[a]	7.0	14.6
Reduction impact logging	27.8	5.1

Sources: [a]Hoa et al. [18], [b]Graham et al. [14]

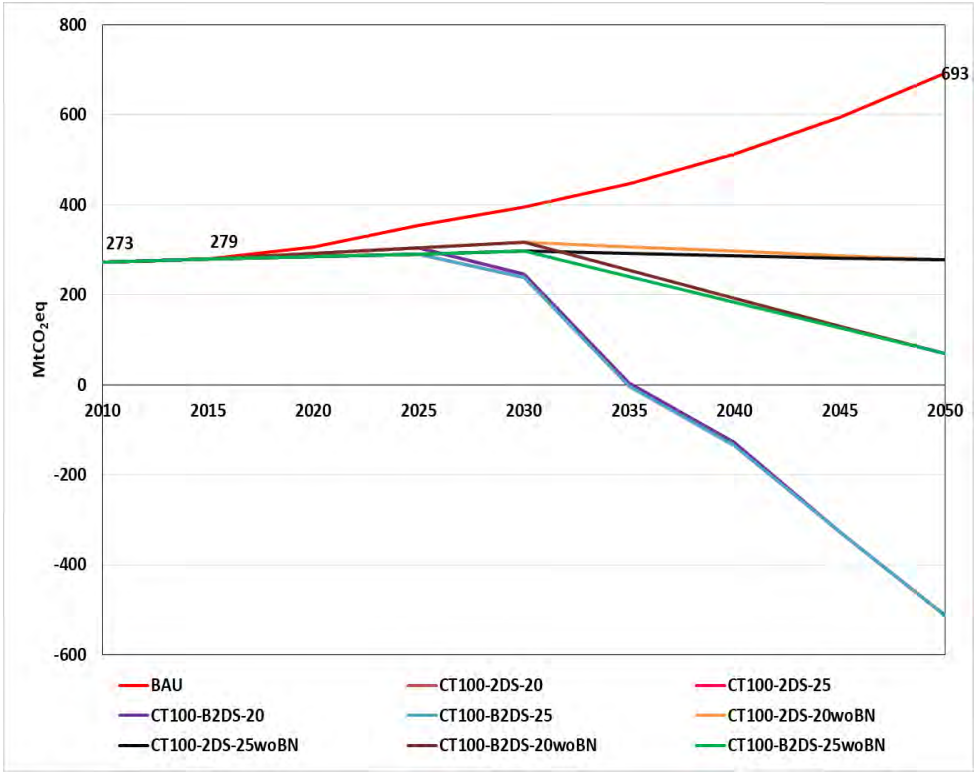
Center for Applied Economic Research (CAER). Support to the development and implementation of the Thai climate change policy. Thailand: Kasetsart University; 2018.

CONCLUSIONS

- This study used **AFOLU-B**, which is a bottom-up model, for the analysis
- **Net sequestration** in AFOLU sector will be possible with mitigation/sequestration measures
- **Net emission** from the AFOLU would increase from 8.3 $MtCO_2eq$ in 2015 to **24.6 $MtCO_2eq$ in 2050**.
- In 2050, net sequestration would be 1.2 $MtCO_2eq$ at carbon price of \$5 per tCO_2eq, 21.4 at \$10 per tCO_2eq and 26.8$MtCO_2eq$ at \$500 per tCO_2eq.
- In Thailand AFOLU sector, the carbon **price above \$10 per tCO_2eq will not** be effective to achieve significant additional mitigation/sequestration.

Thailand's GHG Emission Profile under LTS Scenarios

GHG Emission Profile under BAU, Emission & Technology Constraint Scenarios Including Carbon Tax



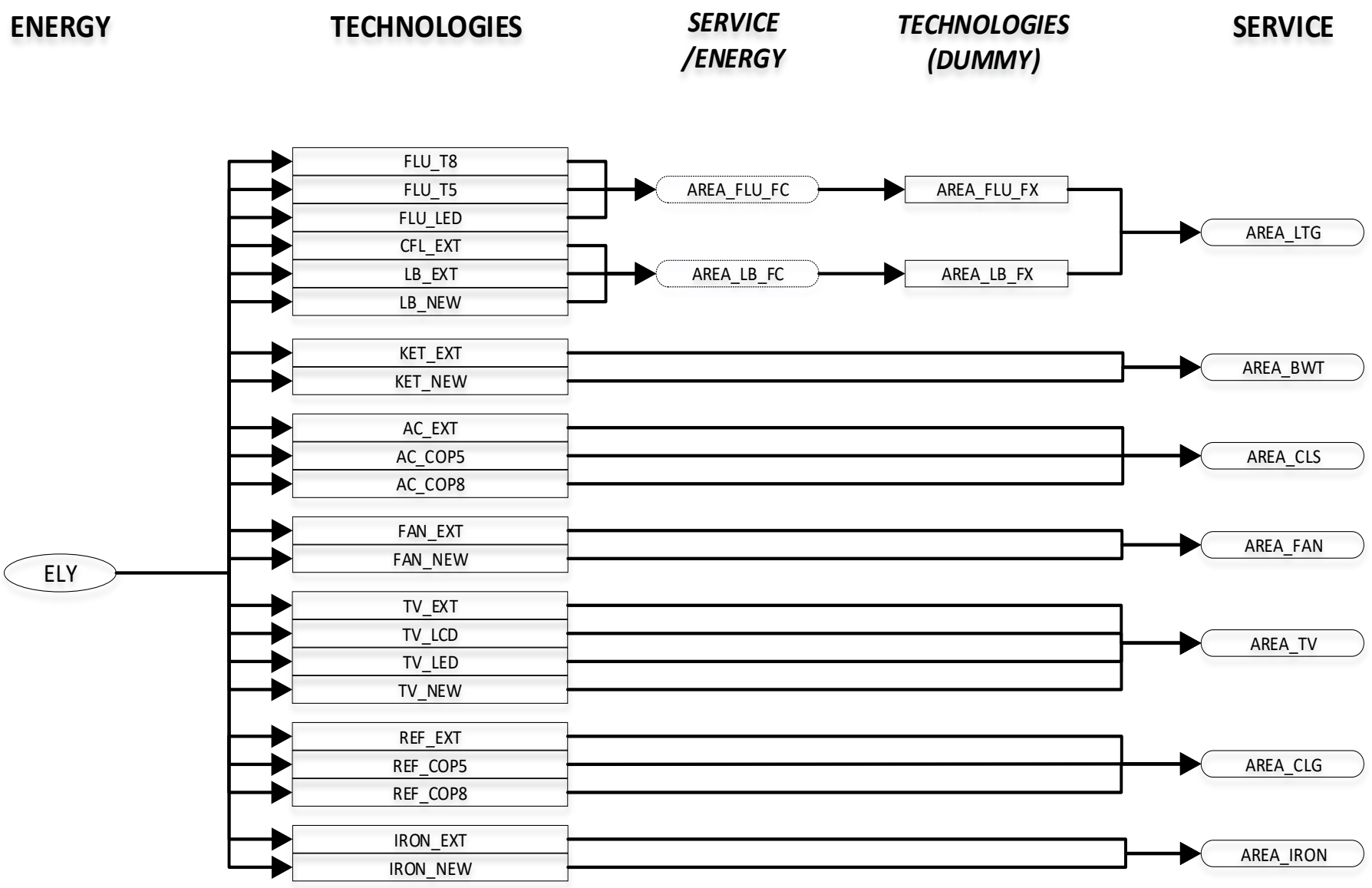
LTS Scenarios with Carbon Tax

Scenario	Availability of Technology	GHG Emission Constraint	
		2030	2050
BAU	All	-	-
Emission Constraint Scenarios including Carbon Tax of US$100/tCO$_2$eq			
CT100-2DS-20	All	20%	60%
CT100-2DS-25	All	25%	60%
CT100-B2DS-20	All	20%	90%
CT100-B2DS-25	All	25%	90%
Emission & Technology Constraint Scenarios including Carbon Tax of US$100/tCO$_2$eq			
CT100-2DS-20woBN	Without both BECCS & nuclear power	20%	60%
CT100-2DS-25woBN	Without both BECCS & nuclear power	25%	60%
CT100-B2DS-20woBN	Without both BECCS & nuclear power	20%	90%
CT100-B2DS-25woBN	Without both BECCS & nuclear power	25%	90%

- A higher GHG emission constraint scenarios of 20%-90% & 25%-90% during 2030 to 2050 along with the imposition of carbon tax of US$100/tCO$_2$e forces the selection of BECCS & Nuclear Power leading to negative emissions.

- In the absence of BECCS & Nuclear Power, the GHG emissions would be higher & positive during 2035 to 2050.

Updated Thailand's AIM/Enduse model in the residential sector



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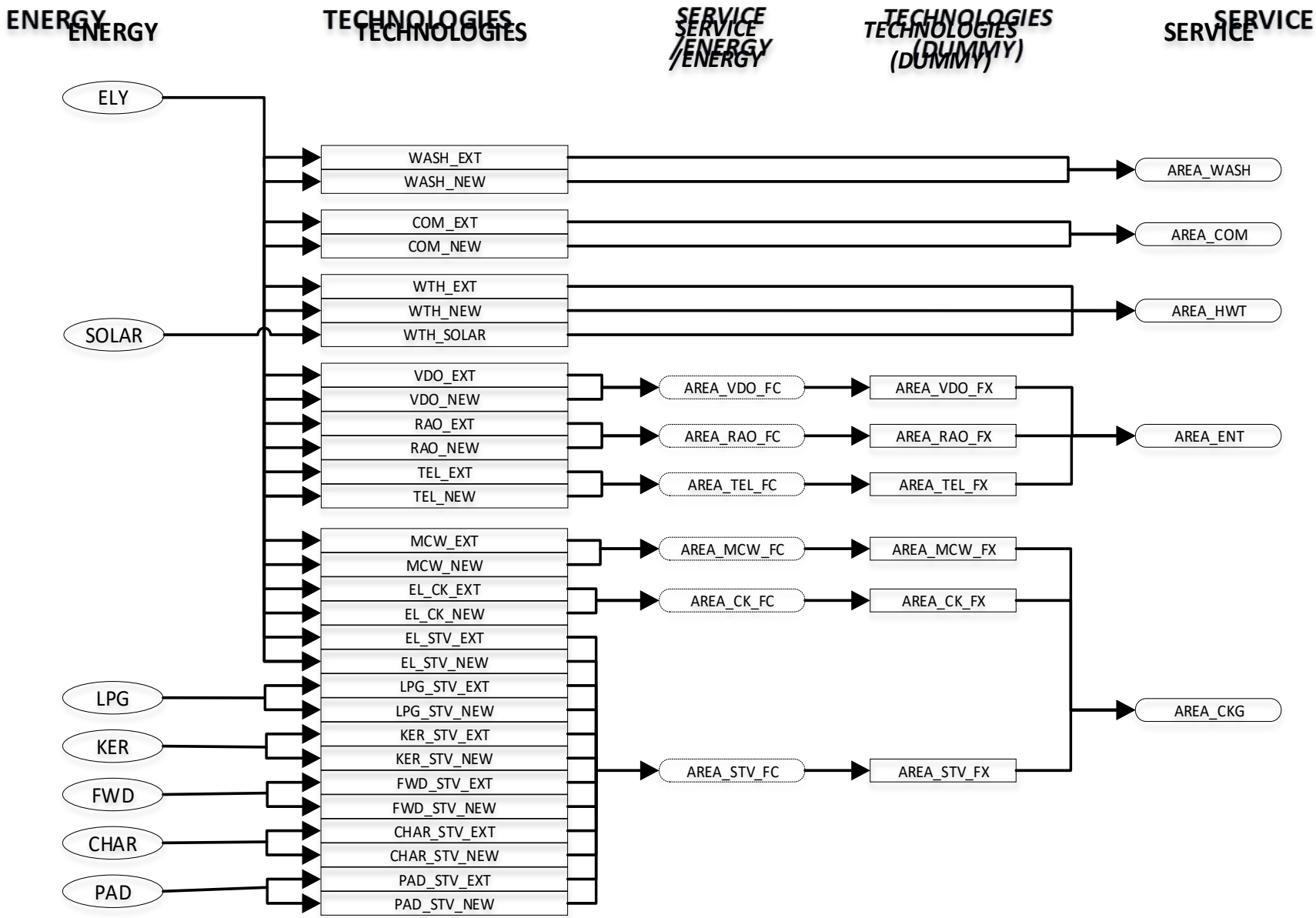

どうもありがとう

Thank You