

## List of Figures

Figure 2.1	Global Energy–related CO <sub>2</sub> Emissions by Sector	4
Figure 2.2	CO <sub>2</sub> Reduction Milestones by 2050	5
Figure 2.3	Conceptual Image towards Carbon Neutrality	6
Figure 2.4	Influence of Energy Transition on the Power Grid	6
Figure 2.5	Categories of Technology for Carbon Neutrality	7
Figure 2.6	CO <sub>2</sub> Reduction Technologies	8
Figure 2.7	Efficiency Improvement of Low-emission Coal-fired Generation	8
Figure 2.8	IGFC Demonstration Project at Osaki	9
Figure 2.9	R&D Roadmap of Carbon-neutral Fuel for Power Generation	10
Figure 2.10	Biomass Cofiring Plant Designed for High Cofiring Ratio (1)	11
Figure 2.11	Biomass Cofiring Plant Designed for High Cofiring Ratio (2)	11
Figure 2.12	Demonstration of Ammonia Cofiring in Existing USC Plant	12
Figure 2.13	Demonstration of RE100 Factory, Panasonic ‘H <sub>2</sub> Kibou Field Demonstration’	13
Figure 2.14	Carbon-neutral Technology R&D Roadmap in the Industrial Sector	14
Figure 2.15	CO <sub>2</sub> Capture Technologies	15
Figure 2.16	CO <sub>2</sub> Capture Plant and Process Listed in Table 2.2	16
Figure 2.17	CO <sub>2</sub> Utilisation Technologies	17
Figure 2.18	Roadmap for Carbon-recycling Technologies	18
Figure 2.19	Biojet Fuel Process (Algae Photosynthesis, FT Synthesis)	18
Figure 2.20	Pilot Plant of Methane and Methanol Syntheses from CO <sub>2</sub>	19
Figure 2.21	CO <sub>2</sub> Storage Technologies	19
Figure 2.22	Roadmap of CCS, Afforestation, and Blue Carbon	20
Figure 2.23	CCS Demonstration Project in Tomakomai	20
Figure 3.1	The Realisation and Target of National Energy Mix	23
Figure 3.2	New Power Plant Installation Plan	24
Figure 3.3	Electricity Production and Power Generation Energy Mix in 2030	24
Figure 3.4	Main Pillars of Policy and President’s Directions for Carbon Neutrality	25
Figure 3.5	Roadmap for Carbon Neutrality in 2060	26

Figure 3.6	Phaseout Plan of Coal-fired Power Plants	28
Figure 3.7	Projection of Power Generation Emission	29
Figure 3.8	Power Plant Capacity and Electricity Production by 2060	30
Figure 3.9	Power Energy Mix in 2060	31
Figure 3.10	Super Grid Plan for Re-sharing Resources	33
Figure 3.11	Major National Energy-related Acts and Policies	40
Figure 3.12	Malaysia’s National Installed Capacity and Generation Capacity	42
Figure 3.13	Electricity Demand Share by Region	42
Figure 3.14	Installed Capacity in Sabah, 2019	43
Figure 3.15	Power Plants in Sabah	43
Figure 3.16	Installed Capacity in Sarawak, 2019	44
Figure 3.17	Power Plants in Sarawak	44
Figure 3.18	Map of Coal-fired Power Plants in Malaysia	46
Figure 3.19	Capacity Additions and Retirements of Peninsular Malaysia	46
Figure 3.20	Energy Sector Targets under the 12th Malaysia Plan	47
Figure 3.21	Selected Target Areas for Low-carbon National Aspiration	48
Figure 3.22	Low-carbon National Aspiration 2040 and Expected Impacts (Draft)	49
Figure 3.23	Summary of RE Capacity Evolution and RE Share	49
Figure 3.24	Hydrogen Roadmap in 2020	51
Figure 3.25	CCUS in NEZ Target of PETRONAS	52
Figure 3.26	ENEOS Yokohama Tsunashima Hydrogen Station	53
Figure 3.27	Kasawari CCS Project Site	54
Figure 3.28	Sarawak Energy’s Hydrogen Production Plant and Hydrogen Bus Terminal	55
Figure 3.29	Thailand's Long-term GHG Emission Development Strategy	63
Figure 3.30	Power Generation by Fuel	63
Figure 3.31	Power Generation Share by Fuel	64
Figure 3.32	Electricity Consumption by Segment	64
Figure 3.33	Installed Capacity of Renewable Energy	65
Figure 3.34	Renewable Energy Generation Capacity and AEDP Target (as of 2020)	66
Figure 3.35	Power Plant under the New AEDP	67
Figure 3.36	Thailand’s Power Development Plan 2018–2037 Revision 1	68

Figure 3.37	Biomass Potential and Current Biomass Power Plant	69
Figure 3.38	Adaptable Technologies for Biomass to Energy	70
Figure 3.39	Synthetic Fuel Process from Biomass (Ref. 1)	70
Figure 3.40	Synthetic Fuel Process from Biomass (Ref. 2)	71
Figure 3.41	Current CCUS Development in Thailand	71
Figure 3.42	CCUS Development Work Plan (2022–2026)	72
Figure 3.43	Total Energy Supply by Source in Viet Nam	75
Figure 3.44	Total Energy Consumption by Source in Viet Nam	75
Figure 3.45	Power Production and Purchase	76
Figure 3.46	Total Carbon Emissions	77
Figure 3.47	Current Status of GHG Emissions in Viet Nam	78
Figure 3.48	Installed Generation Capacity by Energy Source for PDP8	81
Figure 3.49	Installed Generation Capacity by Energy Source for PDP8	83
Figure 3.50	Pathways of Viet Nam CO <sub>2</sub> Emissions, Gigatonnes of CO <sub>2</sub> Equivalent (GtCO <sub>2</sub> e)	85
Figure 3.51	Erex's Power Generation Plan in Viet Nam	86
Figure 3.52	Biomass Power Plant Potential by Region in Viet Nam	86
Figure 3.53	Candidate Sites for Newly Constructed Biomass Power Plants	87
Figure 3.54	Current Status of Coal-fired Power in Viet Nam (as of January 2022)	88
Figure 3.55	Coal-fired Power Plants by Years Since the Start of Operation	89
Figure 3.56	Offshore Wind Power Potential in Viet Nam and Nearby Areas	91
Figure 3.57	Viet Nam's OWP Projects, Southern Zone	91
Figure 3.58	Location of Solar Power Generation and Hydropower Plants and FiT Prices in Viet Nam	92
Figure 3.59	The Unit Cost of Electricity by Type of Generation in Viet Nam	93

## List of Tables

Table 2.1	Combined Power Generation and CO <sub>2</sub> Capture Technologies	15
Table 2.2	CO <sub>2</sub> Capture Technologies	16
Table 3.1	Plan of Biomass Cofiring with Coal	29
Table 3.2	NRE Potential	32
Table 3.3	Applicable Technologies for Carbon Neutrality in Indonesia (1)	35
Table 3.4	Applicable Technologies for Carbon Neutrality in Indonesia (2)	36
Table 3.5	List of Coal-fired Power Plants in Malaysia	45
Table 3.6	Applicable Technology Solutions for Malaysia: Reduction	57
Table 3.7	Applicable Technology Solutions for Malaysia: Reduction (2)	58
Table 3.8	Thailand's Energy Policy	62
Table 3.9	Total Capacity under PDP2018 Revision 1	65
Table 3.10	Share of Fuel Used in Power Generation (%)	66
Table 3.11	Applicable Technologies for Carbon Neutrality (1)	72
Table 3.12	Applicable Technologies for Carbon Neutrality (2)	73
Table 3.13	Installed Generation Capacity by Energy Source for PDP8 (as of 2030)	80
Table 3.14	Installed Generation Capacity by Energy Source for PDP8	82
Table 3.15	Viet Nam's C&I Rooftop Solar Developers	90
Table 3.16	Carbon-neutral Technology with High Applicability in Viet Nam	88