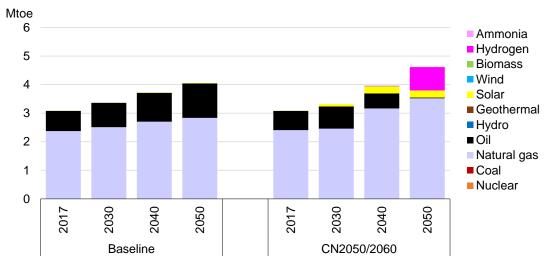
Appendix

1. Brunei Darussalam

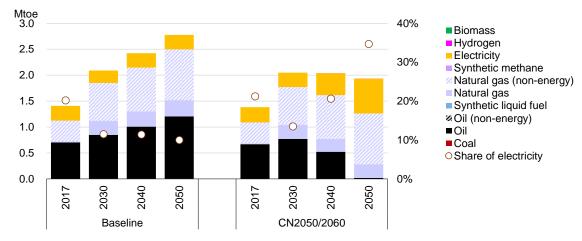
(a) CN2050/2060

Figure A.1. Primary Energy Supply (BRN-CN2050/2060)



BRN = Brunei Darussalam, Mtoe = million tonnes of oil equivalent. Source: Author.

Figure A.2. Final Energy Consumption (BRN-CN2050/2060)



BRN = Brunei Darussalam, Mtoe = million tonnes of oil equivalent. Source: Author.

TWh ■ Net imports 16 Ammonia 14 Hydrogen 12 ■ Biomass 10 Offshore wind 8 Onshore wind 6 Solar PV Geothermal 4 ■ Hydro 2 Gas-hydrogen 0 Gas -2 Coal-biomass 2017 2050 2017 2040 Coal-ammonia ■ Coal Baseline CN2050/2060 Nuclear

Figure A.3. Power Generation (BRN-CN2050/2060)

BRN = Brunei Darussalam, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

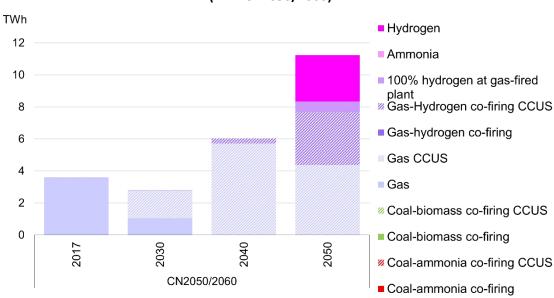
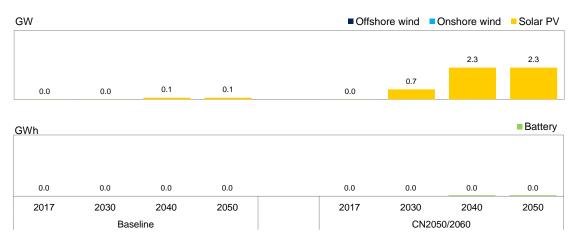


Figure A.4. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (BRN-CN2050/2060)

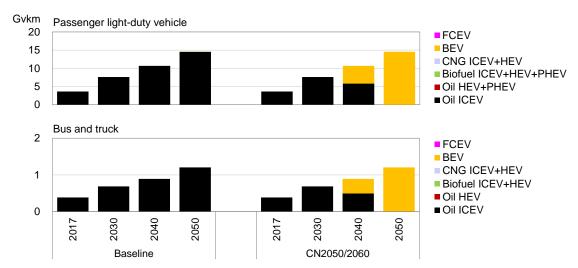
BRN = Brunei Darussalam; CCUS = carbon dioxide capture, utilisation, and storage; TWh = terawatt-hour. Source: Author.

Figure A.5. Variable Renewable Energy and Battery (BRN-CN2050/2060)



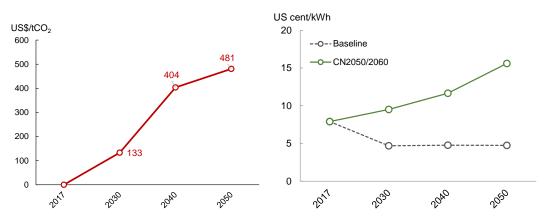
 $\label{eq:BRN} \textbf{BRN} = \textbf{Brunei Darussalam, GW} = \textbf{gigawatt}, \textbf{GWh} = \textbf{gigawatt-hour, PV} = \textbf{photovoltaic.}$ Source: Author.

Figure A.6. Travel Distance by Vehicle Technology (BRN-CN2050/2060)



BEV = battery electric vehicle, BRN = Brunei Darussalam, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10⁹ vehicle-km, PHEV = plug-in hybrid electric vehicle.

Figure A.7. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (BRN-CN2050/2060)



BRN = Brunei Darussalam, kWh = kilowatt-hour, tCO_2 = tonne of carbon dioxide.

Source: Author.

Table A.1. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (BRN-CN2050/2060)

		Baseline	9			BRN-CN2050/2060						
		(MtCO ₂))			(MtCO₂)						
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060		
Electricity	2.46	1.41	1.54	1.48	1.26	2.54	0.58	0.27	0.32	0.33		
Industry	0.41	0.39	0.40	0.41	0.42	0.41	0.14	0.04	0.04	0.04		
Transport	1.56	2.28	2.73	3.30	4.38	1.45	2.28	1.54	0.06	0.03		
Other end	0.17	0.50	0.55	0.59	0.66	0.17	0.50	0.55	0.58	0.64		
Other												
including DACCS	2.14	2.14	2.14	2.14	2.14	2.14	2.14	0.42	-0.99	-1.04		
LULUCF						0.00	0.00	0.00	0.00	0.00		
Energy-												
related CO ₂ emissions	6.73	6.72	7.37	7.93	8.85	6.71	5.64	2.82	0.00	0.00		

BRN = Brunei Darussalam, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

(b) CN2050/2060_w/oCarbonSink

Mtoe Ammonia Hydrogen 5 Biomass Wind 4 Solar 3 ■ Geothermal Hydro 2 ■ Oil Natural gas 1 Coal Nuclear 0 2040 2040 2017 2030 2050 2017 2030 Baseline CN2050/2060 _w/oCarbonSink

Figure A.8. Primary Energy Supply (BRN-CN2050/2060_w/oCarbonSink)

BRN = Brunei Darussalam, Mtoe = million tonnes of oil equivalent .

Source: Author.

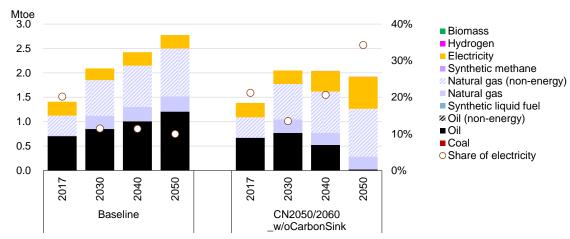


Figure A.9. Final Energy Consumption (BRN-CN2050/2060_w/oCarbonSink)

BRN = Brunei Darussalam, Mtoe = million tonnes of oil equivalent. Source: Author.

TWh 16 ■ Net imports Ammonia 14 Hydrogen 12 Biomass 10 Offshore wind 8 Onshore wind 6 Solar PV 4 Geothermal ■ Hydro 2 Gas-hydrogen 0 Gas -2 Coal-biomass 2017 2040 2017 2040 2050 2050 Coal-ammonia Coal Baseline CN2050/2060 Nuclear _w/oCarbonSink

Figure A.10. Power Generation (BRN-CN2050/2060_w/oCarbonSink)

BRN = Brunei Darussalam, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

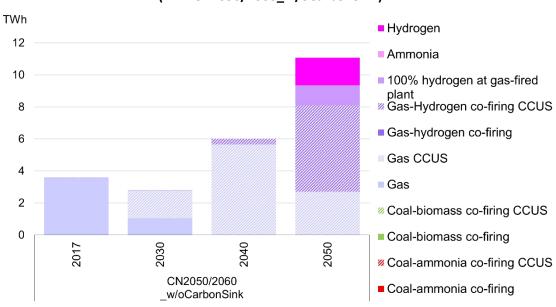
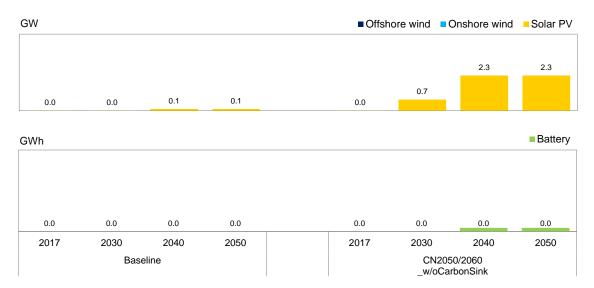


Figure A.11. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (BRN-CN2050/2060_w/oCarbonSink)

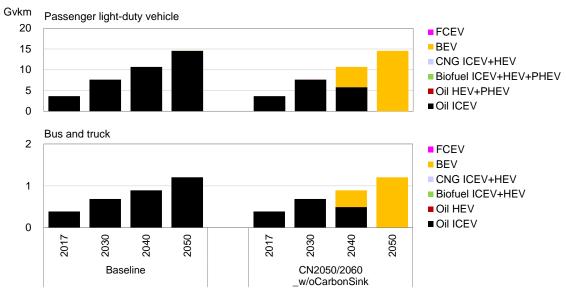
BRN = Brunei Darussalam; CCUS = carbon dioxide capture, utilisation, and storage; TWh = terawatt-hour. Source: Author.

Figure A.12. Variable Renewable Energy and Battery (BRN-CN2050/2060_w/oCarbonSink)



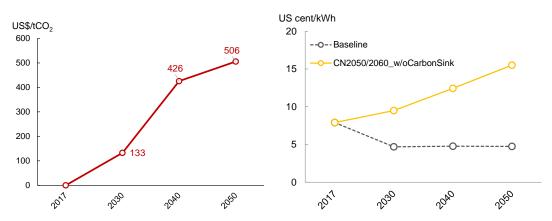
 $\label{eq:BRN} \textbf{BRN} = \textbf{Brunei Darussalam, GW} = \textbf{gigawatt, GWh} = \textbf{gigawatt-hour, PV} = \textbf{photovoltaic.}$ Source: Author.

Figure A.13. Travel Distance by Vehicle Technology (BRN-CN2050/2060_w/oCarbonSink)



BEV = battery electric vehicle, BRN = Brunei Darussalam, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10⁹ vehicle-km, PHEV = plug-in hybrid electric vehicle.

Figure A.14. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (BRN-CN2050/2060_w/oCarbonSink)



BRN = Brunei Darussalam, KWh = kilowatt-hour, tCO_2 = tonne of carbon dioxide.

Source: Author.

Table A.2. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (BRN-CN2050/2060_w/oCarbonSink)

		Baseline	2	BRN-CN2050/2060_w/oCarbonSink								
		(MtCO ₂))			(MtCO₂)						
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060		
Electricity	2.46	1.41	1.54	1.48	1.26	2.54	0.58	0.27	0.32	0.24		
Industry	0.41	0.39	0.40	0.41	0.42	0.41	0.14	0.04	0.04	0.08		
Transport	1.56	2.28	2.73	3.30	4.38	1.45	2.28	1.54	0.06	0.03		
Other end	0.17	0.50	0.55	0.59	0.66	0.17	0.50	0.55	0.58	0.64		
use												
Other	2.14	2.14	2.14	2.14	2.14	2.14	2.14	0.43	-0.99	-0.99		
including												
DACCS												
LULUCF												
Energy-	6.73	6.72	7.37	7.93	8.85	6.71	5.64	2.82	0.00	0.00		
related CO ₂												
emissions												

BRN = Brunei Darussalam, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

2. Cambodia

(a) CN2050/2060

Figure A.15. Primary energy supply (KHM-CN2050/2060)

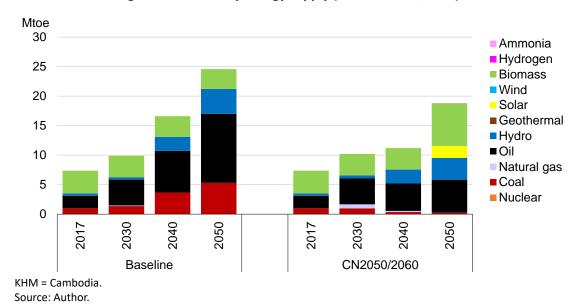
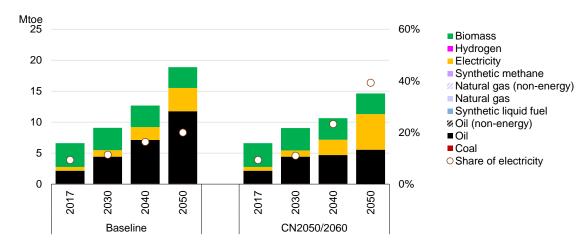


Figure A.16. Final Energy Consumption (KHM-CN2050/2060)



 $\label{eq:KHM} \textbf{KHM} = \textbf{Cambodia}, \, \textbf{Mtoe} = \textbf{million} \, \, \textbf{tonnes} \, \, \textbf{of} \, \, \textbf{oil} \, \, \textbf{equivalent}.$

TWh ■ Net imports 140 Ammonia 120 Hydrogen 100 Biomass 80 Offshore wind 60 Onshore wind 40 Solar PV Geothermal 20 Hydro 0 Gas-hydrogen -20 Gas -40 Coal-biomass 2017 2017 2050 Coal-ammonia ■ Coal CN2050/2060 Baseline Nuclear

Figure A.17. Power Generation (KHM-CN2050/2060)

KHM = Cambodia, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

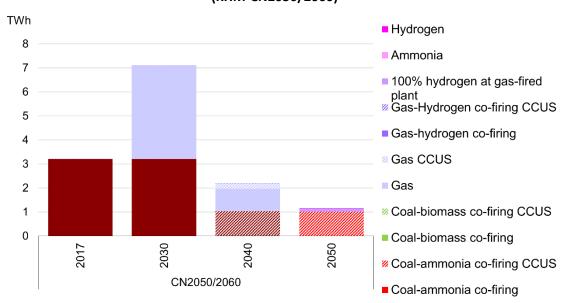
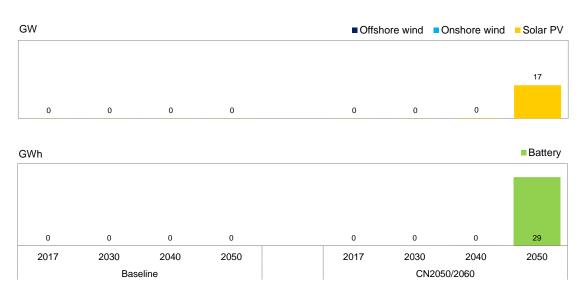


Figure A.18. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (KHM-CN2050/2060)

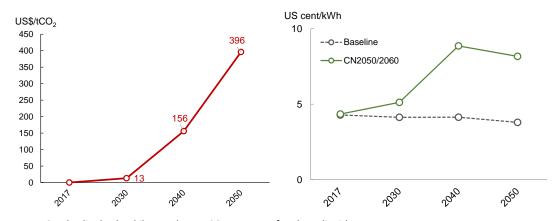
CCUS = carbon dioxide capture, utilisation, and storage; KHM = Cambodia; TWh = terawatt-hour. Source: Author.

Figure A.19. Variable Renewable Energy and Battery (KHM-CN2050/2060)



 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, KHM = Cambodia, PV = photovoltaic.} \\ \mbox{Source: Author.}$

Figure A.20. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (KHM-CN2050/2060)



KHM = Cambodia, kWh = kilowatt-hour, tCO_2 = tonne of carbon dioxide.

Table A.3. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (KHM-CN2050/2060)

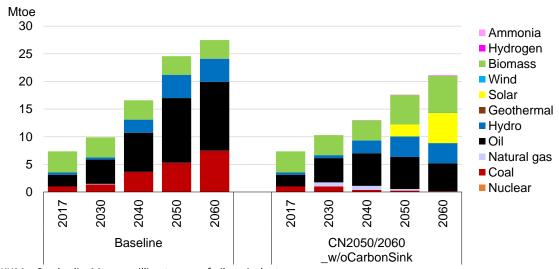
		Baseline				KHM-CN2050/2060					
		(MtCO₂)	(MtCO₂)								
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	3.77	5.47	14.28	20.79	29.38	3.77	5.31	-0.15	-16.16	-15.99	
Industry	0.62	4.02	10.10	21.48	25.15	0.62	3.99	1.84	4.22	5.23	
Transport	5.42	8.09	9.25	10.47	8.43	5.42	8.09	9.25	10.39	8.43	
Other end	0.55	1.65	2.88	4.88	5.67	0.55	1.65	2.88	1.55	2.33	
use	0.55	1.05	2.00	4.00	5.07	0.55	1.05	2.00	1.55	2.55	
Other											
including	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
DACCS											
LULUCF						0.00	0.00	0.00	0.00	0.00	
Energy-											
related CO₂	10.37	19.23	36.51	57.61	68.64	10.37	19.04	13.81	0.00	0.00	
emissions											

KHM = Cambodia, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

Source: Author.

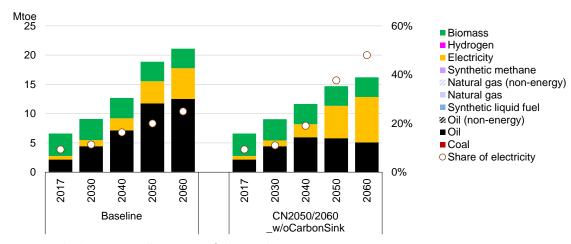
(b) CN2050/2060_w/oCarbonSink

Figure A.21. Primary Energy Supply (KHM-CN2050/2060_w/oCarbonSink)



KHM = Cambodia, Mtoe = million tonnes of oil equivalent.

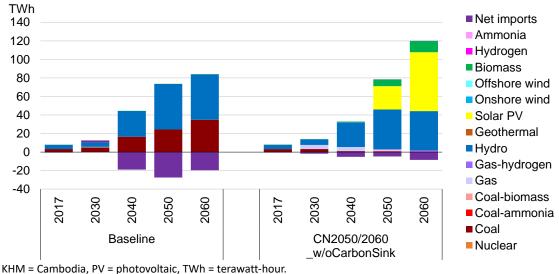
Figure A.22. Final Energy Consumption (KHM-CN2050/2060_w/oCarbonSink)



KHM = Cambodia, Mtoe = million tonnes of oil equivalent.

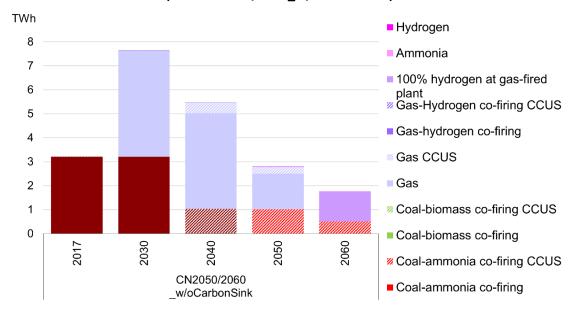
Source: Author.

Figure A.23. Power Generation (KHM-CN2050/2060_w/oCarbonSink)



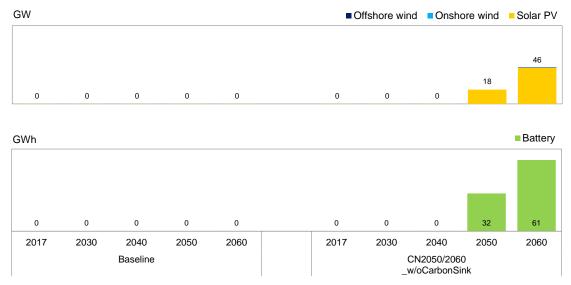
Anivi – Cambodia, PV – priotovoitaic, TVVII – terawatt-rioui.

Figure A.24. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (KHM-CN2050/2060_w/oCarbonSink)



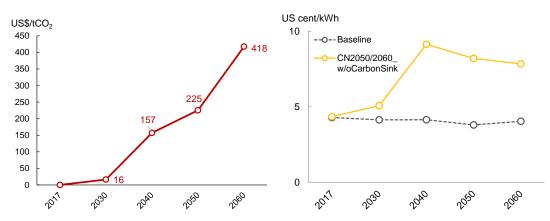
CCUS = carbon dioxide capture, utilisation, and storage; KHM = Cambodia; TWh = terawatt-hour. Source: Author.

Figure A.25. Variable Renewable Energy and Battery (KHM-CN2050/2060_w/oCarbonSink)



 $\mathsf{GW} = \mathsf{gigawatt}$, $\mathsf{GWh} = \mathsf{gigawatt}$ -hour, $\mathsf{KHM} = \mathsf{Cambodia}$, $\mathsf{PV} = \mathsf{photovoltaic}$. Source: Author.

Figure A.26. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (KHM-CN2050/2060_w/oCarbonSink)



KHM = Cambodia, $tCO_2 = tonne$ of carbon dioxide.

Source: Author.

Table A.4. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (KHM-CN2050/2060_w/oCarbonSink)

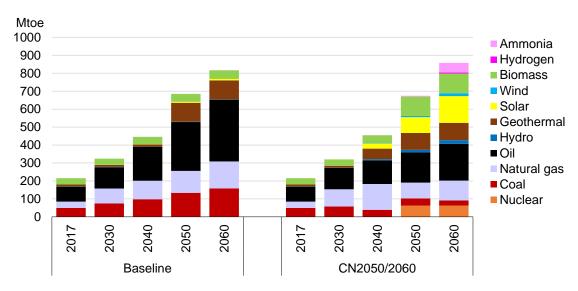
	ı	Baseline				KHM-CN2050/2060_w/oCarbonSink					
		(MtCO ₂)	(MtCO₂)								
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	3.77	5.47	14.28	20.79	29.38	3.77	5.52	1.07	-7.73	-14.12	
Industry	0.62	4.02	10.10	21.48	25.15	0.62	3.77	5.21	4.22	5.22	
Transport	5.42	8.09	9.25	10.47	8.43	5.42	8.09	9.25	10.47	7.89	
Other end use	0.55	1.65	2.88	4.88	5.67	0.55	1.65	2.88	2.24	1.01	
Other											
including	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
DACCS											
LULUCF											
Energy-											
related CO ₂	10.37	19.23	36.51	57.61	68.64	10.37	19.04	18.41	9.20	0.00	
emissions											

KHM = Cambodia, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

3. Indonesia

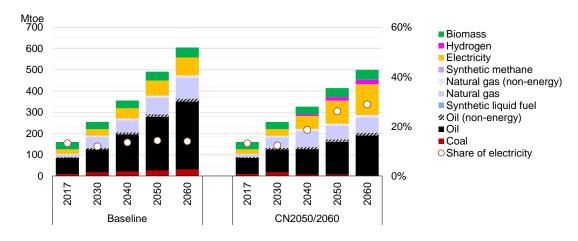
(a) CN2050/2060

Figure A.27. Primary Energy Supply (IDN-CN2050/2060)



IDN = Indonesia, Mtoe = million tonnes of oil equivalent. Source: Author.

Figure A.28. Final Energy Consumption (IDN-CN2050/2060)



IDN = Indonesia, Mtoe = million tonnes of oil equivalent.

TWh ■ Net imports 3000 Ammonia 2500 Hydrogen Biomass 2000 Offshore wind 1500 Onshore wind Solar PV 1000 Geothermal 500 ■ Hydro Gas-hydrogen Gas -500 Coal-biomass 2060 2017 2017 2060 Coal-ammonia ■ Coal Baseline CN2050/2060 Nuclear

Figure A.29. Power Generation (IDN-CN2050/2060)

IDN = Indonesia, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

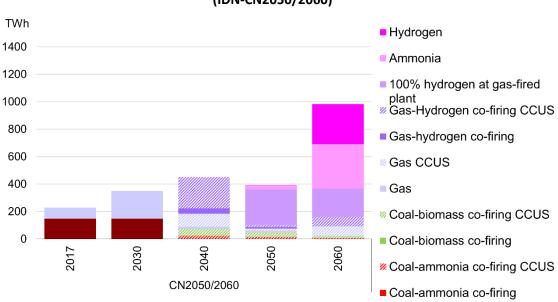


Figure A.30. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (IDN-CN2050/2060)

CCUS = CCUS = carbon dioxide capture, utilisation, and storage; IDN = Indonesia; TWh = terawatt-hour. Source: Author.

GW Offshore wind Onshore wind Solar PV

480

9 4 16 45 70 0 5

Battery

CN2050/2060

Figure A.31. Variable Renewable Energy and Battery (IDN-CN2050/2060)

 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, IDN = Indonesia, PV = photovoltaic.} \\ \mbox{Source: Author.}$

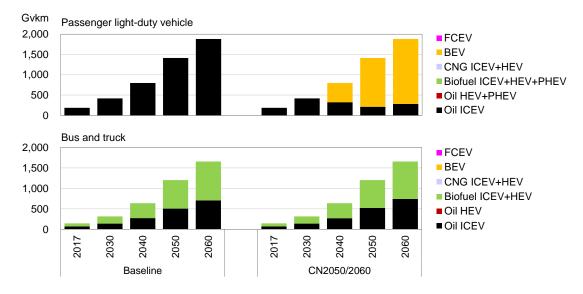
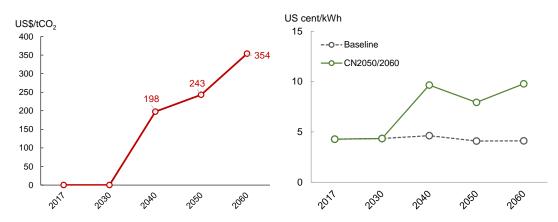
Baseline 

Figure A.32. Travel Distance by Vehicle Technology (IDN-CN2050/2060)

BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, IDN = Indonesia, Gvkm = 10⁹ vehicle-km, PHEV = plug-in hybrid electric vehicle.

Source: Author.

Figure A.33. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (IDN-CN2050/2060)



IDN = Indonesia, kWh = kilowatt-hour, $tCO_2 = tonne$ of carbon dioxide.

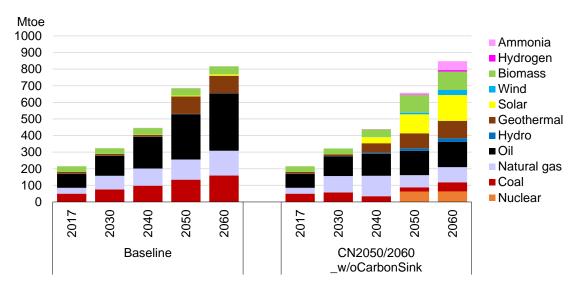
Table A.5. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (IDN-CN2050/2060)

		Bas	seline			IDN-CN2050/2060						
		(M	tCO ₂)			(MtCO₂)						
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060		
Electricity	178.60	259.32	359.23	470.06	566.66	178.60	224.50	0.31	-259.26	-262.19		
Industry	91.13	145.48	222.11	298.24	381.68	91.13	142.50	143.55	137.60	127.46		
Transport	120.26	242.29	400.13	630.51	828.88	120.26	242.29	310.79	418.17	552.03		
Other end	01 F0	128.91	127.33	127.04	111 64	01 F0	120.00	110 45	02.10	74.23		
use	81.58	128.91	127.33	127.04	111.64	81.58	128.88	118.45	92.18	74.23		
Other												
including	39.36	40.31	54.69	63.38	73.16	39.36	38.67	40.44	40.84	-246.04		
DACCS												
LULUCF						635.50	-130.00	-240.00	-300.00	-300.00		
Energy-												
related	510.93	816.30	1 162 49	1 500 24	1 062 02	510.93	776.84	612 55	420 E2	245.50		
CO ₂	510.93	810.30	1,163.48	1,589.24	1,962.02	510.93	770.84	613.55	429.53	245.50		
emissions												

IDN = Indonesia, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = Iand use, land-use change and forestry. Source: Author.

(b) CN2050/2060_w/oCarbonSink

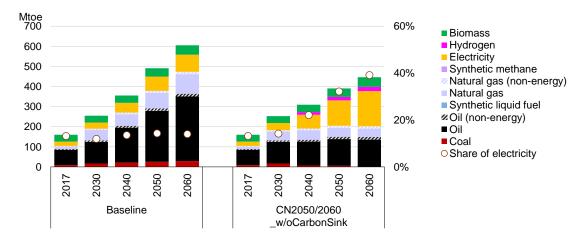
Figure A.34. Primary Energy Supply (IDN-CN2050/2060_w/oCarbonSink)



IDN = Indonesia, Mtoe = million tonnes of oil equivalent.

Source: Author.

Figure A.35. Final Energy Consumption (IDN-CN2050/2060_w/oCarbonSink)



IDN = Indonesia, Mtoe = million tonnes of oil equivalent.

TWh ■ Net imports 3000 Ammonia 2500 Hydrogen Biomass 2000 Offshore wind 1500 Onshore wind Solar PV 1000 Geothermal 500 ■ Hydro 0 Gas-hydrogen Gas -500 ■ Coal-biomass 2017 2030 2017 2040 2050 2060 2050 Coal-ammonia ■ Coal Baseline CN2050/2060 Nuclear _w/oCarbonSink

Figure A.36. Power Generation (IDN-CN2050/2060_w/oCarbonSink)

IDN = Indonesia, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

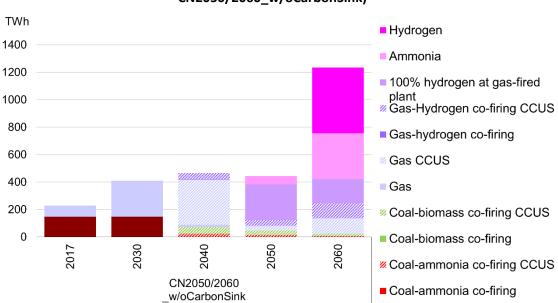
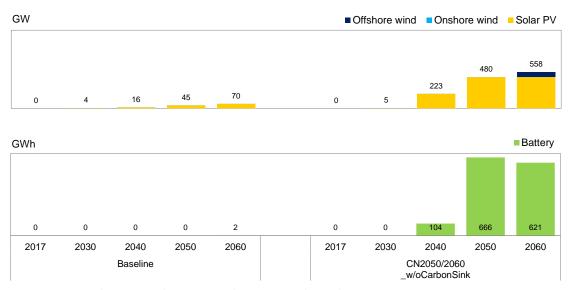


Figure A.37. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (IDN-CN2050/2060_w/oCarbonSink)

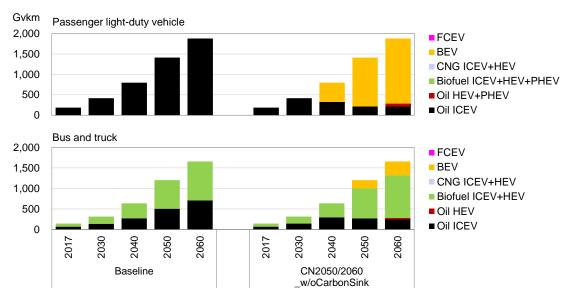
CCUS = carbon dioxide capture, utilisation, and storage; IDN = Indonesia; TWh = terawatt-hour. Source: Author.

Figure A.38. Variable Renewable Energy and Battery (IDN-CN2050/2060_w/oCarbonSink)



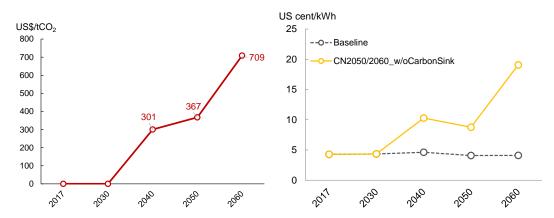
 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, IDN = Indonesia, PV = photovoltaic.} \\ \mbox{Source: Author.}$

Figure A.39. Travel Distance by Vehicle Technology (IDN-CN2050/2060_w/oCarbonSink)



BEV = battery electric vehicle, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, IDN = Indonesia, Gvkm = 10⁹ vehicle-km, PHEV = plug-in hybrid electric vehicle.

Figure A.40. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (IDN-CN2050/2060_w/oCarbonSink)



IDN = Indonesia, kWh = kilowatt-hour, tCO_2 = tonne of carbon dioxide.

Table A.6. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (IDN-CN2050/2060_w/oCarbonSink)

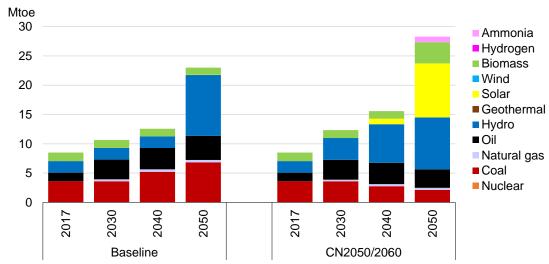
		Base	line	IDN-CN2050/2060_w/oCarbonSink						
		(Mto	CO ₂)	(MtCO ₂)						
	2017	2030	2040	2050	2017	2030	2040	2050	2060	
Electricity	178.60	259.32	359.23	470.06	566.66	178.62	245.89	-7.75	-265.61	-259.34
Industry	91.13	145.48	222.11	298.24	381.68	91.13	142.51	99.67	86.81	51.81
Transport	120.26	242.29	400.13	630.51	828.88	120.26	242.29	297.92	354.62	387.99
Other end use	81.58	128.91	127.33	127.04	111.64	81.58	113.98	103.94	91.57	73.63
Other including	39.36	40.31	54.69	63.38	73.16	39.36	38.67	37.94	-1.53	-254.09
DACCS										
LULUCF										
Energy-related	510.93	816.30	1,163.48	1,589.24	1,962.02	510.95	783.34	531.72	265.86	0.00
CO ₂ emissions										

IDN = Indonesia, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry. Source: Author.

4. Lao People's Democratic Republic

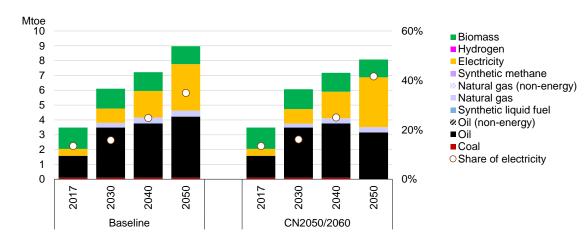
(a) CN2050/2060

Figure A.41. Primary Energy Supply (LAO-CN2050/2060)



LAO = Lao People's Democratic Republic, Mtoe = million tonnes of oil equivalent. Source: Author.

Figure A.42. Final Energy Consumption (LAO-CN2050/2060)



LAO = Lao People's Democratic Republic, Mtoe = million tonnes of oil equivalent. Source: Author.

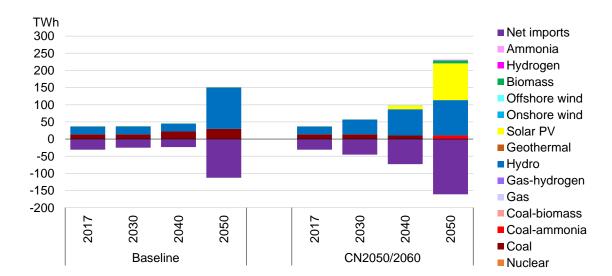


Figure A.43. Power Generation (LAO-CN2050/2060)

 $\label{eq:LAO} \mbox{LAO = Lao People's Democratic Republic, PV = photovoltaic, TWh = terawatt-hour.} \\ \mbox{Source: Author.}$

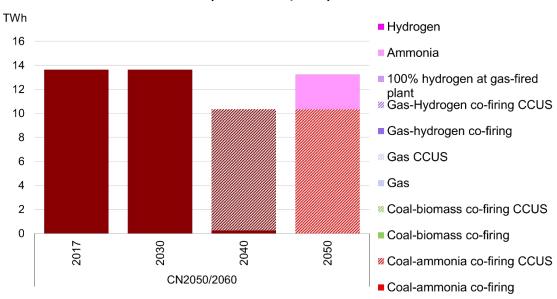
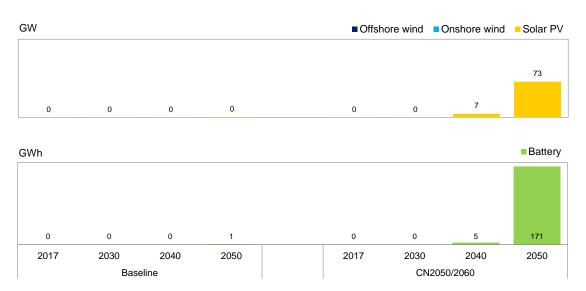


Figure A.44. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (LAO-CN2050/2060)

CCUS = carbon dioxide capture, utilisation, and storage; LAO = Lao People's Democratic Republic; TWh = terawatt-hour.

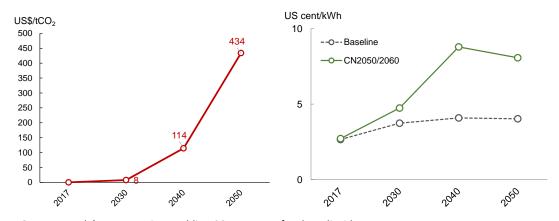
Source: Author.

Figure A.45. Variable Renewable Energy and Battery (LAO-CN2050/2060)



GW = gigawatt, GWh = gigawatt-hour, LAO = Lao People's Democratic Republic, PV = photovoltaic. Source: Author.

Figure A.46. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (LAO-CN2050/2060)



 $LAO = Lao People's Democratic Republic, <math>tCO_2 = tonne of carbon dioxide$. Source: Author.

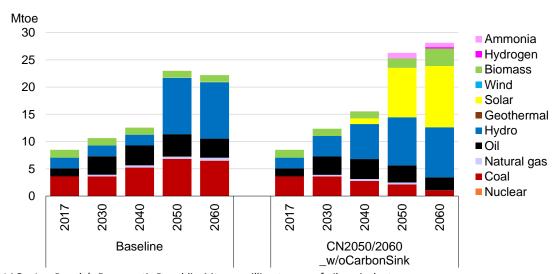
Table A.7. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (LAO-CN2050/2060)

	ı	Baseline	LAO-CN2050/2060							
		(MtCO ₂)	(MtCO2)							
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060
Electricity	13.84	13.84	20.27	26.63	25.30	13.84	13.84	1.26	-9.32	-8.29
Industry	0.59	1.73	2.94	5.08	5.86	0.59	1.59	2.47	1.25	1.48
Transport	3.15	4.50	4.61	4.69	3.78	3.15	4.50	4.61	4.39	3.78
Other end use	1.23	5.46	5.26	4.57	3.15	1.23	5.35	5.14	4.46	3.04
Other										
including	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.77	0.00
DACCS										
LULUCF						0.00	0.00	0.00	0.00	0.00
Energy-										
related CO ₂	18.80	25.54	33.07	40.98	38.09	18.80	25.28	13.47	0.00	0.00
emissions										

Lao PDR = Lao People's Democratic Republic, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry. Source: Author.

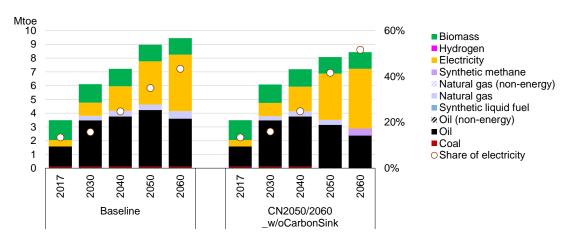
(b) CN2050/2060_w/oCarbonSink

Figure A.47. Primary Energy Supply (LAO-CN2050/2060_w/oCarbonSink)



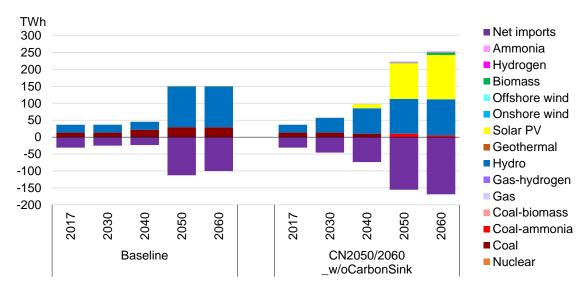
LAO = Lao People's Democratic Republic, Mtoe = million tonnes of oil equivalent. Source: Author.

Figure A.48. Final Energy Consumption (LAO-CN2050/2060_w/oCarbonSink)



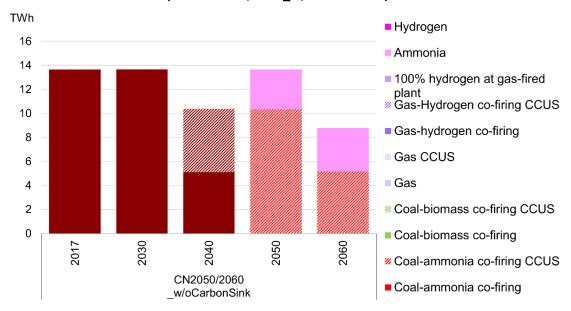
LAO = Lao People's Democratic Republic, Mtoe = million tonnes of oil equivalent. Source: Author.

Figure A.49. Power Generation (LAO-CN2050/2060_w/oCarbonSink)



 ${\sf LAO = Lao\ People's\ Democratic\ Republic,\ PV = photovoltaic,\ TWh = terawatt-hour.}$ Source: Author.

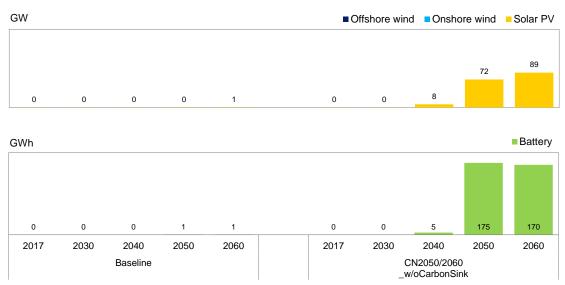
Figure A.50. Generated Electricity from coal, Gas, Ammonia, and Hydrogen (LAO-CN2050/2060_w/oCarbonSink)



CCUS = carbon dioxide capture, utilisation, and storage; LAO = People's Democratic Republic; TWh = terawatthour.

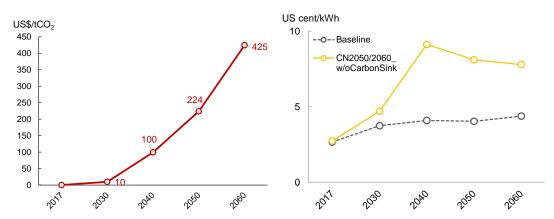
Source: Author.

Figure A.51. Variable Renewable Energy and Battery (LAO-CN2050/2060_w/oCarbonSink)



GW = gigawatt, GWh = gigawatt-hour, LAO = Lao People's Democratic Republic, PV = photovoltaic. Source: Author.

Figure A.52. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (LAO-CN2050/2060_w/oCarbonSink)



kWh = kilowatt-hour, LAO = Lao People's Democratic Republic, $tCO_2 = tonne$ of carbon dioxide. Source: Author.

Table A.8. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (LAO-CN2050/2060_w/oCarbonSink)

	В	Baseline	LAO-CN2050/2060_w/oCarbonSink							
	(MtCO ₂)	(MtCO₂)							
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060
Electricity	13.84	13.84	20.27	26.63	25.30	13.84	13.84	5.70	-1.42	-8.01
Industry	0.59	1.73	2.94	5.08	5.86	0.59	1.55	2.47	1.25	1.46
Transport	3.15	4.50	4.61	4.69	3.78	3.15	4.50	4.61	4.69	3.53
Other end use	1.23	5.46	5.26	4.57	3.15	1.23	5.39	5.19	4.47	3.03
Other										
including	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02
DACCS										
LULUCF										
Energy-related	10 00	25.54	33.07	40.98	38.09	18.80	25.28	17.96	0 00	0.00
CO ₂ emissions	18.80	25.54	33.07	40.98	38.09	18.80	25.28	17.96	8.98	0.00

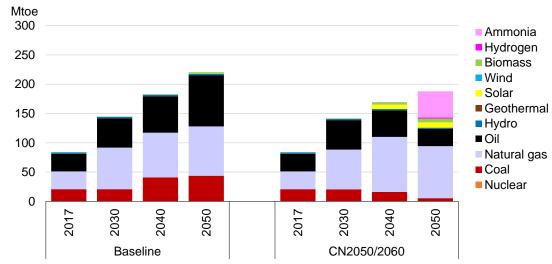
Lao PDR = Lao People's Democratic Republic, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

Source: Author.

5. Malaysia

(a) CN2050/2060

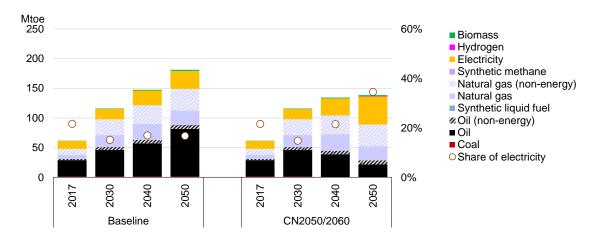
Figure A.53. Primary Energy Supply (MYS-CN2050/2060)



Mtoe = million tonnes of oil equivalent, MYS = Malaysia.

Source: Author.

Figure A.54. Final Energy Consumption (MYS-CN2050/2060)



Mtoe = million tonnes of oil equivalent, MYS = Malaysia.

TWh ■ Net imports 1000 Ammonia 900 Hydrogen 800 700 Biomass 600 Offshore wind 500 Onshore wind 400 Solar PV 300 Geothermal 200 ■ Hydro 100 Gas-hydrogen 0 Gas -100 Coal-biomass 2017 2030 2040 2050 2017 2040 2050 ■ Coal-ammonia ■ Coal CN2050/2060 Baseline Nuclear

Figure A.55. Power Generation (MYS-CN2050/2060)

MYS = Malaysia, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

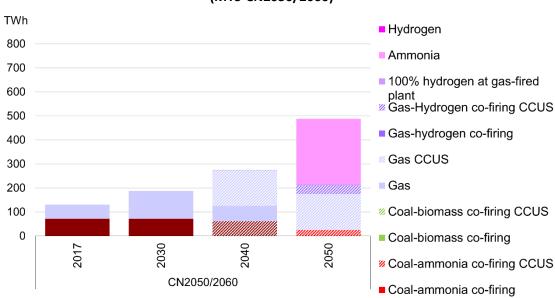
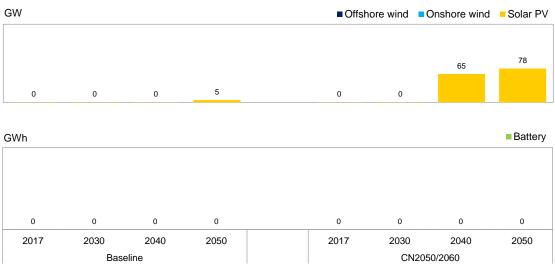


Figure A.56. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (MYS-CN2050/2060)

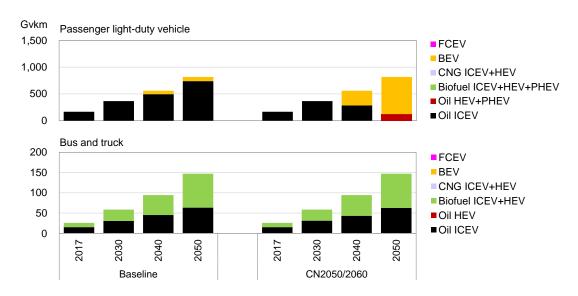
MYS = Malaysia; CCUS = carbon dioxide capture, utilisation, and storage; TWh = terawatt-hour. Source: Author.

Figure A.57. Variable Renewable Energy and Battery (MYS-CN2050/2060)



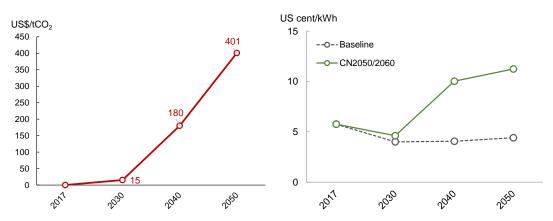
GW = gigawatt, GWh = gigawatt-hour, MYS = Malaysia, PV = photovoltaic. Source: Author.

Figure A.58. Travel Distance by Vehicle Technology (MYS-CN2050/2060)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10^9 vehicle-km, MYS = Malaysia, PHEV = plug-in hybrid electric vehicle.

Figure A.59. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (MYS-CN2050/2060)



kWh = kilowatt-hour, MYS = Malaysia, tCO_2 = tonne of carbon dioxide.

Source: Author.

Table A.9. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (MYS-CN2050/2060)

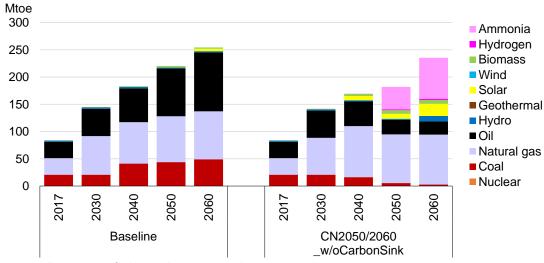
		Baseli	ine			MYS-CN2050/2060					
		(MtC	O ₂)			(MtCO₂)					
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	104.75	130.24	196.17	220.09	240.03	104.75	130.24	196.17	220.09	240.03	
Industry	29.94	41.97	54.04	68.22	82.53	29.94	41.97	54.04	68.22	82.53	
Transport	67.38	123.07	153.51	204.83	252.19	67.38	123.07	153.51	204.83	252.19	
Other	Г 01	20.17	25.07	27.16	22.74	F 01	20.17	25.07	27.16	22.74	
end use	5.81	20.17	25.07	27.16	23.74	5.81	20.17	25.07	27.16	23.74	
Other											
including	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	5.29	
DACCS											
LULUCF											
Energy-											
related	242.47	220.74	424.00	E3E C0	CO2 70	242.47	220.74	424.00	E3E 60	CO2 70	
CO ₂	213.17	320.74	434.06	525.60	603.78	213.17	320.74	434.06	525.60	603.78	
emissions		NA:III: t -									

MYS = Malaysia, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage,

LULUCF = land use, land-use change and forestry.

(b) CN2050/2060_w/oCarbonSink

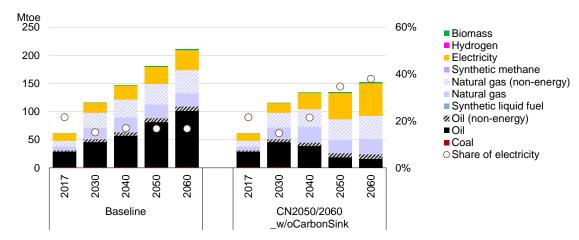
Figure A.60. Primary Energy Supply (MYS-CN2050/2060_w/oCarbonSink)



Mtoe = million tonnes of oil equivalent, MYS = Malaysia.

Source: Author.

Figure A.61. Final Energy Consumption (MYS-CN2050/2060_w/oCarbonSink)



Mtoe = million tonnes of oil equivalent, MYS = Malaysia.

TWh ■ Net imports 1000 Ammonia 900 Hydrogen 800 700 Biomass 600 Offshore wind 500 Onshore wind 400 Solar PV 300 Geothermal 200 Hydro 100 Gas-hydrogen Gas -100 Coal-biomass 2017 2030 2050 2060 2017 2030 2060 Coal-ammonia ■ Coal CN2050/2060 Baseline Nuclear

_w/oCarbonSink

Figure A.62. Power Generation (MYS-CN2050/2060_w/oCarbonSink)

MYS = Malaysia, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

Figure A.63. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen

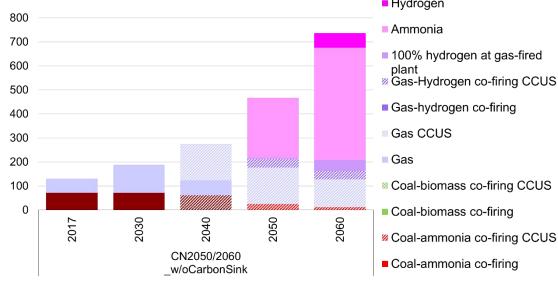
(MYS-CN2050/2060_w/oCarbonSink)

TWh

800

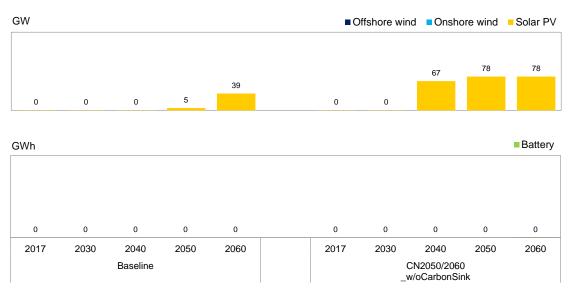
700

Ammonia



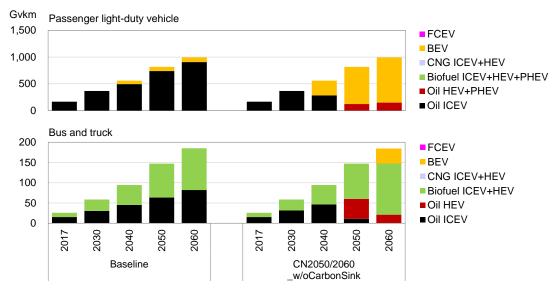
CCUS = carbon dioxide capture, utilisation, and storage; MYS = Malaysia; TWh = terawatt-hour. Source: Author.

Figure A.64. Variable Renewable Energy and Battery (MYS-CN2050/2060_w/oCarbonSink)



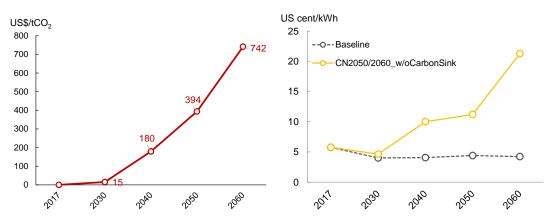
 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, MYS = Malaysia, PV = photovoltaic.} \\ \mbox{Source: Author.}$

Figure A.65. Travel Distance by Vehicle Technology (MYS-CN2050/2060_w/oCarbonSink)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10⁹ vehicle-km, MYS = Malaysia, PHEV = plug-in hybrid electric vehicle.

Figure A.66. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (MYS-CN2050/2060_w/oCarbonSink)



kWh = kilowatt-hour, MYS = Malaysia, $tCO_2 = tonne$ of carbon dioxide.

Source: Author.

Table A.10. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (MYS-CN2050/2060_w/oCarbonSink)

		Baseli	ine			MYS-CN2050/2060_w/oCarbonSink					
		(MtC	O ₂)					(MtCO ₂)			
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	104.75	130.24	196.17	220.09	240.03	104.67	122.86	24.99	-10.62	-13.11	
Industry	29.94	41.97	54.04	68.22	82.53	29.94	42.18	52.18	42.67	49.75	
Transport	67.38	123.07	153.51	204.83	252.19	67.48	123.07	103.94	46.55	42.51	
Other	Г 01	20.17	25.07	27.16	23.74	г 01	20.12	24.00	24.76	20.04	
end use	5.81	20.17	25.07	27.16	23.74	5.81	20.12	24.90	24.76	20.84	
Other											
including	5.29	5.29	5.29	5.29	5.29	5.29	4.60	2.53	0.90	-99.98	
DACCS											
LULUCF											
Energy-											
related	213.17	320.74	434.06	525.60	603.78	213.19	312.82	208.55	104.27	0.00	
CO ₂	213.1/	320.74	434.00	323.00	005.78	213.19	312.02	200.33	104.27	0.00	
emissions											

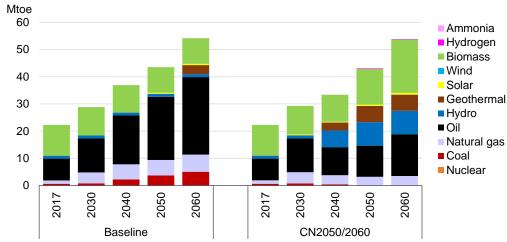
MYS = Malaysia, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage,

LULUCF = land use, land-use change and forestry.

6. Myanmar

(a) CN2050/2060

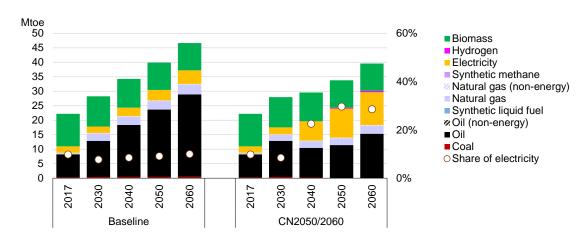
Figure A.67. Primary Energy Supply (MMR-CN2050/2060)



MMR = Myanmar, Mtoe = million tonnes of oil equivalent.

Source: Author.

Figure A.68. Final Energy Consumption (MMR-CN2050/2060)



 $\label{eq:MMR} \textbf{MMR} = \textbf{Myanmar}, \, \textbf{Mtoe} = \textbf{million tonnes of oil equivalent}.$

TWh ■ Net imports 250 Ammonia Hydrogen 200 Biomass Offshore wind 150 Onshore wind Solar PV 100 Geothermal Hydro 50 Gas-hydrogen Gas 0 Coal-biomass 2030 2050 2060 2017 2050 2060 2017 ■ Coal-ammonia ■ Coal Baseline CN2050/2060 Nuclear

Figure A.69. Power Generation (MMR-CN2050/2060)

MMR = Myanmar, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

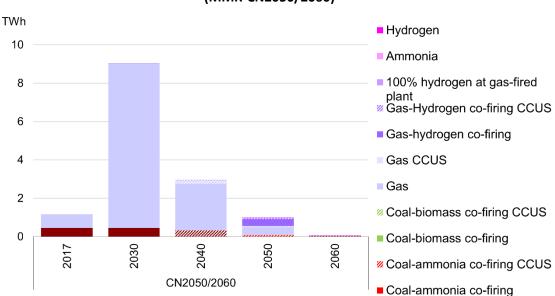


Figure A.70. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (MMR-CN2050/2060)

CCUS = carbon dioxide capture, utilisation, and storage; MMR = Myanmar; TWh = terawatt-hour. Source: Author.

GW ■ Offshore wind ■ Onshore wind ■ Solar PV Battery GWh 0 0 2017 2030 2040 2050 2060 2017 2030 2040 2050 2060

Figure A.71. Variable Renewable Energy and Battery (MMR-CN2050/2060)

 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, MMR = Myanmar, PV = photovoltaic.} \\ \mbox{Source: Author.}$

Baseline

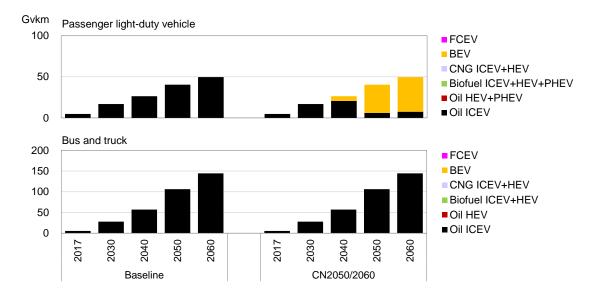
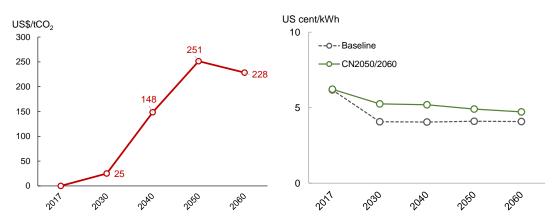


Figure A.72. Travel Distance by Vehicle Technology (MMR-CN2050/2060)

CN2050/2060

BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10⁹ vehicle-km, MMR = Myanmar, PHEV = plug-in hybrid electric vehicle.

Figure A.73. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (MMR-CN2050/2060)



kWh = kilowatt-hour, MMR = Myanmar, $tCO_2 = tonne$ of carbon dioxide.

Source: Author.

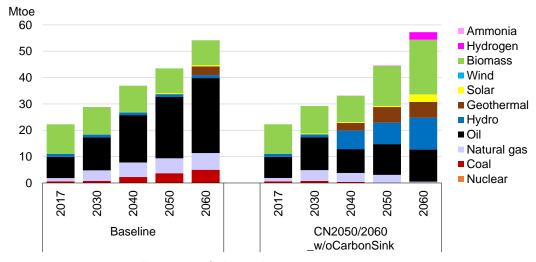
Table A.11. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (MMR-CN2050/2060)

		Basel	ine			MMR-CN2050/2060					
		(MtC	O ₂)					(MtCO ₂))		
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	1.53	2.87	11.40	17.20	22.86	1.57	4.31	0.99	-15.52	-42.68	
Industry	15.11	24.09	31.87	35.91	41.61	15.11	23.41	6.83	2.56	2.90	
Transport	7.84	17.99	27.51	40.16	50.76	7.84	17.99	26.66	32.91	44.37	
Other end	3.09 5.00 5.64 5.64 6.89 3.09 3.84 4.32 4.86								6.26		
use											
Other	1.70	1.70	1.70	1.70	1.70	1.70	1.56	1.16	1.16	1.16	
including											
DACCS											
LULUCF						50.46	25.66	-12.90	-12.90	-12.90	
Energy-	29.27	51.63	78.12	100.60	123.82	29.31	51.12	39.95	25.97	12.00	
related											
CO ₂											
emissions											

MMR = Myanmar, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

(b) CN2050/2060_w/oCarbonSink

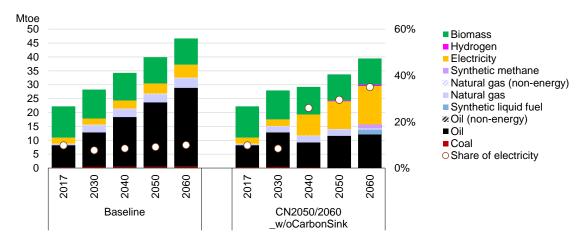
Figure A.74. Primary Energy Supply (MMR-CN2050/2060_w/oCarbonSink)



 $\label{eq:mmr} \mbox{MMR} = \mbox{Myanmar, Mtoe} = \mbox{million tonnes of oil equivalent}.$

Source: Author.

Figure A.75. Final Energy Consumption (MMR-CN2050/2060_w/oCarbonSink)



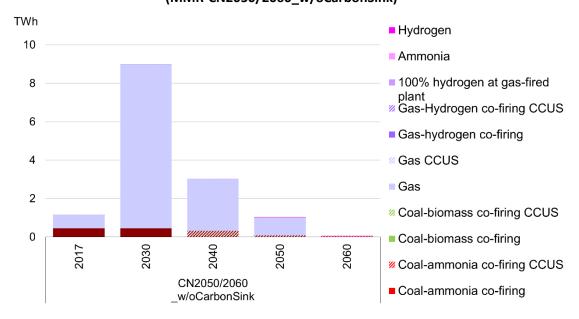
MMR = Myanmar, Mtoe = million tonnes of oil equivalent.

TWh ■ Net imports 250 Ammonia Hydrogen 200 Biomass Offshore wind 150 Onshore wind Solar PV 100 ■ Geothermal Hydro 50 Gas-hydrogen Gas 0 Coal-biomass 2030 2040 2017 2030 2040 2050 2060 2017 2050 2060 Coal-ammonia ■ Coal CN2050/2060 Baseline Nuclear _w/oCarbonSink

Figure A.76. Power Generation (MMR-CN2050/2060_w/oCarbonSink)

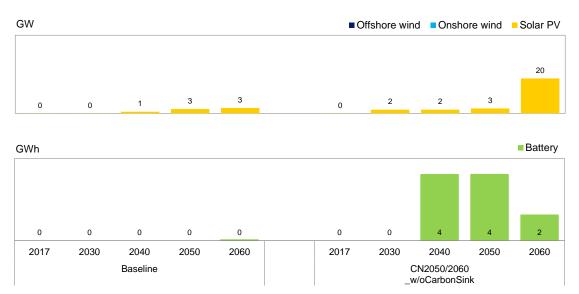
MMR = Myanmar, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

Figure A.77. Generated electricity from Coal, Gas, Ammonia, and Hydrogen (MMR-CN2050/2060_w/oCarbonSink)



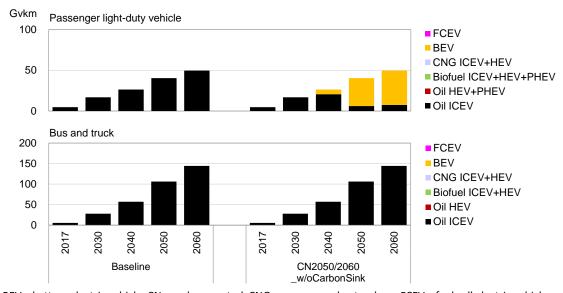
CCUS = carbon dioxide capture, utilisation, and storage; MMR = Myanmar; TWh = terawatt-hour. Source: Author.

Figure A.78. Variable Renewable Energy and Battery (MMR-CN2050/2060_w/oCarbonSink)



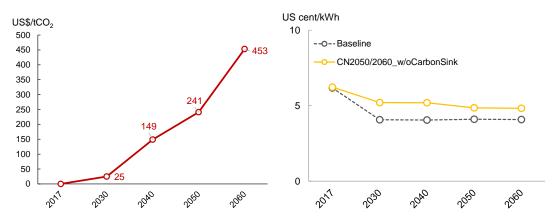
 $\mathsf{GW} = \mathsf{gigawatt}, \mathsf{GWh} = \mathsf{gigawatt}$ -hour, $\mathsf{MMR} = \mathsf{Myanmar}, \mathsf{PV} = \mathsf{photovoltaic}.$ Source: Author.

Figure A.79. Travel Distance by Vehicle Technology (MMR-CN2050/2060_w/oCarbonSink)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10^9 vehicle-km, MMR = Myanmar, PHEV = plug-in hybrid electric vehicle.

Figure A.80. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (MMR-CN2050/2060_w/oCarbonSink)



kWh = kilowatt-hour, MMR = Myanmar, tCO_2 = tonne of carbon dioxide.

Source: Author.

Table A.12. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (MMR-CN2050/2060_w/oCarbonSink)

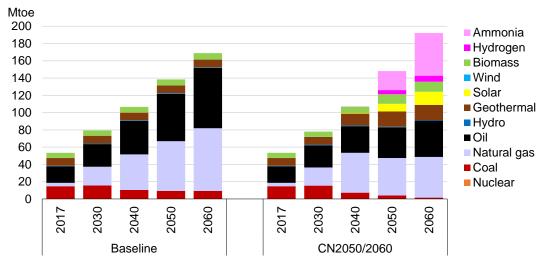
		Baseli	ne			MMR-CN2050/2060_w/oCarbonSink					
		(MtC) ₂)					(MtCO ₂)		
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	1.53	2.87	11.40	17.20	22.86	1.57	4.29	1.08	-23.90	-47.80	
Industry	15.11	24.09	31.87	35.91	41.61	15.11	23.44	2.74	2.56	2.78	
Transport	7.84	17.99	27.51	40.16	50.76	7.84	17.99	26.66	33.84	39.46	
Other end	3.09	5.00	5.64	5.64	6.89	3.09	3.84	4.32	4.32	3.71	
Other											
including DACCS	1.70	1.70	1.70	1.70	1.70	1.70	1.56	1.16	1.16	1.86	
LULUCF											
Energy-											
related CO ₂ emissions	29.27	51.63	78.12	100.60	123.82	29.31	51.12	35.95	17.98	0.00	

MMR = Myanmar, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

7. Philippines

(a) CN2050/2060

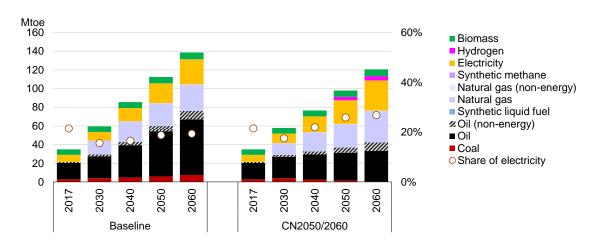
Figure A.81. Primary Energy Supply (PHL-CN2050/2060)



Mtoe = million tonnes of oil equivalent, PHL = Philippines.

Source: Author.

Figure A.82. Final Energy Consumption (PHL-CN2050/2060)



 $\label{eq:Mtoe} \mbox{Mtoe} = \mbox{million tonnes of oil equivalent, PHL} = \mbox{Philippines}.$

TWh ■ Net imports 800 Ammonia 700 Hydrogen 600 Biomass Offshore wind 500 Onshore wind 400 Solar PV 300 Geothermal 200 ■ Hydro Gas-hydrogen 100 Gas 0 Coal-biomass 2017 2030 2040 2050 2060 2017 2050 Coal-ammonia ■ Coal CN2050/2060 Baseline Nuclear

Figure A.83. Power Generation (PHL-CN2050/2060)

PHL = Philippines, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

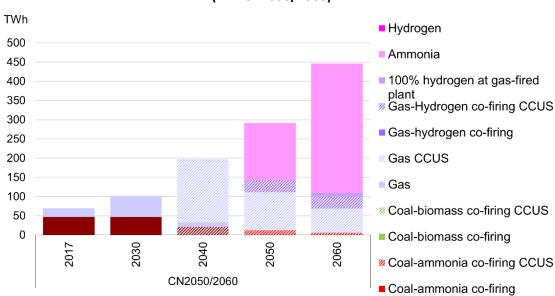
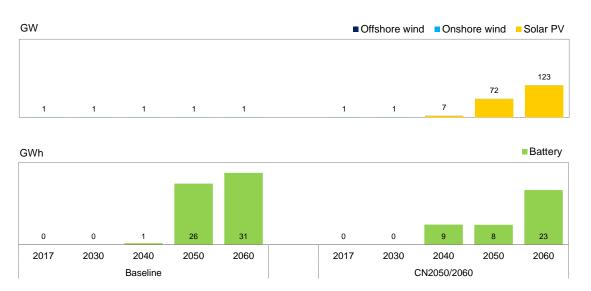


Figure A.84. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (PHL-CN2050/2060)

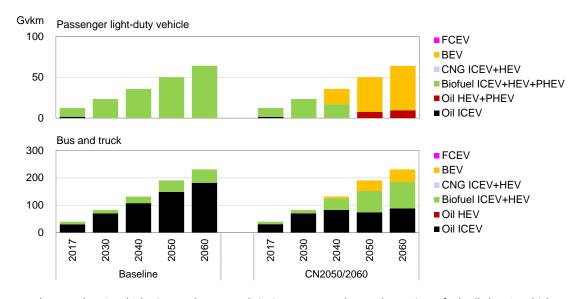
CCUS = carbon dioxide capture, utilisation, and storage; PHL = Philippines; TWh = terawatt-hour. Source: Author.

Figure A.85. Variable Renewable Energy and Battery (PHL-CN2050/2060)



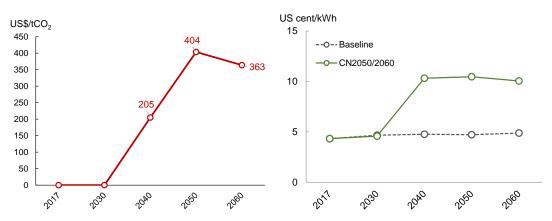
 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, PHL = Philippines, PV = photovoltaic.} \\ \mbox{Source: Author.}$

Figure A.86. Travel Distance by Vehicle Technology (PHL-CN2050/2060)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10^9 vehicle-km, PHEV = plug-in hybrid electric vehicle, PHL = Philippines.

Figure A.87. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (PHL-CN2050/2060)



kWh = kilowatt-hour, PHL = Philippines, $tCO_2 = tonne$ of carbon dioxide.

Source: Author.

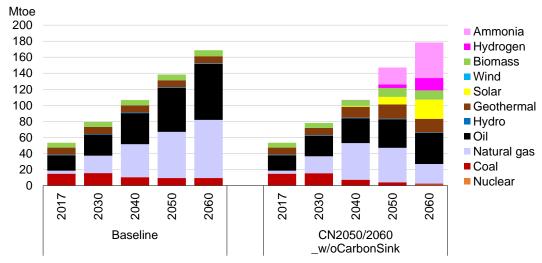
Table A.13. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (PHL-CN2050/2060)

		Baseli	ine				PHL-	CN2050/	2060	
		(MtC	O ₂)					(MtCO ₂)		
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060
Electricity	52.31	60.29	64.83	89.15	109.99	52.31	63.54	7.99	-12.33	-14.00
Industry	15.70	30.08	44.91	67.23	95.25	15.70	28.85	23.26	28.79	36.61
Transport	32.71	57.94	83.46	108.35	127.91	32.71	57.94	75.75	74.04	86.24
Other	15.70	34.63	49.63	55.70	58.00	15.70	29.42	41.69	53.04	57.79
end use										
Other	5.33	4.11	4.47	4.79	5.23	5.33	3.35	1.42	-68.49	-166.63
including										
DACCS										
LULUCF						0.00	0.00	0.00	0.00	0.00
Energy-	121.75	187.04	247.29	325.23	396.38	121.75	183.09	150.11	75.05	0.00
related										
CO ₂										
emissions										

PHL = Philippines, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

(b) CN2050/2060_w/oCarbonSink

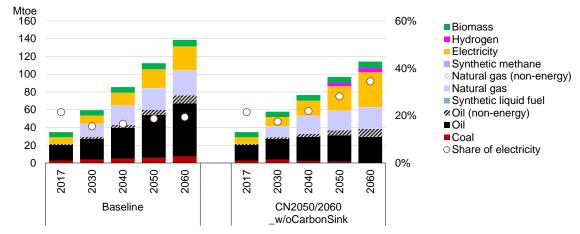
Figure A.88. Primary energy supply (PHL-CN2050/2060_w/oCarbonSink)



Mtoe = million tonnes of oil equivalent, PHL = Philippines.

Source: Author.

Figure A.89. Final Energy Consumption (PHL-CN2050/2060_w/oCarbonSink)



Mtoe = million tonnes of oil equivalent, PHL = Philippines.

TWh ■ Net imports 800 Ammonia 700 Hydrogen 600 Biomass Offshore wind 500 Onshore wind 400 Solar PV 300 Geothermal 200 ■ Hydro Gas-hydrogen 100 Gas 0 Coal-biomass 2040 2030 2040 2050 2017 2030 2050 2060 2017 Coal-ammonia ■ Coal CN2050/2060 Baseline

Figure A.90. Power Generation (PHL-CN2050/2060_w/oCarbonSink)

PHL = Philippines, PV = photovoltaic, TWh = terawatt-hour. Source: Author.

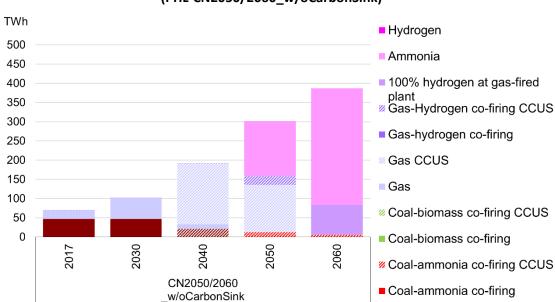


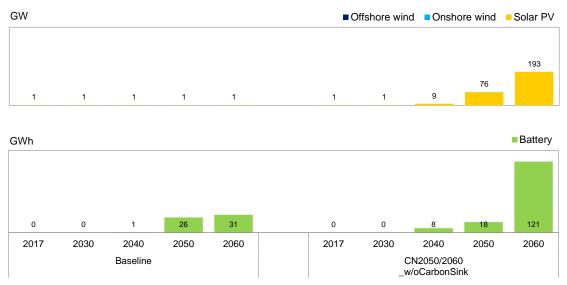
Figure A.91. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (PHL-CN2050/2060_w/oCarbonSink)

_w/oCarbonSink

Nuclear

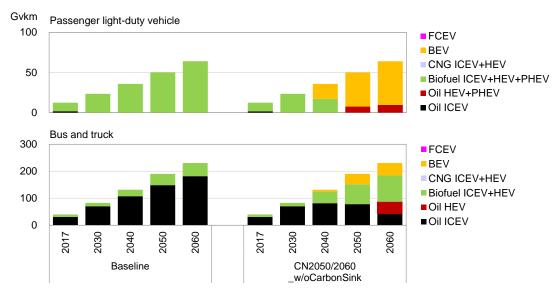
CCUS = carbon dioxide capture, utilisation, and storage; PHL = Philippines; TWh = terawatt-hour. Source: Author.

Figure A.92. Variable Renewable Energy and Battery (PHL-CN2050/2060_w/oCarbonSink)



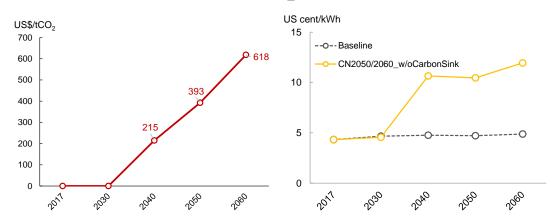
 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, PHL = Philippines, PV = photovoltaic.} \\ \mbox{Source: Author.}$

Figure A.93. Travel Distance by Vehicle Technology (PHL-CN2050/2060_w/oCarbonSink)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10⁹ vehicle-km, PHEV = plug-in hybrid electric vehicle, PHL = Philippines.

Figure A.94. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (PHL-CN2050/2060_w/oCarbonSink)



kWh = kilowatt-hour, PHL = Philippines, $tCO_2 = tonne$ of carbon dioxide.

Source: Author.

Table A.14. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (PHL-CN2050/2060_w/oCarbonSink)

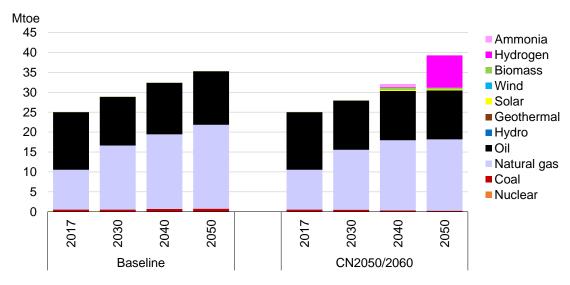
		Baseli	ine			PHL-CN2050/2060_w/oCarbonSink					
		(MtC	O ₂)					(MtCO ₂)			
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	52.31	60.29	64.83	89.15	109.99	52.31	63.53	7.89	-11.66	-17.09	
Industry	15.70	30.08	44.91	67.23	95.25	15.70	28.85	23.27	22.48	15.71	
Transport	32.71	57.94	83.46	108.35	127.91	32.71	57.94	75.84	74.04	75.99	
Other end use	15.70	34.63	49.63	55.70	58.00	15.70	29.42	41.69	52.42	54.24	
Other including DACCS	5.33	4.11	4.47	4.79	5.23	5.33	3.35	1.43	-62.22	-128.86	
LULUCF											
Energy- related CO ₂ emissions	121.75	187.04	247.29	325.23	396.38	121.75	183.09	150.11	75.05	0.00	

PHL = Philippines, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

8. Singapore

(a) CN2050/2060

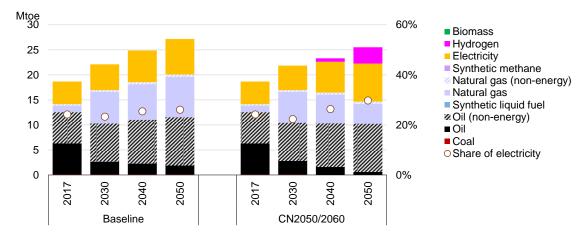
Figure A.95. Primary Energy Supply (SGP-CN2050/2060)



Mtoe = million tonnes of oil equivalent, SGP = Singapore.

Source: Author.

Figure A.96. Final Energy Consumption (SGP-CN2050/2060)



Mtoe = million tonnes of oil equivalent, SGP = Singapore.

TWh ■ Net imports 160 Ammonia 140 Hydrogen 120 Biomass Offshore wind 100 Onshore wind 80 Solar PV 60 Geothermal 40 Hydro Gas-hydrogen 20 Gas 0 Coal-biomass 2017 2017 Coal-ammonia ■ Coal Baseline CN2050/2060 Nuclear

Figure A.97. Power Generation (SGP-CN2050/2060)

PV = photovoltaic, SGP = Singapore, TWh = terawatt-hour. Source: Author.

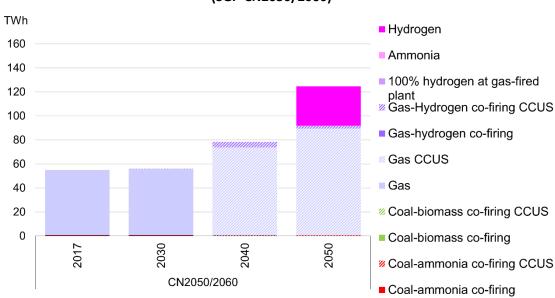
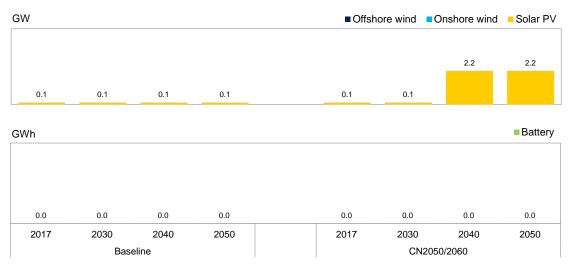


Figure A.98. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (SGP-CN2050/2060)

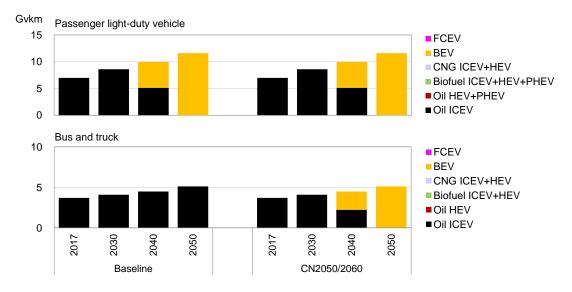
CCUS = carbon dioxide capture, utilisation, and storage; SGP = Singapore; TWh = terawatt-hour. Source: Author.

Figure A.99. Variable Renewable Energy and Battery (SGP-CN2050/2060)



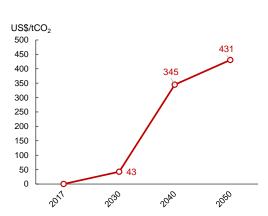
 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, PV = photovoltaic, SGP = Singapore.} \\ \mbox{Source: Author.}$

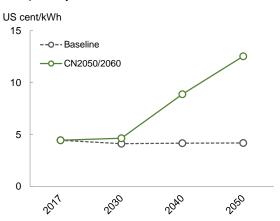
Figure A.100. Travel Distance by Vehicle Technology (SGP-CN2050/2060)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10^9 vehicle-km, PHEV = plug-in hybrid electric vehicle, SGP = Singapore. Source: Author.

Figure A.101. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (SGP-CN2050/2060)





SGP = Singapore, tCO_2 = tonne of carbon dioxide.

Source: Author.

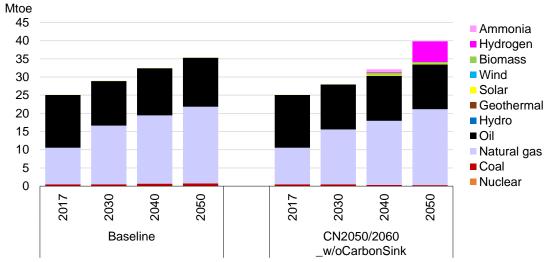
Table A.15. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (SGP-CN2050/2060)

		Baseline	!			SGP-CN2050/2060					
		(MtCO ₂)						(MtCO ₂)		
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	21.10	23.54	28.38	31.70	31.70	21.10	21.37	0.88	1.49	0.78	
Industry	15.52	13.98	15.90	18.17	21.29	15.52	14.03	12.21	8.40	9.49	
Transport	6.60	7.93	6.91	5.85	6.18	6.60	7.93	5.09	1.84	1.95	
Other end	0.60	0.95	0.93	0.89	0.94	0.60	0.95	0.92	0.87	0.91	
Other											
including DACCS	6.57	6.57	6.57	6.57	6.57	6.57	6.51	6.30	-12.60	-13.13	
LULUCF						0.00	0.00	0.00	0.00	0.00	
Energy-											
related CO ₂ emissions	50.40	52.97	58.68	63.18	66.68	50.40	50.79	25.39	0.00	0.00	

SGP = Singapore, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

(b) CN2050/2060_w/oCarbonSink

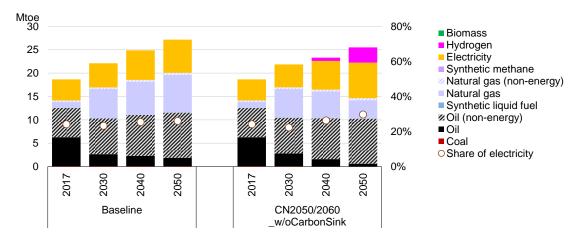
Figure A.102. Primary Energy Supply (SGP-CN2050/2060_w/oCarbonSink)



Mtoe = million tonnes of oil equivalent, SGP = Singapore.

Source: Author.

Figure A.103. Final Energy Consumption (SGP-CN2050/2060_w/oCarbonSink)

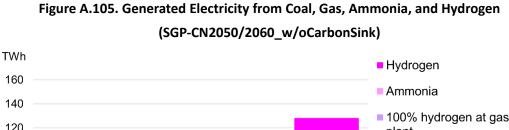


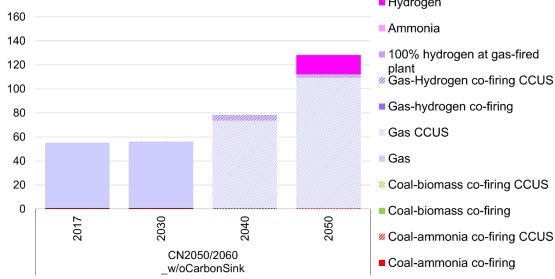
Mtoe = million tonnes of oil equivalent, SGP = Singapore.

TWh ■ Net imports 160 Ammonia 140 Hydrogen 120 ■ Biomass Offshore wind 100 Onshore wind 80 Solar PV 60 Geothermal 40 Hydro Gas-hydrogen 20 Gas 0 Coal-biomass 2017 2040 2050 2017 2040 Coal-ammonia ■ Coal Baseline CN2050/2060 Nuclear w/oCarbonSink

Figure A.104. Power Generation (SGP-CN2050/2060_w/oCarbonSink)

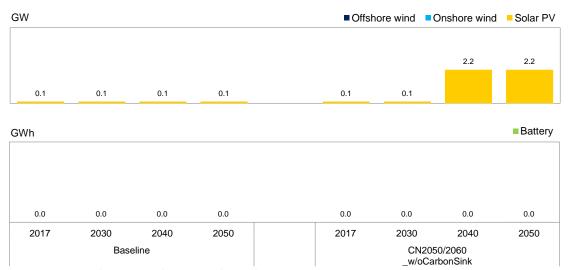
PV = photovoltaic, SGP = Singapore, TWh = terawatt-hour. Source: Author.





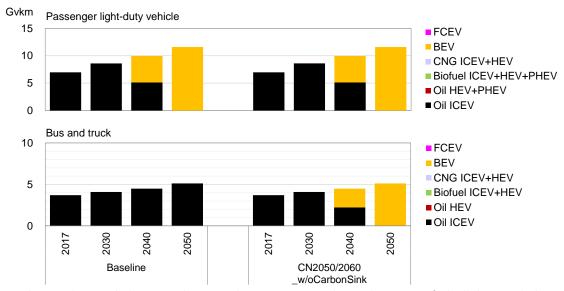
CCUS = carbon dioxide capture, utilisation, and storage; SGP = Singapore; TWh = terawatt-hour. Source: Author.

Figure A.106. Variable Renewable Energy and Battery (SGP-CN2050/2060_w/oCarbonSink)



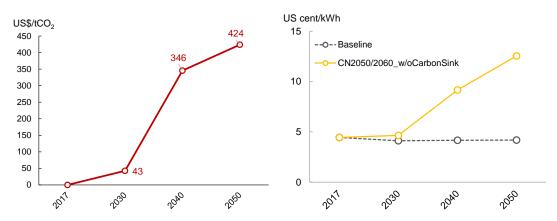
 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, PV = photovoltaic, SGP = Singapore.} \\ \mbox{Source: Author.}$

Figure A.107. Travel Distance by Vehicle Technology (SGP-CN2050/2060_w/oCarbonSink)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10^9 vehicle-km, PHEV = plug-in hybrid electric vehicle, SGP = Singapore.

Figure A.108. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (SGP-CN2050/2060_w/oCarbonSink)



kWh = kilowatt-hour, SGP = Singapore, tCO_2 = tonne of carbon dioxide.

Source: Author.

Table A.16. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (SGP-CN2050/2060_w/oCarbonSink)

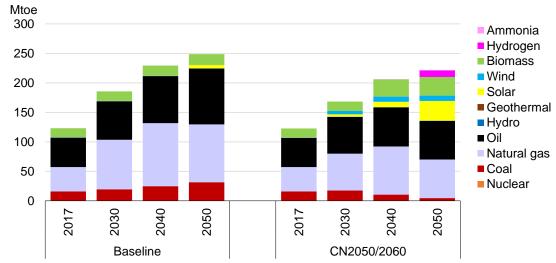
		Baseline				SGP-CN2050/2060_w/oCarbonSink					
		(MtCO₂)						(MtCO ₂)		
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	21.10	23.54	28.38	31.70	31.70	21.10	21.37	0.88	2.19	0.97	
Industry	15.52	13.98	15.90	18.17	21.29	15.52	14.03	12.21	8.40	9.49	
Transport	6.60	7.93	6.91	5.85	6.18	6.60	7.93	5.09	1.84	1.95	
Other end	0.60	0.95	0.93	0.89	0.94	0.60	0.95	0.92	0.87	0.91	
use	0.00	0.55	0.55	0.03	0.54	0.00	0.55	0.52	0.07	0.51	
Other											
including	6.57	6.57	6.57	6.57	6.57	6.57	6.51	6.30	-13.29	-13.33	
DACCS											
LULUCF											
Energy-											
related CO₂	50.40	52.97	58.68	63.18	66.68	50.40	50.79	25.39	0.00	0.00	
emissions											

SGP = Singapore, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

9. Thailand

(a) CN2050/2060

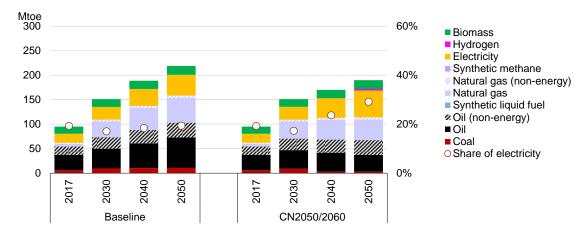
Figure A.109. Primary Energy Supply (THA-CN2050/2060)



Mtoe = million tonnes of oil equivalent, THA = Thailand.

Source: Author.

Figure A.110. Final Energy Consumption (THA-CN2050/2060)



Mtoe = million tonnes of oil equivalent, THA = Thailand.

TWh ■ Net imports 1400 Ammonia 1200 Hydrogen Biomass 1000 Offshore wind 800 Onshore wind Solar PV 600 Geothermal 400 ■ Hydro 200 Gas-hydrogen Gas 0 Coal-biomass 2030 2040 2017 2050 2017 2050 Coal-ammonia ■ Coal CN2050/2060 Baseline

■ Nuclear

Figure A.111. Power Generation (THA-CN2050/2060)

PV = photovoltaic, THA = Thailand, TWh = terawatt-hour. Source: Author.

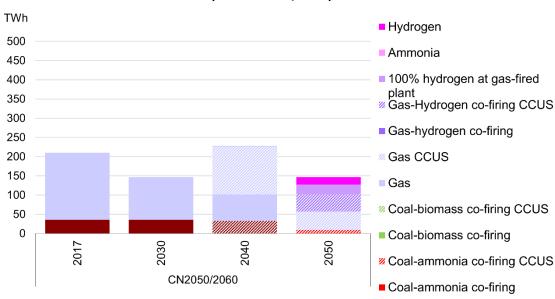


Figure A.112. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (THA-CN2050/2060)

CCUS = carbon dioxide capture, utilisation, and storage; THA = Thailand; TWh = terawatt-hour. Source: Author.

GW ■ Offshore wind ■ Onshore wind ■ Solar PV 354 149 81 46 3 3 Battery GWh 0 0 0 13 2017 2030 2040 2050 2017 2030 2040 2050

CN2050/2060

Figure A.113. Variable Renewable Energy and Battery (THA-CN2050/2060)

GW = gigawatt, GWh = gigawatt-hour, PV = photovoltaic, THA = Thailand. Source: Author.

Baseline

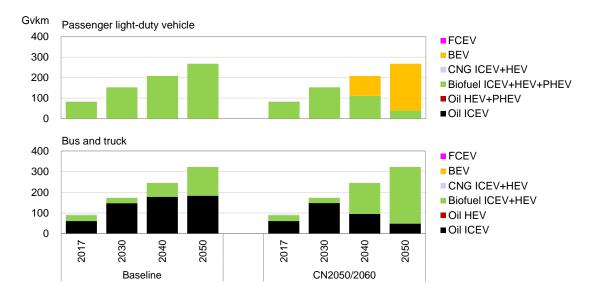
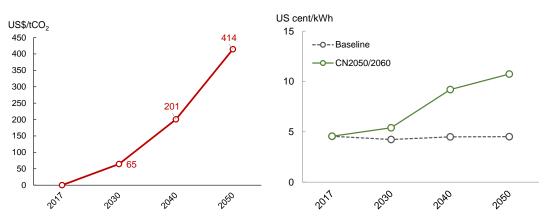


Figure A.114. Travel Distance by Vehicle Technology (THA-CN2050/2060)

BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 109 vehicle-km, PHEV = plug-in hybrid electric vehicle, THA = Thailand. Source: Author.

Figure A.115. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (THA-CN2050/2060)



kWh = kilowatt-hour, $tCO_2 = tonne$ of carbon dioxide, THA = Thailand.

Source: Author.

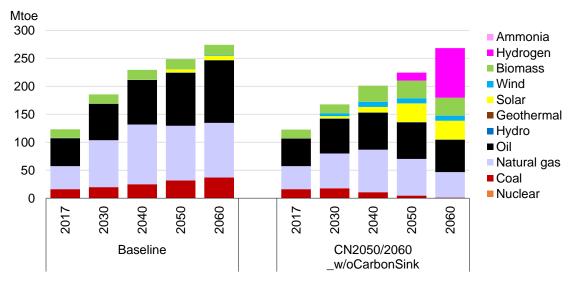
Table A.17. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (THA-CN2050/2060)

		Baseli	ne			THA-CN2050/2060						
		(MtC	O ₂)					(MtCO ₂)				
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060		
Electricity	97.27	130.66	172.12	161.54	183.92	97.25	73.45	-17.37	-52.72	-53.13		
Industry	43.07	101.30	143.12	182.23	223.42	43.07	97.80	82.47	80.43	93.20		
Transport	71.29	104.55	120.16	127.37	131.07	71.29	104.55	103.81	91.02	92.05		
Other	16 20	22.25	20.01	42.25	20 77	16 20	22.20	20.74	42.60	27.06		
end use	16.38	32.35	39.01	43.35	38.77	16.38	32.28	38.74	42.60	37.96		
Other												
including	25.60	25.71	28.16	30.01	30.83	24.29	18.44	16.61	-39.33	-48.08		
DACCS												
LULUCF						-91.00	-115.40	-117.70	-120.00	-120.00		
Energy-												
related	253.60	394.55	502.57	544.50	608.01	252.27	326.51	224.25	122.00	122.00		
CO ₂	255.00	394.33	302.37	344.30	000.01	232.27	320.51	224.25	122.00	122.00		
emissions												

THA = Thailand, $MtCO_2$ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

(b) CN2050/2060_w/oCarbonSink

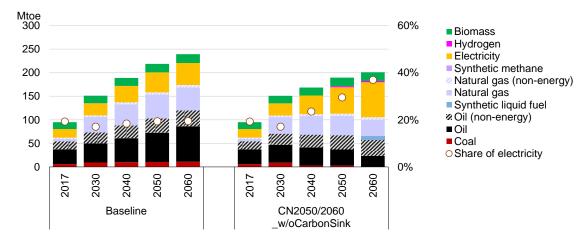
Figure A.116. Primary Energy Supply (THA-CN2050/2060_w/oCarbonSink)



 $\label{eq:Mtoe} \mbox{Mtoe} = \mbox{million tonnes of oil equivalent, THA} = \mbox{Thailand}.$

Source: Author.

Figure A.117. Final Energy Consumption (THA-CN2050/2060_w/oCarbonSink)



Mtoe = million tonnes of oil equivalent, THA = Thailand.

TWh ■ Net imports 1400 Ammonia 1200 Hydrogen ■ Biomass 1000 Offshore wind 800 Onshore wind Solar PV 600 Geothermal 400 ■Hydro Gas-hydrogen 200 Gas 0 ■ Coal-biomass 2017 2030 2040 2050 2060 2017 2030 2040 2060 2050 Coal-ammonia ■ Coal Baseline CN2050/2060 ■ Nuclear _w/oCarbonSink

Figure A.118. Power Generation (THA-CN2050/2060_w/oCarbonSink)

PV = photovoltaic, THA = Thailand, TWh = terawatt-hour. Source: Author.

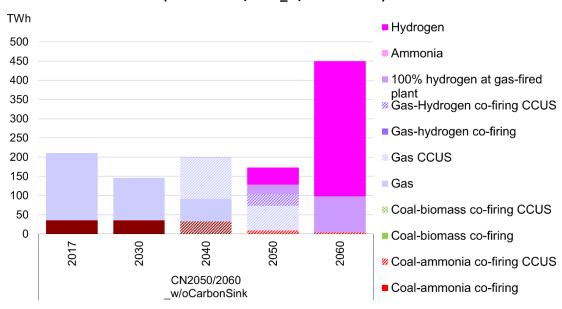
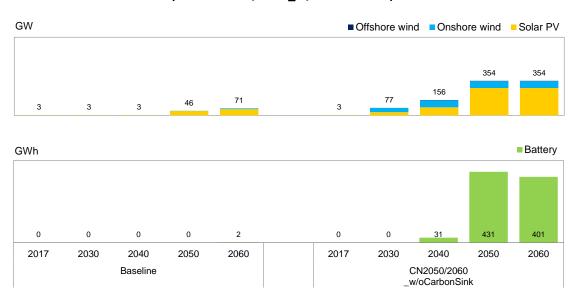


Figure A.119. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (THA-CN2050/2060_w/oCarbonSink)

CCUS = carbon dioxide capture, utilisation, and storage; THA = Thailand; TWh = terawatt-hour. Source: Author.

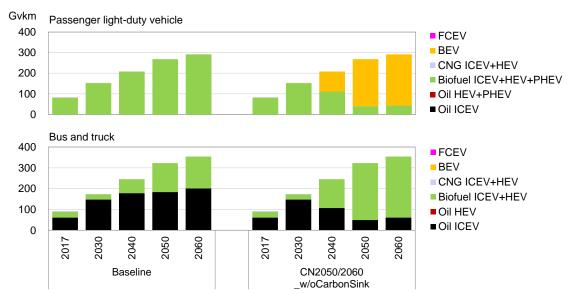
Figure A.120. Variable Renewable Energy and Battery (THA-CN2050/2060_w/oCarbonSink)



 $\label{eq:GW} \textbf{GW} = \textbf{gigawatt}, \textbf{GWh} = \textbf{gigawatt-hour}, \ \textbf{PV} = \textbf{photovoltaic}, \ \textbf{THA} = \textbf{Thailand}.$

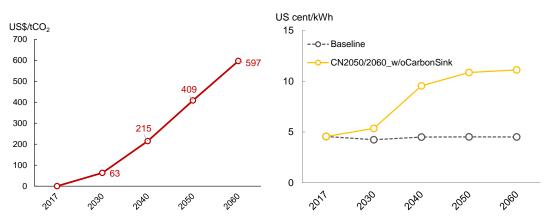
Source: Author.

Figure A.121. Travel Distance by Vehicle Technology (THA-CN2050/2060_w/oCarbonSink)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10⁹ vehicle-km, PHEV = plug-in hybrid electric vehicle, THA = Thailand.

Figure A.122. (Left) Marginal Carbon Dioxide Abatement Cost, (Right) Electricity Price (THA-CN2050/2060_w/oCarbonSink)



kWh = kilowatt-hour, $tCO_2 = tonne$ of carbon dioxide, THA = Thailand.

Source: Author.

Table A.18. Carbon Dioxide Emission Baseline and without Carbon Sink Scenarios (THA-CN2050/2060_w/oCarbonSink)

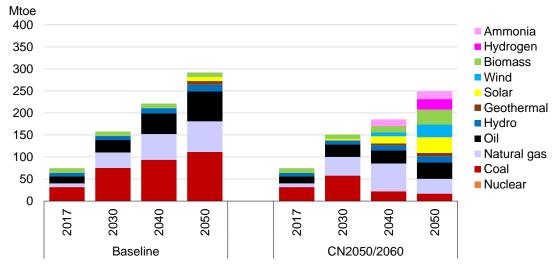
		Baseli	ine			THA-CN2050/2060_w/oCarbonSink					
		(MtC	O ₂)					(MtCO ₂)			
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060	
Electricity	97.27	130.66	172.12	161.54	183.92	97.25	73.12	-21.81	-52.52	-56.34	
Industry	43.07	101.30	143.12	182.23	223.42	43.07	98.13	80.36	78.32	52.26	
Transport	71.29	104.55	120.16	127.37	131.07	71.29	104.55	103.81	91.02	91.32	
Other	16.38	32.35	39.01	43.35	38.77	16.38	32.24	38.74	42.60	35.59	
end use											
Other											
including	25.60	25.71	28.16	30.01	30.83	24.29	18.47	16.58	-50.58	-122.82	
DACCS											
LULUCF											
Energy-											
related	253.60	394.55	502.57	544.50	608.01	252.27	326.51	217.67	108.84	0.00	
CO ₂	233.00	334.33	302.37	J44.JU	000.01	232.27	320.31	217.07	100.04	0.00	
emissions	1.1.1.000										

THA = Thailand, MtCO2 = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.

10. Viet Nam

(a) CN2050/2060

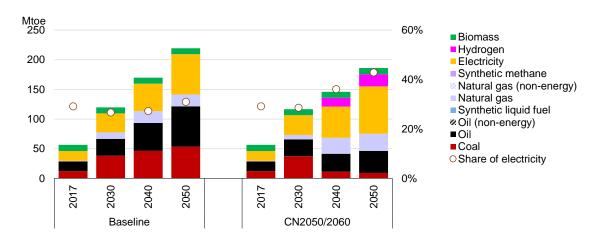
Figure A.123. Primary Energy Supply (VNM-CN2050/2060)



Mtoe = million tonnes of oil equivalent, VNM = Viet Nam.

Source: Author.

Figure A.124. Final Energy Consumption (VNM-CN2050/2060)



Mtoe = million tonnes of oil equivalent, VNM = Viet Nam.

TWh ■ Net imports 1800 Ammonia 1600 Hydrogen 1400 ■ Biomass 1200 Offshore wind 1000 Onshore wind 800 Solar PV 600 Geothermal 400 Hydro 200 Gas-hydrogen 0 Gas -200 Coal-biomass 2030 2017 2030 2040 2017 2040 2050 Coal-ammonia ■ Coal Baseline CN2050/2060 Nuclear

Figure A.125. Power Generation (VNM-CN2050/2060)

TWh = terawatt-hour, VNM = Viet Nam.

Source: Author.

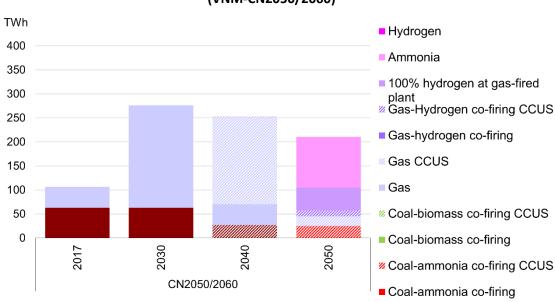


Figure A.126. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (VNM-CN2050/2060)

 $CCUS = carbon\ dioxide\ capture,\ utilisation,\ and\ storage;\ TWh = terawatt-hour;\ VNM = Viet\ Nam.$ Source: Author.

GW ■ Offshore wind ■ Onshore wind ■ Solar PV 409 168 78 27 Battery GWh 0 2017 2030 2040 2050 2017 2030 2040 2050

Figure A.127. Variable Renewable Energy and Battery (VNM-CN2050/2060)

 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, PV = photovoltaic, VNM = Viet Nam.} \\ \mbox{Source: Author.}$

Baseline

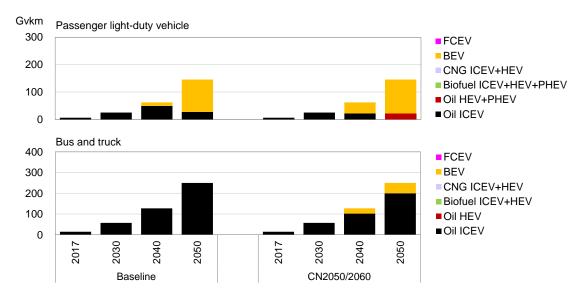
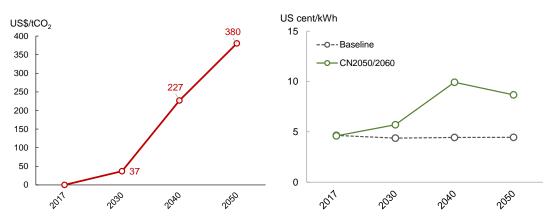


Figure A.128. Travel Distance by Vehicle Technology (VNM-CN2050/2060)

CN2050/2060

BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle,, Gvkm = 10^9 vehicle-km, PHEV = plug-in hybrid electric vehicle, VNM = Viet Nam.

Figure A.129. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (VNM-CN2050/2060)



kWh = kilowatt-hour, tCO₂ = tonne of carbon dioxide, VNM = Viet Nam.

Source: Author.

Table A.19. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (VNM-CN2050/2060)

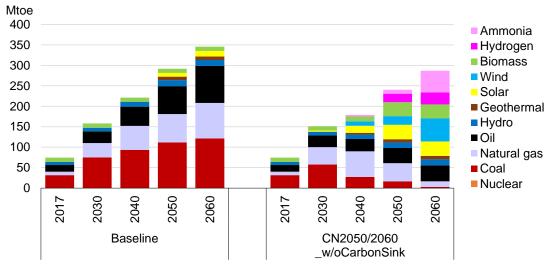
		Baseli	ine				VNM	-CN2050/	2060	
		(MtC	O ₂)					(MtCO ₂)		
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060
Electricity	82.78	184.95	251.39	311.89	364.80	82.78	147.91	23.34	-95.01	-95.72
Industry	54.03	164.14	229.98	299.17	354.77	54.03	160.57	86.89	80.81	59.52
Transport	32.83	71.32	104.10	130.69	166.35	32.83	71.32	84.40	103.21	130.25
Other	12.00	29.23	42.66	42.27	38.49	12.98	20.01	26.21	30.66	32.79
end use	12.98	29.23	42.00	42.27	36.49	12.90	20.01	20.21	50.00	32.79
Other										
including	12.30	18.27	26.46	35.16	44.52	12.30	15.74	15.58	-62.37	-69.55
DACCS										
LULUCF						-39.49	-58.50	-58.50	-58.50	-58.50
Energy-										
related	194.93	467.91	654.58	819.18	968.94	194.93	415.56	236.43	57.30	E7 20
CO ₂	194.93	407.91	034.38	019.10	906.94	194.93	413.30	230.43	37.30	57.30
emissions										

VNM = Viet Nam, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage,

LULUCF = land use, land-use change and forestry.

(b) CN2050/2060_w/oCarbonSink

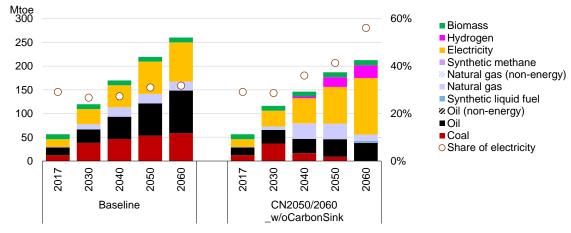
Figure A.130. Primary Energy Supply (VNM-CN2050/2060_w/oCarbonSink)



Mtoe = million tonnes of oil equivalent, VNM = Viet Nam.

Source: Author.

Figure A.131. Final Energy Consumption (VNM-CN2050/2060_w/oCarbonSink)



Mtoe = million tonnes of oil equivalent, VNM = Viet Nam.

TWh ■ Net imports 1800 Ammonia 1600 Hydrogen 1400 ■ Biomass 1200 Offshore wind 1000 Onshore wind 800 Solar PV 600 Geothermal 400 ■Hydro 200 Gas-hydrogen Gas -200 ■ Coal-biomass 2017 2030 2040 2050 2060 2017 2050 2060 Coal-ammonia ■ Coal Baseline CN2050/2060 ■ Nuclear _w/oCarbonSink

Figure A.132. Power Generation (VNM-CN2050/2060_w/oCarbonSink)

PV = photovoltaic, TWh = terawatt-hour, VNM = Viet Nam. Source: Author.

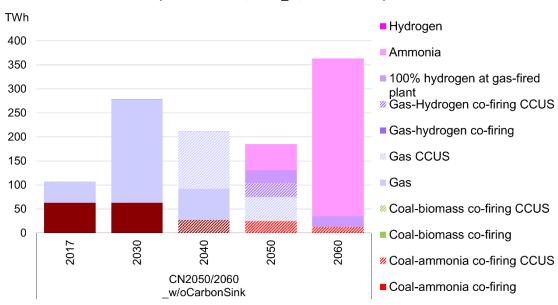
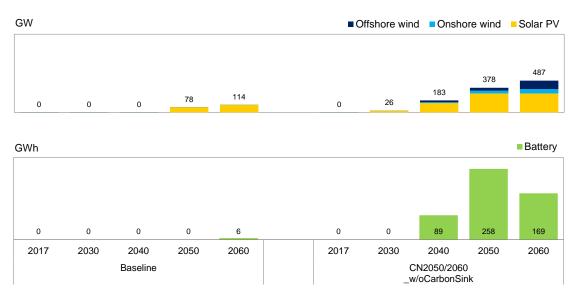


Figure A.133. Generated Electricity from Coal, Gas, Ammonia, and Hydrogen (VNM-CN2050/2060_w/oCarbonSink)

CCUS = carbon dioxide capture, utilisation, and storage; TWh = terawatt-hour; VNM = Viet Nam. Source: Author.

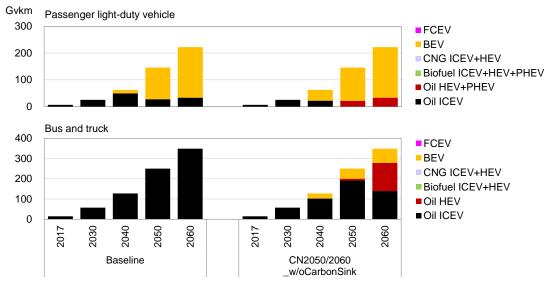
Figure A.134. Variable Renewable Energy and Battery (VNM-CN2050/2060_w/oCarbonSink)



 $\label{eq:GW} \mbox{GW = gigawatt, GWh = gigawatt-hour, PV = photovoltaic, VNM = Viet Nam.}$

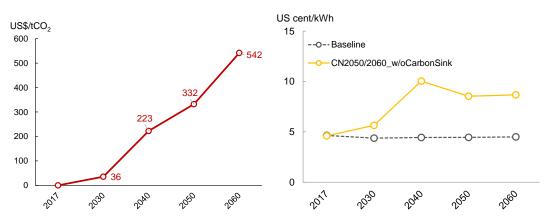
Source: Author.

Figure A.135. Travel Distance by Vehicle Technology (VNM-CN2050/2060_w/oCarbonSink)



BEV = battery electric vehicle, CN = carbon neutral, CNG = compressed natural gas, FCEV = fuel cell electric vehicle, HEV = hybrid electric vehicle, ICEV = internal combustion engine vehicle, Gvkm = 10⁹ vehicle-km, PHEV = plug-in hybrid electric vehicle, VNM = Viet Nam.

Figure A.136. Marginal Carbon Dioxide Abatement Cost (Left), Electricity Price (Right) (VNM-CN2050/2060_w/oCarbonSink)



kWh = kilowatt-hour, $tCO_2 = tonne$ of carbon dioxide, $VNM = Viet\ Nam$.

Source: Author.

Table A.20. Carbon Dioxide Emission Baseline and with Carbon Sink Scenarios (VNM-CN2050/2060_w/oCarbonSink)

		Baseli	ine			VNN	л-CN2050	/2060_w	/oCarbon	Sink
		(MtC	O ₂)					(MtCO ₂)		
	2017	2030	2040	2050	2060	2017	2030	2040	2050	2060
Electricity	82.78	184.95	251.39	311.89	364.80	82.78	148.83	29.10	-93.39	-97.21
Industry	54.03	164.14	229.98	299.17	354.77	54.03	159.63	121.71	98.84	31.13
Transport	32.83	71.32	104.10	130.69	166.35	32.83	71.32	84.40	102.58	116.52
Other	12.98	29.23	42.66	42.27	38.49	12.98	20.01	26.21	21.49	12.73
end use	12.50	23.23	42.00	42.27	30.43	12.50	20.01	20.21	21.43	12.73
Other										
including	12.30	18.27	26.46	35.16	44.52	12.30	15.76	15.61	9.00	-63.17
DACCS										
LULUCF										
Energy-										
related	194.93	467.91	654.58	819.18	968.94	194.93	415.56	277.04	138.52	0.00
CO ₂	134.33	407.31	034.36	017.10	300.34	134.33	413.30	2//.04	130.32	0.00
emissions										

VNM = Viet Nam, MtCO₂ = Million tonne of carbon dioxide, DACCS = Direct Air Carbon Capture and Storage, LULUCF = land use, land-use change and forestry.