

Net-Zero America - kentucky state report

2021-03-18

These data underlie graphs and tables presented in the Princeton Net-Zero America study:

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Notes

- These data are all data from the study available at https://netzeroamerica.prince-ton.edu.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one "no new policies" reference scenario. In this document, state-level results are grouped by scenario. For some scenarios, the study generated national, but not statelevel results.
- Within results for a given scenario, data tables are organized into corresponding sections of the full net-zero study (e.g., Pillar 1, Pillar 2, etc.)
- For Pillar 6 (Land sinks), values shown are maximum carbon storage potentials.

Data by category and subcategory

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Table 1: E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		12,650	14,338				
Sales of cooking units - Electric	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Resistance (%)							
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of space heating units - Gas Furnace (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3
Sales of water heating units - Gas Furnace (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

Table 2: E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.26	3.36	4.91	5.18	4.05	4.16
Cumulative 5-yr (billion \$2018)							

Table 3: E+ scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97
Final energy use - Industry (PJ)	382	396	409	403	409	414	415
Final energy use - Residential (PJ)	184	171	156	137	121	111	106
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193

Table 4: E+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		3.38	3.59				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	76.9	81.8	96.9	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Sales of space heating units - Electric	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Heat Pump (%)							
Sales of space heating units - Electric	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Resistance (%)							
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of water heating units - Electric	0	8.47	44.9	53	53.3	53.4	53.4
Heat Pump (%)							
Sales of water heating units - Electric	62.5	70	49.2	44.5	44.3	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	34.2	19.2	3.59	0.151	0	0	0
(%)							
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38

Table 5: E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		840	2,147	3,490	5,282	5,754	5,483
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		1.72		7.66		12.4
units)							
Public EV charging plugs - L2 (1000 units)	0.251		41.4		184		298
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.56	1.82	1.26	0.403	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.9	15.1	46.4	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78.1	48.9	16.6	3.3	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.4	4.53	3.21	1.19	0.29	0.063	0
Vehicle sales - Light-duty - hydrogen FC	0.11	0.34	0.203	0.063	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 6: E+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	5.14	0	0	5.51	0
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0.071
Capital invested - Solar PV - Constrained (billion \$2018)		0.091	0	0	0	0.132	0.08
Capital invested - Wind - Constrained (billion \$2018)		0	0.098	0.431	0.052	0	0
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	45.2	72.8	103	147	208	288	390
Installed renewables - Solar - Base land use assumptions (MW)	80	80	80	80	80	80	170
Installed renewables - Solar - Constrained land use assumptions (MW)	80	80	80	80	80	80	80
Installed renewables - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	73.6	421	465	465	465

Table 7: E+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

Table 7: E+ scenario - PILLAR 2: Clean Electricity - Generation (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Biomass w/ccu power plant (GWh)	0	0	5,771	5,771	5,771	11,950	11,950
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	145	145	145	145	145	145	283
Solar - Constrained land use assumptions	145	145	145	145	145	145	145
(GWh)							
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions	0	0	217	1,055	1,146	1,146	1,146
(GWh)							

Table 8: E+ scenario - PILLAR 3: Clean fuels - Bioenergy

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)		0	227	552	552	902	902
Conversion capital investment -		0	4,717	5,838	0	6,983	0
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	6	6	8	8
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	4	4	4	9	9
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	1	1
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

Table 9: E+ scenario - PILLAR 4: CCUS - CO2 capture

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	5.71	20.1	22.8	35.3	34.1
Annual - BECCS (MMT)		0	5.71	13.2	13	21.4	21.4
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	6.95	6.44	10.4	9.12
Cumulative - All (MMT)		0	5.71	25.9	48.6	83.9	118
Cumulative - BECCS (MMT)		0	5.71	18.9	31.9	53.4	74.8
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)		0	0	6.95	13.4	23.8	33

Table 10: E+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	505	1,390	1,455	2,534	2,836
Cumulative investment - All (million \$2018)		0	1,724	2,883	2,920	3,762	4,000
Cumulative investment - Spur (million \$2018)		0	284	929	966	1,808	2,046
Cumulative investment - Trunk (million \$2018)		0	1,440	1,954	1,954	1,954	1,954
Spur (km)		0	230	1,031	1,097	2,176	2,477
Trunk (km)		0	275	359	359	359	359

Table 11: E+ scenario - PILLAR 4: CCUS - CO2 storage

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	1.1	1.76	3.61	5.16	6.52
Injection wells (wells)		0	1	4	7	12	15
Resource characterization, appraisal, permitting costs (million \$2020)		45.8	128	165	165	165	165
Wells and facilities construction costs (million \$2020)		0	30.5	119	212	354	439

Table 12: E+ scenario - PILLAR 6: Land sinks - Agriculture

Table 12: E+ Scenario - PILLAR 6: Land Sink			0000	0005	00/0	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-432
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							4.040
Carbon sink potential - Aggressive							-4,963
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-136
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-5,532
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-432
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,618
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-67.9
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-3,118
deployment - Total (1000 tCO2e/y)							•
Land impacted for carbon sink -							188
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,250
Aggressive deployment - Cropland							_,
measures (1000 hectares)							
Land impacted for carbon sink -							247
Aggressive deployment - Permanent							2-71
conservation cover (1000 hectares)							
Land impacted for carbon sink -				+		+	2,685
Aggressive deployment - Total (1000							2,000
hectares)							
Land impacted for carbon sink - Moderate							188
deployment - Corn-ethanol to energy							100
grasses (1000 hectares)							1,187
Land impacted for carbon sink - Moderate							1,187
deployment - Cropland measures (1000							
hectares)							45.
Land impacted for carbon sink - Moderate							124
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,498
deployment - Total (1000 hectares)							
uepioyment - Total (1000 nectares)							

Table 13: E+ scenario - PILLAR 6: Land sinks - Forests

Table 13: E+ scenario - PILLAR 6: Land sini		0005	0000	0005	00/0	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-96.7
regeneration (1000 tC02e/y)							
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tC02e/y)							
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,409
cropland (1000 tCO2e/y)							.,
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tCO2e/y)							10,201
Carbon sink potential - High - Restore							-3,200
productivity (1000 tCO2e/y)							-3,200
Carbon sink potential - Low - Accelerate							-48.5
							-46.5
regeneration (1000 tC02e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,177
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-24.5
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,555
retention of HWP (1000 tCO2e/y)							·
Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tCO2e/y)							333
Carbon sink potential - Low - Reforest							-704
cropland (1000 tCO2e/y)							-104
Carbon sink potential - Low - Reforest							-773
							-113
pasture (1000 tC02e/y)							1.070
Carbon sink potential - Low - Restore							-1,079
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-72.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-17,376
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-897
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,923
rotation length (1000 tCO2e/y)							•
Carbon sink potential - Mid - Improve							-35.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-3,110
retention of HWP (1000 tC02e/y)							0,110
Carbon sink potential - Mid - Increase							-651
							-031
trees outside forests (1000 tC02e/y)							1.057
Carbon sink potential - Mid - Reforest							-1,057
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-5,490
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-2,139
productivity (1000 tCO2e/y)							
,	[

Table 13: E+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							15.8
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							208
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,891
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							17.7
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							91.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							.,
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							.,
(1000 hectares)							
Land impacted for carbon sink potential -							7.91
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							.,,
(1000 hectares)							
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							.,
hectares)							
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							0.00
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							O
hectares)							
Land impacted for carbon sink potential -			+			+	48.3
Low - Increase trees outside forests							40.5
(1000 hectares)							
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							40.0
Land impacted for carbon sink potential -						+	50.3
Low - Reforest pasture (1000 hectares)							30.3
							642
Land impacted for carbon sink potential - Low - Restore productivity (1000							642
hectares)							0 107
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							
(1000 hectares)							44.0
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)							

Tahla 12. Fx	econario -	DTIIAP 6.	Land sinks -	Enrecte	(continued)
Table 15. Et	SCEHUITO -	PILLAK O.	LUIIU SIIIKS -	FULLS IS	CUITUITURUT

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 14: E+ scenario - IMPACTS - Fossil fuel industries

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		263	222	178	134	84.2	58.4
Natural gas consumption - Cumulative (tcf)							5,358
Natural gas production - Annual (tcf)		96.2	91	79.2	67	53.1	41.3
Oil consumption - Annual (million bbls)		88.2	77.2	61.2	46.1	34.1	24.3
Oil consumption - Cumulative (million bbls)							1,887
Oil production - Annual (million bbls)		2.93	2.94	2.94	2.33	1.89	1.26

Table 15: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		761	2.43	2.42	2.27	1.72	0.168
Monetary damages from air pollution - Natural Gas (million 2019\$)		166	129	71.3	56.6	24.6	8.83
Monetary damages from air pollution - Transportation (million 2019\$)		1,223	1,135	858	493	225	90.1
Premature deaths from air pollution - Coal (deaths)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Natural Gas (deaths)		18.7	14.5	8.05	6.39	2.78	0.997
Premature deaths from air pollution - Transportation (deaths)		138	128	96.5	55.5	25.3	10.1

Table 16: E+ scenario - IMPACTS - Jobs

2020	2025	2030	2035	2040	2045	2050
	96.7	299	1,155	982	1,266	1,043
	3,515	4,016	4,488	3,984	3,689	3,953
	6,895	8,210	10,972	10,457	8,644	10,810
	3,343	2,045	1,485	1,026	741	535
	2020	96.7 3,515 6,895	96.7 299 3,515 4,016 6,895 8,210	96.7 299 1,155 3,515 4,016 4,488 6,895 8,210 10,972	96.7 299 1,155 982 3,515 4,016 4,488 3,984 6,895 8,210 10,972 10,457	96.7 299 1,155 982 1,266 3,515 4,016 4,488 3,984 3,689 6,895 8,210 10,972 10,457 8,644

Table 16: E+ scenario - IMPACTS - Jobs (continued)

Table 16: E+ Scending - IMPACTS - Jubs (co	-						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		192	198	249	252	245	305
By economic sector - Pipeline (jobs)		384	485	428	317	312	353
By economic sector - Professional (jobs)		2,162	1,906	2,831	2,559	2,950	2,893
By economic sector - Trade (jobs)		2,011	1,576	1,563	1,364	1,319	1,276
By economic sector - Utilities (jobs)		5,255	5,483	6,059	5,536	4,636	4,648
By education level - All sectors -		7,408	7,599	9,006	8,212	7,226	7,950
Associates degree or some college (jobs)							
By education level - All sectors -		4,990	4,941	5,868	5,290	4,789	5,164
Bachelors degree (jobs)							
By education level - All sectors - Doctoral		139	128	162	144	149	151
degree (jobs)		10.101	10.150	10.000		10.505	
By education level - All sectors - High		10,191	10,458	12,880	11,654	10,535	11,394
school diploma or less (jobs)		1100	1000	1.01/		1100	
By education level - All sectors - Masters		1,128	1,092	1,314	1,177	1,102	1,156
or professional degree (jobs)				2.252	2.222		
By resource sector - Biomass (jobs)		295	796	3,253	2,933	4,620	4,463
By resource sector - CO2 (jobs)		24.2	1,338	1,452	1,106	1,664	2,392
By resource sector - Coal (jobs)		3,153	589	505	432	384	339
By resource sector - Grid (jobs)		5,665	6,646	8,440	7,292	6,211	6,045
By resource sector - Natural Gas (jobs)		4,926	4,400	3,428	3,561	2,066	1,464
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		4,580	3,754	2,855	2,011	1,414	933
By resource sector - Solar (jobs)		2,727	3,196	4,630	4,869	4,415	6,347
By resource sector - Wind (jobs)		2,484	3,499	4,667	4,273	3,026	3,833
Median wages - Annual - All (\$2019 per		54,997	55,154	55,014	55,539	56,203	56,450
job)							
On-Site or In-Plant Training - Total jobs - 1		3,827	3,908	4,608	4,177	3,679	4,012
to 4 years (jobs)							
On-Site or In-Plant Training - Total jobs - 4		1,415	1,435	1,626	1,462	1,306	1,382
to 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		3,777	3,876	4,748	4,311	3,904	4,248
None (jobs)							
On-Site or In-Plant Training - Total jobs -		191	200	236	216	191	209
Over 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		14,645	14,798	18,012	16,312	14,721	15,965
Up to 1 year (jobs)							
On-the-Job Training - All sectors - 1 to 4		4,882	4,989	5,848	5,304	4,658	5,080
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,345	1,370	1,552	1,397	1,246	1,317
years (jobs)							
On-the-Job Training - All sectors - None		1,241	1,246	1,496	1,352	1,237	1,345
(jobs)			,		•		
On-the-Job Training - All sectors - Over 10		233	247	296	271	236	270
years (jobs)							
On-the-Job Training - All sectors - Up to 1		16,154	16,366	20,038	18,153	16,423	17,804
year (jobs)		, -	-,	,	-,	-, -	,
Related work experience - All sectors - 1		8,676	8,710	10,438	9,429	8,449	9,108
to 4 years (jobs)		7,512	7,772	,	.,	,	.,
Related work experience - All sectors - 4		5,489	5,568	6,575	5,960	5,299	5,768
to 10 years (jobs)		5, .5,	3,333	3,5.5	0,700	0,277	0,.00
Related work experience - All sectors -		3,382	3,477	4,217	3,821	3,452	3,720
None (jobs)		0,002	0,411	7,211	0,021	0,402	0,120
Related work experience - All sectors -		1,540	1,575	1,873	1,704	1,497	1,660
Over 10 years (jobs)		1,040	1,010	1,010	1,104	1,771	1,000
Related work experience - All sectors - Up		4,768	4,887	6,126	5,562	5,103	5,559
to 1 year (jobs)		4,100	4,001	0,120	5,502	5,105	0,009
Wage income - All (million \$2019)		1,312	1,336	1,608	1,471	1,338	1,457
vvago moomo - An (million 42017)		1,012	1,330	1,000	1,411	1,000	1,401

Table 17: E- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		12,642	14,325				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	43.5	47.1	51.3	61.6	76.1	85	88
Resistance (%)							
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric	5.4	22.1	27.3	42.8	66.9	83.6	89.9
Heat Pump (%)							
Sales of space heating units - Electric	3.11	4.17	4.24	4.4	4.84	5.52	5.99
Resistance (%)							
Sales of space heating units - Fossil (%)	15.1	5.03	4.61	3.36	1.65	0.539	0.139
Sales of space heating units - Gas Furnace	76.4	68.7	63.8	49.5	26.6	10.3	3.94
(%)							
Sales of water heating units - Electric	0.117	1.95	7.08	21.8	44.5	59.3	64.4
Heat Pump (%)							
Sales of water heating units - Electric	4.29	6.36	8.3	14.3	23.5	29.4	31.5
Resistance (%)							
Sales of water heating units - Gas Furnace	94.4	90.1	83.1	62.2	30.5	9.74	2.54
(%)							
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

Table 18: E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.71	2.75	3.26	3.36	4.25	4.44
Cumulative 5-yr (billion \$2018)							

Table 19: E- scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	119	117	114	110	106	103
Final energy use - Industry (PJ)	382	396	410	408	416	420	420
Final energy use - Residential (PJ)	184	172	163	153	142	129	118
Final energy use - Transportation (PJ)	427	394	360	333	312	287	259

Table 20: E- scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		3.35	3.47				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	76.8	77.4	79.5	85.1	92.9	97.7	99.4
Resistance (%)							
Sales of cooking units - Gas (%)	23.2	22.6	20.5	14.9	7.09	2.29	0.616
Sales of space heating units - Electric	26.6	35.6	39.7	51.4	69.2	80.7	84.7
Heat Pump (%)							
Sales of space heating units - Electric	26.5	28.2	26.4	21.5	14.1	9.46	7.83
Resistance (%)							
Sales of space heating units - Fossil (%)	9.65	12.5	11.9	9.77	6.6	4.55	3.88
Sales of space heating units - Gas (%)	37.2	23.6	22	17.4	10.1	5.25	3.56
Sales of water heating units - Electric	0	1.46	5.6	17.5	35.8	47.8	51.9
Heat Pump (%)							
Sales of water heating units - Electric	62.5	74	71.8	64.8	54.3	47.5	45.1
Resistance (%)							
Sales of water heating units - Gas Furnace	34.2	22.2	20.3	15.3	7.52	2.39	0.624
(%)							
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.38	2.39	2.38	2.38

Table 21: E- scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		0	135	286	962	3,037	4,422
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		0.518		2.83		7.94
units)							
Public EV charging plugs - L2 (1000 units)	0.251		12.5		68		191
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC	0.332	0.969	2.74	7.17	15.7	26.3	34
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.57	1.98	2.06	1.64	1.05	0.538	0.231
Vehicle sales - Light-duty - EV (%)	1.88	4.66	11.8	25.8	48.3	72	87.5
Vehicle sales - Light-duty - gasoline (%)	91.8	87.5	79.7	66.7	46.3	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.56	5.37	6.03	5.49	4.12	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC	0.113	0.38	0.326	0.249	0.177	0.098	0.046
(%)							
Vehicle sales - Light-duty - other (%)	0.103	0.107	0.097	0.085	0.061	0.034	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 22: E- scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-432
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-4,963
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-136
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-5,532
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Moderate							-432
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,618
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-67.9
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-3,118
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							188
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,250
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							247
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							

Table 22: E- scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							2,685
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							188
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,187
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							124
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,498
deployment - Total (1000 hectares)							

Table 23: E- scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-96.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,409
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tC02e/y)							
Carbon sink potential - High - Restore							-3,200
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-48.5
regeneration (1000 tC02e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tCO2e/y)							•
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,177
rotation length (1000 tCO2e/y)							•
Carbon sink potential - Low - Improve							-24.5
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,555
retention of HWP (1000 tCO2e/y)							•
Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-704
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-773
pasture (1000 tC02e/y)							
Carbon sink potential - Low - Restore							-1,079
productivity (1000 tCO2e/y)							.,017
Carbon sink potential - Mid - Accelerate		+					-72.6
regeneration (1000 tC02e/y)							. 2.0

Table 23: E- scenario - PILLAR 6: Land sinks - Forests (continued)

Item Carbon sink potential - Mid - All (not	2020	2025	2030	2035	2040	2045	2050 -17,376
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tC02e/y)							-2,139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

Table 23: E- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							
(1000 hectares)							44.0
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)							200
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							1000
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							
hectares)							10.0
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares) Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							70
hectares)							
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							09.9
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							303
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							1,293
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							4,022
hectares)							
Hectal est							

Table 24: E- scenario - IMPACTS - Health

Table 24. L- Scendi lo - IMPACTO - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		761	2.43	2.42	2.27	1.72	0.168
Coal (million 2019\$)							
Monetary damages from air pollution -		142	85.7	32.8	14.1	4.84	2.76
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,243	1,249	1,211	1,086	860	589
Transportation (million 2019\$)							
Premature deaths from air pollution -		85.9	0.275	0.273	0.256	0.195	0.019
Coal (deaths)							
Premature deaths from air pollution -		16.1	9.67	3.71	1.59	0.547	0.312
Natural Gas (deaths)							
Premature deaths from air pollution -		140	141	136	122	96.8	66.2
Transportation (deaths)							

Table 25: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		12,650	14,338				
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of space heating units - Gas Furnace (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3
Sales of water heating units - Gas Furnace (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

Table 26: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.26	3.36	4.91	5.18	4.05	4.16
Cumulative 5-yr (billion \$2018)							

Table 27: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview

11										
Item	2020	2025	2030	2035	2040	2045	2050			
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97			
Final energy use - Industry (PJ)	382	396	409	403	409	414	415			
Final energy use - Residential (PJ)	184	171	156	137	121	111	106			
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193			

Table 28: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		3.38	3.59				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	76.9	81.8	96.9	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Sales of space heating units - Electric	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Heat Pump (%)							
Sales of space heating units - Electric	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Resistance (%)							
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of water heating units - Electric	0	8.47	44.9	53	53.3	53.4	53.4
Heat Pump (%)							
Sales of water heating units - Electric	62.5	70	49.2	44.5	44.3	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	34.2	19.2	3.59	0.151	0	0	0
(%)							
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38

Table 29: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		840	2,147	3,490	5,282	5,754	5,483
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		1.72		7.66		12.4
units)							
Public EV charging plugs - L2 (1000 units)	0.251		41.4		184		298
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.56	1.82	1.26	0.403	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.9	15.1	46.4	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78.1	48.9	16.6	3.3	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.4	4.53	3.21	1.19	0.29	0.063	0
Vehicle sales - Light-duty - hydrogen FC	0.11	0.34	0.203	0.063	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 30: E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion		0	0	0	0	0.519	5.27
\$2018)							
Capital invested - Wind - Base (billion		0	0	0	0.302	0.116	0.175
\$2018)							
Installed renewables - OffshoreWind -	0	0	0	0	0	0	0
Base land use assumptions (MW)							
Installed renewables - OffshoreWind -	0	0	0	0	0	0	0
Constrained land use assumptions (MW)							
Installed renewables - Solar - Base land	80	80	80	80	80	699	7,359
use assumptions (MW)							
Installed renewables - Solar -	160	160	160	160	160	1,870	15,347
Constrained land use assumptions (MW)							
Installed renewables - Wind - Base land	0	0	0	0	256	359	524
use assumptions (MW)							
Installed renewables - Wind - Constrained	0	0	147	930	930	930	930
land use assumptions (MW)							

Table 31: E+RE+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	145	145	145	145	145	1,075	11,440
Solar - Constrained land use assumptions	289	289	289	289	289	2,876	23,756
(GWh)							
Wind - Base land use assumptions (GWh)	0	0	0	0	623	860	1,310
Wind - Constrained land use assumptions	0	0	433	2,292	2,292	2,292	2,292
(GWh)							

Table 32: E+RE+ scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-432
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-4,963
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-136
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-5,532
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-432
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,618
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-67.9
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-3,118
deployment - Total (1000 tCO2e/y)							-, -
Land impacted for carbon sink -							188
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,250
Aggressive deployment - Cropland							_,
measures (1000 hectares)							
Land impacted for carbon sink -							247
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,685
Aggressive deployment - Total (1000							2,000
hectares)							
Land impacted for carbon sink - Moderate	+					+	188
deployment - Corn-ethanol to energy							100
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,187
deployment - Cropland measures (1000							1,101
hectares)							
Land impacted for carbon sink - Moderate							124
							124
deployment - Permanent conservation cover (1000 hectares)							
							1 / 00
Land impacted for carbon sink - Moderate							1,498
deployment - Total (1000 hectares)							

Table 33: E+RE+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-96.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							

Table 33: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase							-96
trees outside forests (1000 tC02e/y)							1 / 0/
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,40
Carbon sink potential - High - Reforest pasture (1000 tC02e/y)							-10,20
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,95
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)							-25
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,17
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,55
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-70
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-77
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,07
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,37
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-89
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,92
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,11
Carbon sink potential - Mid - Increase rees outside forests (1000 tCO2e/y)							-6
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,05
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,49
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,13
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 nectares)							15
and impacted for carbon sink potential - ligh - Avoid deforestation (over 30 years)							20
1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,8
and impacted for carbon sink potential - High - Improve plantations (1000 nectares)							17

Table 33: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase retention of HWP (1000							0
hectares)							
Land impacted for carbon sink potential -							91.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							000
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							1,061
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							4,000
(1000 hectares)							
Land impacted for carbon sink potential -							7.91
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							
(1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							40.0
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							30.3
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							0-12
hectares)							
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							
hectares)							10.0
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares) Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							10
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Table 33: E+RE+	. cronario -	DTII AD A.	I and cinke -	Forests	(continued)
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Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 34: E+RE+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		761	2.43	2.42	2.27	1.72	0.168
Coal (million 2019\$)							
Monetary damages from air pollution -		138	98.7	54.6	33.5	10.3	3.25
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,223	1,135	858	493	225	90.1
Transportation (million 2019\$)							
Premature deaths from air pollution -		85.9	0.275	0.273	0.256	0.195	0.019
Coal (deaths)							
Premature deaths from air pollution -		15.6	11.1	6.16	3.78	1.16	0.366
Natural Gas (deaths)							
Premature deaths from air pollution -		138	128	96.5	55.5	25.3	10.1
Transportation (deaths)							

Table 35: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		12,650	14,338				
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of space heating units - Gas Furnace (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3
Sales of water heating units - Gas Furnace (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

Table 36: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.26	3.36	4.91	5.18	4.05	4.16
Cumulative 5-yr (billion \$2018)							

Table 37: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97

Table 37: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview (continued)

	-	-	•	-			
Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	382	396	409	403	409	414	415
Final energy use - Residential (PJ)	184	171	156	137	121	111	106
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193

Table 38: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		3.38	3.59				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	76.9	81.8	96.9	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Sales of space heating units - Electric	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Heat Pump (%)							
Sales of space heating units - Electric	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Resistance (%)							
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of water heating units - Electric	0	8.47	44.9	53	53.3	53.4	53.4
Heat Pump (%)							
Sales of water heating units - Electric	62.5	70	49.2	44.5	44.3	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	34.2	19.2	3.59	0.151	0	0	0
(%)							
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38

Table 39: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		840	2,147	3,490	5,282	5,754	5,483
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		1.72		7.66		12.4
units)							
Public EV charging plugs - L2 (1000 units)	0.251		41.4		184		298
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.56	1.82	1.26	0.403	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.9	15.1	46.4	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78.1	48.9	16.6	3.3	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.4	4.53	3.21	1.19	0.29	0.063	0
Vehicle sales - Light-duty - hydrogen FC	0.11	0.34	0.203	0.063	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 40: E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion		0	0	0	0	0	0
\$2018)							
Capital invested - Solar PV - Constrained		0	0	0	0	0	0
(billion \$2018)							
Installed renewables - OffshoreWind -	0	0	0	0	0	0	0
Base land use assumptions (MW)							
Installed renewables - OffshoreWind -	0	0	0	0	0	0	0
Constrained land use assumptions (MW)							
Installed renewables - Solar - Base land	80	80	80	80	80	80	80
use assumptions (MW)							
Installed renewables - Solar -	80	80	80	80	80	80	80
Constrained land use assumptions (MW)							
Installed renewables - Wind - Base land	0	0	0	0	0	0	0
use assumptions (MW)							
Installed renewables - Wind - Constrained	0	0	0	0	0	0	0
land use assumptions (MW)							

Table 41: E+RE- scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	145	145	145	145	145	145	145
Solar - Constrained land use assumptions (GWh)	145	145	145	145	145	145	145
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

Table 42: E+RE- scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Aggressive deployment - Cropland measures (1000							-4,963
tCO2e/y) Carbon sink potential - Aggressive							-136
deployment - Permanent conservation cover (1000 tC02e/y)							
Carbon sink potential - Aggressive deployment - Total (1000 tC02e/y)							-5,532
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tC02e/y)							-3,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188

Table 42: E+RE- scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							2,250
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							247
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,685
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							188
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,187
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							124
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,498
deployment - Total (1000 hectares)							

Table 43: E+RE- scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							•
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,409
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-3,200
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-48.5
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,177
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-24.5
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,555
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-704
cropland (1000 tCO2e/y)							

Table 43: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

Conhon sink notantial Low Referent	2020	2025	2030	2035	2040	2045	205 -77
Carbon sink potential - Low - Reforest							-//
pasture (1000 tC02e/y)							1.07
Carbon sink potential - Low - Restore							-1,07
productivity (1000 tC02e/y)							70
Carbon sink potential - Mid - Accelerate							-72.
regeneration (1000 tCO2e/y)							17.07
Carbon sink potential - Mid - All (not							-17,37
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-89
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,92
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-35.
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-3,11
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-65
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-1,05
cropland (1000 tCO2e/y)							.,
Carbon sink potential - Mid - Reforest							-5,49
pasture (1000 tC02e/y)							0,47
Carbon sink potential - Mid - Restore							-2,13
productivity (1000 tCO2e/y)							-2,13
Land impacted for carbon sink potential -							15.
							15.
High - Accelerate regeneration (1000							
hectares)							00
Land impacted for carbon sink potential -							20
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,89
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							17.
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							91.
High - Increase trees outside forests							, 11
(1000 hectares)							
Land impacted for carbon sink potential -							93.
High - Reforest cropland (1000 hectares)							73.
Land impacted for carbon sink potential -							29
							29
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,06
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,66
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							7.9
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							19
Low - Avoid deforestation (over 30 years)							.,
(1000 hectares)							
Land impacted for carbon sink potential -							1,10
Low - Extend rotation length (1000							1,10
LOW - LALGIN I OLALION ICHIGLII (1000							

Table 43: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000							8.86
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							.0.0
(1000 hectares)							
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							
(1000 hectares) Land impacted for carbon sink potential -							1,999
							1,999
Mid - Extend rotation length (1000 hectares)							
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares)							10.0
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 44: E+RE- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		761	2.43	2.42	2.27	1.72	0.168
Coal (million 2019\$)							
Monetary damages from air pollution -		140	91.6	117	86.9	29.1	8.96
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,223	1,135	858	493	225	90.1
Transportation (million 2019\$)							
Premature deaths from air pollution -		85.9	0.275	0.273	0.256	0.195	0.019
Coal (deaths)							
Premature deaths from air pollution -		15.7	10.3	13.2	9.81	3.29	1.01
Natural Gas (deaths)							
Premature deaths from air pollution -		138	128	96.5	55.5	25.3	10.1
Transportation (deaths)							

Table 45: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		12,642	14,325				
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric Heat Pump (%)	5.4	22.1	27.3	42.8	66.9	83.6	89.9
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.24	4.4	4.84	5.52	5.99
Sales of space heating units - Fossil (%)	15.1	5.03	4.61	3.36	1.65	0.539	0.139
Sales of space heating units - Gas Furnace (%)	76.4	68.7	63.8	49.5	26.6	10.3	3.94
Sales of water heating units - Electric Heat Pump (%)	0.117	1.95	7.08	21.8	44.5	59.3	64.4
Sales of water heating units - Electric Resistance (%)	4.29	6.36	8.3	14.3	23.5	29.4	31.5
Sales of water heating units - Gas Furnace (%)	94.4	90.1	83.1	62.2	30.5	9.74	2.54
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

Table 46: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.71	2.75	3.26	3.36	4.25	4.44
Cumulative 5-yr (billion \$2018)							

Table 47: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	119	117	114	110	106	103
Final energy use - Industry (PJ)	382	396	410	408	416	420	420
Final energy use - Residential (PJ)	184	172	163	153	142	129	118
Final energy use - Transportation (PJ)	427	394	360	333	312	287	259

Table 48: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		3.35	3.47				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	76.8	77.4	79.5	85.1	92.9	97.7	99.4
Resistance (%)							
Sales of cooking units - Gas (%)	23.2	22.6	20.5	14.9	7.09	2.29	0.616
Sales of space heating units - Electric	26.6	35.6	39.7	51.4	69.2	80.7	84.7
Heat Pump (%)							
Sales of space heating units - Electric	26.5	28.2	26.4	21.5	14.1	9.46	7.83
Resistance (%)							
Sales of space heating units - Fossil (%)	9.65	12.5	11.9	9.77	6.6	4.55	3.88
Sales of space heating units - Gas (%)	37.2	23.6	22	17.4	10.1	5.25	3.56
Sales of water heating units - Electric	0	1.46	5.6	17.5	35.8	47.8	51.9
Heat Pump (%)							
Sales of water heating units - Electric	62.5	74	71.8	64.8	54.3	47.5	45.1
Resistance (%)							
Sales of water heating units - Gas Furnace	34.2	22.2	20.3	15.3	7.52	2.39	0.624
(%)							
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.38	2.39	2.38	2.38

Table 49: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		0	135	286	962	3,037	4,422
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		0.518		2.83		7.94
units)							
Public EV charging plugs - L2 (1000 units)	0.251		12.5		68		191
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC	0.332	0.969	2.74	7.17	15.7	26.3	34
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.57	1.98	2.06	1.64	1.05	0.538	0.231
Vehicle sales - Light-duty - EV (%)	1.88	4.66	11.8	25.8	48.3	72	87.5
Vehicle sales - Light-duty - gasoline (%)	91.8	87.5	79.7	66.7	46.3	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.56	5.37	6.03	5.49	4.12	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC	0.113	0.38	0.326	0.249	0.177	0.098	0.046
(%)							
Vehicle sales - Light-duty - other (%)	0.103	0.107	0.097	0.085	0.061	0.034	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 50: E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam	0	0	0	0	0	0.018	0
power plant (billion \$2018) Capital invested - Biomass w/ccu power	0	0	31.9	0	7.92	5.72	0
plant (billion \$2018)							

Table 51: E-B+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	18	18
Biomass w/ccu power plant (GWh)	0	0	35,757	35,757	44,647	51,069	51,069

Table 52: E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy

	•	0,					
Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)		0	2,298	2,298	2,870	3,689	3,789
Conversion capital investment -		0	29,223	0	7,265	9,733	1,101
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	1	1
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	5	6
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	29	29	36	40	40
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0

Table 52: E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

Table 53: E-B+ scenario - PILLAR 4: CCUS - CO2 capture

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	35.4	35.4	47.5	59.7	61.2
Annual - BECCS (MMT)		0	35.4	35.4	44.2	56.3	57.5
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0	0	0	0.14
Cumulative - All (MMT)		0	35.4	70.8	118	178	239
Cumulative - BECCS (MMT)		0	35.4	70.8	115	171	229
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)		0	0	0	0	0	0.14

Table 54: E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	1,500	1,584	1,637	2,764	3,373
Cumulative investment - All (million \$2018)		0	3,203	3,800	4,513	5,600	6,265
Cumulative investment - Spur (million \$2018)		0	1,678	1,677	1,686	2,774	3,438
Cumulative investment - Trunk (million \$2018)		0	1,525	2,123	2,827	2,827	2,827
Spur (km)		0	1,225	1,225	1,195	2,322	2,931
Trunk (km)		0	275	359	442	442	442

Table 55: E-B+ scenario - PILLAR 4: CCUS - CO2 storage

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	1.85	6.42	13.1	17.7	18.4
Injection wells (wells)		0	3	12	21	35	44
Resource characterization, appraisal, permitting costs (million \$2020)		45.8	201	311	311	311	311
Wells and facilities construction costs (million \$2020)		0	91.4	356	635	1,062	1,318

Table 56: E-B+ scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-971
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-4,584
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Aggressive							-124
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-5,680
deployment - Total (1000 tCO2e/y)							

Table 56: E-B+ scenario - PILLAR 6: Land sinks - Agriculture (continued)

Table 56: E-B+ scenario - PILLAR 6: Land s							
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-971
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,418
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy							
crops (1000 tC02e/y)							
Carbon sink potential - Moderate							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Moderate							-62.1
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-3,451
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							395
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							5,086
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							92.2
Aggressive deployment - Cropland to							
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							432
Aggressive deployment - Pasture to							
energy crops (1000 hectares)							
Land impacted for carbon sink -							226
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							6,231
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							395
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,086
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							92.2
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							432
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							113
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							2,118
deployment - Total (1000 hectares)							

Table 57: E-B+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							-21,196
Carbon sink potential - High - Avoid deforestation (1000 tC02e/y)							-1,537

Table 57: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tC02e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tC02e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,409
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-3,200
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-48.5
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tC02e/y)							
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,177
rotation length (1000 tC02e/y)							_,
Carbon sink potential - Low - Improve							-24.5
plantations (1000 tCO2e/y)							24.0
Carbon sink potential - Low - Increase							-1,555
retention of HWP (1000 tC02e/y)							1,000
Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tC02e/y)							-330
Carbon sink potential - Low - Reforest							-704
·							-104
cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest							-773
pasture (1000 tC02e/y)							-113
							1.070
Carbon sink potential - Low - Restore							-1,079
productivity (1000 tCO2e/y)							70.
Carbon sink potential - Mid - Accelerate							-72.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-17,376
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-897
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,923
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-35.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-3,110
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-651
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,057
cropland (1000 tCO2e/y)							,
Carbon sink potential - Mid - Reforest							-5,490
pasture (1000 tC02e/y)							0,170
Carbon sink potential - Mid - Restore							-2,139
productivity (1000 tC02e/y)							کران <i>۲</i>
Land impacted for carbon sink potential -	-			-	-		15.8
High - Accelerate regeneration (1000							10.0
= -							
hectares)							000
Land impacted for carbon sink potential -							208
High - Avoid deforestation (over 30 years)							

Table 57: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020			2035	2040	2045	2050
Land impacted for carbon sink potential -							2,891
High - Extend rotation length (1000							, -
hectares)							
Land impacted for carbon sink potential -							17.7
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							·
hectares)							
Land impacted for carbon sink potential -							91.7
High - Increase trees outside forests							7
(1000 hectares)							
Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							70.2
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							290
							1 0 / 1
Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							7.91
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							_
hectares)							
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							10.0
(1000 hectares)							
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							40.0
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							50.5
							642
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							
hectares)							0.407
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -				T			202
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							
hectares)							
		+	+				13.3
Land impacted for carbon sink potential -				l l		1	13.3

<u>Table 57: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)</u>

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 58: E-B+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		761	2.43	2.42	2.27	1.72	0.168
Coal (million 2019\$)							
Monetary damages from air pollution -		144	82.8	45.5	28.5	14.3	5.55
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,243	1,249	1,211	1,086	860	589
Transportation (million 2019\$)							
Premature deaths from air pollution -		85.9	0.275	0.273	0.256	0.195	0.019
Coal (deaths)							
Premature deaths from air pollution -		16.3	9.35	5.14	3.22	1.62	0.626
Natural Gas (deaths)							
Premature deaths from air pollution -		140	141	136	122	96.8	66.2
Transportation (deaths)							

Table 59: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		12,419	12,935				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	43.5	45.6	45.9	45.7	46	45.9	45.7
Resistance (%)							
Sales of cooking units - Gas (%)	56.5	54.4	54.1	54.3	54	54.1	54.3
Sales of space heating units - Electric	5.4	26.5	53.4	75.5	79.2	79.6	79.6
Heat Pump (%)							
Sales of space heating units - Electric	3.11	5.03	9.13	15	18.3	18.8	18.9
Resistance (%)							
Sales of space heating units - Fossil (%)	15.1	4.63	2.27	0.341	0.034	0	0
Sales of space heating units - Gas Furnace	76.4	63.9	35.2	9.15	2.46	1.58	1.52
(%)							
Sales of water heating units - Electric	0.117	0.149	0.144	0.146	0.145	0.143	0.145
Heat Pump (%)							
Sales of water heating units - Electric	4.29	5.63	5.49	5.57	5.54	5.49	5.54
Resistance (%)							
Sales of water heating units - Gas Furnace	94.4	92.6	92.8	92.7	92.7	92.8	92.8
(%)							
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

Table 60: REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.28	3.39	4.37	4.58	4.26	4.41
Cumulative 5-yr (billion \$2018)							

Table 61: REF scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	120	121	120	120	122	127
Final energy use - Industry (PJ)	382	406	427	438	455	470	488
Final energy use - Residential (PJ)	184	172	165	159	157	156	157
Final energy use - Transportation (PJ)	426	395	363	345	346	357	372

Table 62: REF scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		3.33	3.22				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	76.6	76.6	76.6	76.6	76.6	76.6	76.6
Resistance (%)							
Sales of cooking units - Gas (%)	23.4	23.4	23.4	23.4	23.4	23.4	23.4
Sales of space heating units - Electric	24.6	48.5	49.4	50.7	51.9	53.4	55.7
Heat Pump (%)							
Sales of space heating units - Electric	27.3	23.3	22.9	22.2	21.3	19.9	17.6
Resistance (%)							
Sales of space heating units - Fossil (%)	9.89	9.17	7.81	7.09	6.94	6.85	6.89
Sales of space heating units - Gas (%)	38.3	19	19.9	20	19.9	19.9	19.8
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	62.5	74.8	75	74.8	74.6	74.6	74.6
Resistance (%)							
Sales of water heating units - Gas Furnace	34.2	22.8	22.6	22.8	23	23	23
(%)							
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.39	2.4	2.4	2.41

Table 63: REF scenario - PILLAR 1: Efficiency/Electrification - Transportation

2020	2025	2030	2035	2040	2045	2050
98.1	98.2	97.9	97	95.6	93.5	91.6
0	0	0	0	0	0	0
0.229	0.242	0.257	0.274	0.294	0.317	0.343
0.083	0.096	0.112	0.13	0.15	0.174	0.202
0.119	0.138	0.16	0.186	0.216	0.25	0.29
1.51	1.31	1.57	2.37	3.69	5.71	7.57
1.56	1.97	2.19	2.03	1.83	1.71	1.62
3.54	5.57	6.35	7.81	9.51	11	12.2
90.3	86.7	84.6	82.7	80.7	78.7	77.2
4.42	5.26	6.45	7.01	7.58	8.17	8.62
0.111	0.377	0.346	0.308	0.305	0.305	0.316
0.102	0.106	0.103	0.103	0.103	0.101	0.104
65.2	63.5	61.6	59.6	58	56.5	55.2
0.027	0.105	0.329	0.671	0.895	0.973	0.993
34	35.5	37	38.5	39.7	40.8	41.7
0.365	0.427	0.496	0.577	0.674	0.793	0.929
0.175	0.208	0.242	0.285	0.339	0.409	0.487
0.255	0.271	0.298	0.345	0.42	0.528	0.671
	98.1 0 0.229 0.083 0.119 1.51 1.56 3.54 90.3 4.42 0.111 0.102 65.2 0.027 34 0.365 0.175	98.1 98.2 0 0 0.229 0.242 0.083 0.096 0.119 0.138 1.51 1.31 1.56 1.97 3.54 5.57 90.3 86.7 4.42 5.26 0.111 0.377 0.102 0.106 65.2 63.5 0.027 0.105 34 35.5 0.365 0.427 0.175 0.208	98.1 98.2 97.9 0 0 0 0.229 0.242 0.257 0.083 0.096 0.112 0.119 0.138 0.16 1.51 1.31 1.57 1.56 1.97 2.19 3.54 5.57 6.35 90.3 86.7 84.6 4.42 5.26 6.45 0.111 0.377 0.346 0.102 0.106 0.103 65.2 63.5 61.6 0.027 0.105 0.329 34 35.5 37 0.365 0.427 0.496 0.175 0.208 0.242	98.1 98.2 97.9 97 0 0 0 0 0.229 0.242 0.257 0.274 0.083 0.096 0.112 0.13 0.119 0.138 0.16 0.186 1.51 1.31 1.57 2.37 1.56 1.97 2.19 2.03 3.54 5.57 6.35 7.81 90.3 86.7 84.6 82.7 4.42 5.26 6.45 7.01 0.111 0.377 0.346 0.308 0.102 0.106 0.103 0.103 65.2 63.5 61.6 59.6 0.027 0.105 0.329 0.671 34 35.5 37 38.5 0.365 0.427 0.496 0.577 0.175 0.208 0.242 0.285	98.1 98.2 97.9 97 95.6 0 0 0 0 0 0 0.229 0.242 0.257 0.274 0.294 0.083 0.096 0.112 0.13 0.15 0.119 0.138 0.16 0.186 0.216 1.51 1.31 1.57 2.37 3.69 1.56 1.97 2.19 2.03 1.83 3.54 5.57 6.35 7.81 9.51 90.3 86.7 84.6 82.7 80.7 4.42 5.26 6.45 7.01 7.58 0.111 0.377 0.346 0.308 0.305 0.102 0.106 0.103 0.103 0.103 0.102 0.106 0.103 0.103 0.103 0.027 0.105 0.329 0.671 0.895 34 35.5 37 38.5 39.7 0.365 0.427 0.496	98.1 98.2 97.9 97 95.6 93.5 0 0 0 0 0 0 0.229 0.242 0.257 0.274 0.294 0.317 0.083 0.096 0.112 0.13 0.15 0.174 0.119 0.138 0.16 0.186 0.216 0.25 1.51 1.31 1.57 2.37 3.69 5.71 1.56 1.97 2.19 2.03 1.83 1.71 3.54 5.57 6.35 7.81 9.51 11 90.3 86.7 84.6 82.7 80.7 78.7 4.42 5.26 6.45 7.01 7.58 8.17 0.111 0.377 0.346 0.308 0.305 0.305 0.102 0.106 0.103 0.103 0.103 0.101 65.2 63.5 61.6 59.6 58 56.5 0.027 0.105 0.329

Table 64: REF scenario - PILLAR 6: Land sinks - Forests

Carbon sink patential High. Accelerate regeneration (1000 1002e/v) -36.7	Item	2020	2025	2030	2035	2040	2045	2050
regeneration (1000 t002e/v) 27/96		2020	2025	2030	2035	2040	2043	
Carbon sink potential High - All (not counting overall) (1000 (CD26/y) Carbon sink potential - High - Avoid deforestation (1000 tCD26/y) 1,537 deforestation (1000 tCD26/y) Carbon sink potential - High - Extend rotation length (1000 tCD26/y) 1,5669 carbon sink potential - High - Improve plantation length (1000 tCD26/y) carbon sink potential - High - Improve plantation length (1000 tCD26/y) carbon sink potential - High - Improve plantation length (1000 tCD26/y) carbon sink potential - High - Improve plantation (1000 tCD26/y) carbon sink potential - High - Improve plantation (1000 tCD26/y) carbon sink potential - High - Improve plantation (1000 tCD26/y) carbon sink potential - High - Referest proposed plantation (1000 tCD26/y) carbon sink potential - High - Referest productively (1000 tCD26/y) carbon sink potential - High - Referest productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Accelerate productively (1000 tCD26/y) carbon sink potential - Low - Extend productively (1000 tCD26/y) carbon sink potential - Low - Extend productively (1000 tCD26/y) carbon sink potential - Low - Extend productively (1000 tCD26/y) carbon sink potential - Low - Extend productively (1000 tCD26/y) carbon sink potential - Low - Extend productively (1000 tCD26/y) carbon sink potential - Low - Reforest pasture (1000 tCD26/y) carbon sink potential - Low - Reforest pasturel (1000 tCD26/y) carbon sink potential - Low - Reforest pa								-70.1
Carbon sink potential - High - Reforest -48.5 -4	= *		+					27704
Carbon sink potential - High - Avoid deforestation (1000 t002e/v) Carbon sink potential - High - Extend rotation length (1000 t002e/v) September								-21,1 70
deforestation (1000 tCOZe/v) Carbon sink potential + ligh - Extend 5,569 rotation length (1000 tCOZe/v)								1 5 2 7
Carbon sink potential - High - Extend								-1,551
rotation length (1000 tC02e/v) Carbon sink potential - High - Improve plantations (1000 tC02e/v) Carbon sink potential - High - Increase retention of HWP (1000 tC02e/v) Carbon sink potential - High - Increase retention of HWP (1000 tC02e/v) Carbon sink potential - High - Increase trees outside forests (1000 tC02e/v) Carbon sink potential - High - Reforest respiratory (1000 tC02e/v) Carbon sink potential - High - Reforest respiratory (1000 tC02e/v) Carbon sink potential - High - Restore productivity (1000 tC02e/v) Carbon sink potential - Low - Accelerate respensation (1000 tC02e/v) Carbon sink potential - Low - Accelerate respensation (1000 tC02e/v) Carbon sink potential - Low - Accelerate respiratory (1000 tC02e/v) Carbon sink potential - Low - Audit (1000 tC02e/v) Carbon sink potential - Low - Audit (1000 tC02e/v) Carbon sink potential - Low - Avoid deforestation (1000 tC02e/v) Carbon sink potential - Low - Avoid deforestation (1000 tC02e/v) Carbon sink potential - Low - Extend rotation length (1000 tC02e/v) Carbon sink potential - Low - Improve plantations (1000 tC02e/v) Carbon sink potential - Low - Improve plantations (1000 tC02e/v) Carbon sink potential - Low - Improve plantations (1000 tC02e/v) Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/v) Carbon sink potential - Low - Reforest repland (1000 tC02e/v) Carbon sink potential - Low - Reforest repland (1000 tC02e/v) Carbon sink potential - Low - Reforest repland (1000 tC02e/v) Carbon sink potential - Low - Reforest repland (1000 tC02e/v) Carbon sink potential - Mid - Audit (1000 tC02e/v) Carbon sink potential - Mid - Audit (1000 tC02e/v) Carbon sink potential - Mid - Audit (1000 tC02e/v) Carbon sink potential - Mid - Reforest repland (1000 tC02e/v) Carbon sink potential - Mid - Reforest repland (1000 tC02e/v) Carbon sink potential - Mid - Reforest responsible (1000 tC02e/v) Carbon sink potential - Mid - Reforest responsible (1000 tC02e/v) Carbon sink potential - Mid - Reforest responsible (1000 tC02e/v) Carbon sink potential - Mid - Re			-					5 440
Carbon sink potential - High - Improve Jack J	·							-3,007
plantations (1000 tC02e/v)								/. 0 1
Carbon sink potential - High - Increase retention of HWP (1000 toOze/y) Carbon sink potential - High - Increase trees outside forests (1000 toOze/y)								-40.1
Petention of HWP (1000 C02e/y) Carbon sink potential - High - Increase trees outside forests (1000 C02e/y) Carbon sink potential - High - Reforest tropland (1000 C02e/y) Carbon sink potential - High - Reforest tropland (1000 C02e/y) Carbon sink potential - High - Reforest pasture (1000 C02e/y) Carbon sink potential - High - Restore productivity (1000 C02e/y) Carbon sink potential - Low - Accelerate regeneration (1000 C02e/y) Carbon sink potential - Low - Accelerate regeneration (1000 C02e/y) Carbon sink potential - Low - All (not counting overlap) (1000 C02e/y) Carbon sink potential - Low - Accelerate regeneration (1000 C02e/y) Carbon sink potential - Low - Accelerate regeneration (1000 C02e/y) Carbon sink potential - Low - Awold deforestation (1000 C02e/y) Carbon sink potential - Low - Extend rotation length (1000 C02e/y) Carbon sink potential - Low - Improve plantations (1000 C02e/y) Carbon sink potential - Low - Improve plantations (1000 C02e/y) Carbon sink potential - Low - Improve plantations (1000 C02e/y) Carbon sink potential - Low - Improve plantations (1000 C02e/y) Carbon sink potential - Low - Reforest regoneration of HWP (1000 C02e/y) Carbon sink potential - Low - Reforest regoneration (1000 C02e/y) Carbon sink potential - Low - Reforest regoneration (1000 C02e/y) Carbon sink potential - Low - Reforest repland (1000 C02e/y) Carbon sink potential - Low - Reforest regoneration (1000 C02e/y) Carbon sink potential - Low - Reforest regoneration (1000 C02e/y) Carbon sink potential - Low - Reforest regoneration (1000 C02e/y) Carbon sink potential - Low - Reforest regoneration (1000 C02e/y) Carbon sink potential - Low - Reforest regoneration (1000 C02e/y) Carbon sink potential - Mid - Avoid deforest (1000 C02e/y) Carbon sink potential - Mid - Reforest regoneration (1000 C02e/y) Carbon sink potential - Mid - Reforest regoneration (1000 C02e/y) Carbon sink potential - Mid - Reforest regoneration (1000 C02e/y) Carbon sink potential - Mid - Reforest r			+					1. 445
Carbon sink potential - High - Increase -965 rese outside forests (1000 CtO2e/v) Carbon sink potential - High - Reforest -1,409 corpland (1000 CtO2e/v) -1,48.5 corpland (1000 CtO2e/v) -1,48.5 corpland (1000 CtO2e/v) -1,48.5 corpland (1000 CtO2e/v) -1,48.5 corpland (1000 CtO2e/v) -2,56 corpland (1000 CtO2e/v) -2,177 corpland (100								-4,000
Trees outside Forests (1000 tC02e/v)								065
Carbon sink potential - High - Reforest -1,409 -10,207 -1,000 -10,207 -1,000 -1								-900
Carbon sink potential - High - Reforest -704 -738								1 / 00
Carbon sink potential - High - Reforest pasture (1000 tC02e/y) Carbon sink potential - High - Restore productivity (1000 tC02e/y) Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Low - Extend rotation length (1000 tC02e/y) Carbon sink potential - Low - Extend rotation length (1000 tC02e/y) Carbon sink potential - Low - Improve plantations (1000 tC02e/y) Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Reforest counting sink potential - Row - Restore productivity (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Reforest counting sink								-1,409
Carbon sink potential - High - Restore productivity (1000 tC02e/y) Carbon sink potential - High - Restore productivity (1000 tC02e/y) Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Low - Extend carbon sink potential - Low - Extend potential - Low - Improve plantations (1000 tC02e/y) Carbon sink potential - Low - Improve plantations (1000 tC02e/y) Carbon sink potential - Low - Improve plantations (1000 tC02e/y) Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Reforest plantation (1000 tC02e/y) Carbon sink potential - Low - Reforest plantation (1000 tC02e/y) Carbon sink potential - Low - Reforest plantation (1000 tC02e/y) Carbon sink potential - Low - Restore productivity (1000 tC02e/y) Carbon sink potential - Low - Restore productivity (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) Carbon sink potential - Mid - Extend -3,923 -3,100 tential - Mid - Extend -3,923 -3,100 tential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Restore -3,110 tential - Mid - Restore -3,100 tential - Mid - Restore -3,2139 tential - Mid - Restore -3,								10.007
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Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y) Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y) Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y) Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore -2,139								
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Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -2,139								
counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase resolution of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase rotation of HWP (1000 tC02e/y) Carbon sink potential - Mid - Reforest rorpland (1000 tC02e/y) Carbon sink potential - Mid - Reforest rorpland (1000 tC02e/y) Carbon sink potential - Mid - Reforest rospland (1000 tC02e/y) Carbon sink potential - Mid - Reforest rospland (1000 tC02e/y) Carbon sink potential - Mid - Restore rospland rosplantation rospland rosplantation rospland rosplantation rosplantatio								-17.376
Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase resolution of the forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest ropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest ropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest ropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest ropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest ropland (1000 tC02e/y) Carbon sink potential - Mid - Restore ropland restore ropland rope rope rope rope rope rope rope rope								,
deforestation (1000 tCO2e/y) Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore -5,490 Carbon sink potential - Mid - Restore								-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y) Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore -5,490 Carbon sink potential - Mid - Restore	•							.
rotation length (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase rees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -2,139			+					-3 923
Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase rees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest ropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest ropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest rest rest rest rest rest ropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest rest rest rest rest rest rest rest								3,720
plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -2,139	• • • • • • • • • • • • • • • • • • • •		+		+			-35.0
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest ropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest rospland (1000 tC02e/y) Carbon sink potential - Mid - Reforest rospland (1000 tC02e/y) Carbon sink potential - Mid - Restore rospland (1000 tC02e/y)								-33.7
retention of HWP (1000 tCO2e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y) Carbon sink potential - Mid - Reforest -1,057 cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest -5,490 pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore -2,139								2 110
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -5,490 Carbon sink potential - Mid - Restore								-3,110
trees outside forests (1000 tCO2e/y) Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore -2,139								
Carbon sink potential - Mid - Reforest -1,057 cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest -5,490 pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore -2,139								100-
cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest -5,490 pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore -2,139								1.057
Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -5,490 -2,139	•							-1,057
pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -2,139								
Carbon sink potential - Mid - Restore -2,139								-5,490
productivity (1000 tCO2e/y)								-2,139
	productivity (1000 tCO2e/y)							

Table 64: REF scenario - PILLAR 6: Land sinks - Forests (continued)

lable 64: REF scenario - PILLAR 6: Land si				0005	00/0	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							15.8
High - Accelerate regeneration (1000 hectares)							
Land impacted for carbon sink potential -							208
High - Avoid deforestation (over 30 years)							200
(1000 hectares)							
Land impacted for carbon sink potential -							2,891
High - Extend rotation length (1000							2,071
hectares)							
Land impacted for carbon sink potential -							17.7
High - Improve plantations (1000							11.1
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							91.7
High - Increase trees outside forests							71.1
(1000 hectares)							
Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							290
							1 0 / 1
Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							
hectares)							1.770
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							
(1000 hectares)							7.91
Land impacted for carbon sink potential -							1.91
Low - Accelerate regeneration (1000							
hectares)							195
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							1107
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							
hectares)							0.07
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							
hectares)							0
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000							0
hectares)							
Land impacted for carbon sink potential -							48.3
							46.3
Low - Increase trees outside forests (1000 hectares)							
,							1//
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							F0.0
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							((0
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							
hectares)							0 107
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							
(1000 hectares)							44.0
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)							

Table 64: REF scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 65: REF scenario - PILLAR 6: Land sinks - Forests - REF only

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural	-13.6		-9.57				-7.76
uptake (Mt CO2e/y)							
Business-as-usual carbon sink - Retained	-1.27		-2.12				-2.23
in Hardwood Products (Mt CO2e/y)							
Business-as-usual carbon sink - Total (Mt	-14.9		-11.7				-9.99
CO2e/y)							

Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		1,969	1,409	1,188	1,068	1,025	1,005
Coal (million 2019\$)							
Monetary damages from air pollution -		134	177	193	250	199	173
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,243	1,267	1,291	1,321	1,351	1,382
Transportation (million 2019\$)							
Premature deaths from air pollution -		222	159	134	121	116	113
Coal (deaths)							
Premature deaths from air pollution -		15.2	19.9	21.8	28.2	22.5	19.5
Natural Gas (deaths)							
Premature deaths from air pollution -		140	142	145	149	152	155
Transportation (deaths)							