Net-Zero America - new hampshire state report

Larson et al. 2020

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These data underlie graphs and tables presented in the Princeton Net-Zero America study (E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, interim report, Princeton University, Princeton, NJ, December 15, 2020. Report available at https://netzeroamerica.princeton.edu.)

Notes

- These data are a subset of all data from the study available at https://netzeroamerica.princeton.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 state-level 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.)
- Some results are not model outputs, but rather they are limits that apply across all scenarios (e.g., maximum carbon storage potential in agricultural soils).

List of Tables

1	E+ scenario - PILLAR 1: Efficiency/Electrification - Residential	4
2	E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	4
3	E+ scenario - PILLAR 1: Efficiency/Electrification - Overview	4
4	E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	4
5	E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	5
6	E+ scenario - PILLAR 2: Clean Electricity - Generating capacity	5
7	E+ scenario - PILLAR 2: Clean Electricity - Generation	5
8	E+ scenario - PILLAR 3: Clean fuels - Bioenergy	5
9	E+ scenario - PILLAR 4: CCUS - CO2 capture	6
10	E+ scenario - PILLAR 4: CCUS - CO2 storage	6
11	E+ scenario - PILLAR 4: CCUS - CO2 pipelines	6
12	E+ scenario - PILLAR 6: Land sinks - Agriculture	6
13	E+ scenario - PILLAR 6: Land sinks - Forests	7
14	E+ scenario - IMPACTS - Health	9
15	E+ scenario - IMPACTS - Jobs	9
16	E+ scenario - IMPACTS - Fossil fuel industries	10
17	E- scenario - PILLAR 1: Efficiency/Electrification - Residential	10

18	E- scenario - PILLAR 1: Efficiency/Electrification - Transportation	10
19	E- scenario - PILLAR 1: Efficiency/Electrification - Overview	11
20	E- scenario - PILLAR 1: Efficiency/Electrification - Commercial	11
21	E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	11
22	E- scenario - PILLAR 6: Land sinks - Agriculture	11
23	E- scenario - PILLAR 6: Land sinks - Forests	12
24	E- scenario - IMPACTS - Health	14
25	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential	14
26	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	15
27	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview	15
28	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	15
29	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	16
30	E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity	16
31	E+RE+ scenario - PILLAR 2: Clean Electricity - Generation	16
32	E+RE+ scenario - PILLAR 6: Land sinks - Agriculture	16
33	E+RE+ scenario - PILLAR 6: Land sinks - Forests	17
34	E+RE+ scenario - IMPACTS - Health	19
35	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential	19
36	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation	19
37	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview	20
38	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial	20
39	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	20
40	E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity	20
41	E+RE- scenario - PILLAR 2: Clean Electricity - Generation	20
42	E+RE- scenario - PILLAR 6: Land sinks - Agriculture	20
43	E+RE- scenario - PILLAR 6: Land sinks - Forests	21
44	E+RE- scenario - IMPACTS - Health	23
45	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential	23
46	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	24
47	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview	24
48	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	24
49	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	24
50	E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity	25
51	E-B+ scenario - PILLAR 2: Clean Electricity - Generation	25
52	E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy	25
53	E-B+ scenario - PILLAR 4: CCUS - CO2 capture	25
54	E-B+ scenario - PILLAR 4: CCUS - CO2 storage	25
55	E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines	25
56	E-B+ scenario - PILLAR 6: Land sinks - Agriculture	26
57	E-B+ scenario - PILLAR 6: Land sinks - Forests	27
58	REF scenario - PILLAR 1: Efficiency/Electrification - Residential	29

59	REF scenario - PILLAR 1: Efficiency/Electrification - Transportation	29
60	REF scenario - PILLAR 1: Efficiency/Electrification - Overview	29
61	REF scenario - PILLAR 1: Efficiency/Electrification - Commercial	29
62	REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	30
63	REF scenario - PILLAR 6: Land sinks - Forests	30
64	REF scenario - IMPACTS - Health	32

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF -	0	1.15	1.23	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55.6	65	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.4	35	5.98	0.301	0	0	0
Sales of space heating units - Electric Heat Pump	4.02	11.4	55.4	81.6	85.2	85.5	85.5
(%)							
Sales of space heating units - Electric Resistance	2.1	2.36	1.9	0.854	0.641	0.637	0.692
(%)							
Sales of space heating units - Fossil (%)	75.2	76.2	35.5	16.4	14	13.8	13.7
Sales of space heating units - Gas (%)	18.7	10	7.16	1.21	0.152	0.086	0.084
Sales of water heating units - Electric Heat Pump	0	1.91	15.5	34.6	37.8	38	38.1
(%)							
Sales of water heating units - Electric Resistance	25.3	41.2	50.4	60.2	61.8	61.9	61.8
(%)							
Sales of water heating units - Gas Furnace (%)	51.5	43.4	31.5	5.04	0.297	0	0
Sales of water heating units - Other (%)	23.2	13.5	2.63	0.195	0.089	0.089	0.089

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	258	662	1,071	1,624	1,766	1,685
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.528	0	2.3	0	3.72
Public EV charging plugs - L2 (1000 units)	0.188	0	12.7	0	55.3	0	89.3
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 (%)	1.55	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	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.41	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 FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.2	36.8	35.1	32.8	30.3	28.7	27.8
Final energy use - Industry (PJ)	21.1	20.7	20.2	19.9	19.6	19.6	19.5
Final energy use - Residential (PJ)	67.8	61.4	54.8	46.6	38.7	33	29.6
Final energy use - Transportation (PJ)	93.6	86.6	75.2	60.9	47.9	39.6	35.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	2,680	2,926	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump	3.23	11	39.6	72.4	77.7	77.9	78
(%)							
Sales of space heating units - Electric Resistance	1.65	4.4	16.6	21.3	22	22.1	22
(%)							
Sales of space heating units - Fossil (%)	57.4	32	6.13	0.259	0	0	0

Table 4: E+ scenario -	PTI I AR 1. Efficiency	//Flectrification -	Commercial	(continued)
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Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	37.7	52.7	37.7	6.03	0.358	0	0
Sales of water heating units - Electric Heat Pump (%)	2.6	3.52	16	41.1	45.6	45.9	45.9
Sales of water heating units - Electric Resistance (%)	12.8	12.4	24	48	52.3	52.5	52.5
Sales of water heating units - Gas Furnace (%)	77.2	79.9	58.1	9.27	0.548	0	0
Sales of water heating units - Other (%)	7.43	4.15	1.94	1.59	1.57	1.57	1.59

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.537	0.548	1.07	1.14	1.01	1.05
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion	0	0	0	0	0	0	0
\$2018)							
Capital invested - Biomass w/ccu allam power	0	0	0	0	0	0	0.021
plant (billion \$2018)							
Capital invested - Biomass w/ccu power plant	0	0	0	0	0	0	0.027
(billion \$2018)							
Capital invested - Solar PV - Base (billion \$2018)	0	0	0	1.31	0.08	3.49	7.46
Capital invested - Solar PV - Constrained (billion	0	0	0.656	2.35	0	1.97	6.03
\$2018)							
Capital invested - Wind - Base (billion \$2018)	0	0.375	2.99	0.454	0.711	0.14	0.786
Capital invested - Wind - Constrained (billion	0	0.184	3.52	1.13	0.606	0.256	0.389
\$2018)							

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	20.8
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	30
Solar - Base land use assumptions (GWh)	0	0	0	2,117	136	6,263	14,020
Solar - Constrained land use assumptions (GWh)	0	0	0	0	848	4,547	14,092
Wind - Base land use assumptions (GWh)	912	572	4,794	771	1,244	261	1,549
Wind - Constrained land use assumptions (GWh)	912	572	5,502	1,726	1,241	439	737

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

Item	2020	2025	2030	2035	2040	2045	2050
	2020	2023	2030	2033	2040	2045	
Biomass purchases (million \$2018/year)	0	0	0	0	0	0	69.3
Conversion capital investment - Cumulative 5-yr	0	0	0	0	0	0	1,591
(million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	1
(quantity)							
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	2
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0	0	0	0	1.88
Annual - BECCS (MMT)	0	0	0	0	0	0	1.88
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	0	1.88
Cumulative - BECCS (MMT)	0	0	0	0	0	0	1.88
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
Cumulative - NGCC (MMT)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)	0	0	0	0	0	0	0
Injection wells (wells)	0	0	0	0	0	0	0
Resource characterization, appraisal, permitting	0	0	0	0	0	0	0
costs (million \$2020)							
Wells and facilities construction costs (million	0	0	0	0	0	0	0
\$2020)							

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	55.8	55.8	55.8	55.8	236
Cumulative investment - All (million \$2018)	0	0	101	101	101	101	223
Cumulative investment - Spur (million \$2018)	0	0	0	0	0	0	122
Cumulative investment - Trunk (million \$2018)	0	0	101	101	101	101	101
Spur (km)	0	0	0	0	0	0	180
Trunk (km)	0	0	55.8	55.8	55.8	55.8	55.8

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-68.9
Cropland measures (1000 tC02e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-2.36
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-71.3
Total (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-36.3
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-1.18
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-37.5
Land impacted for carbon sink - Aggressive	0	0	0
deployment - Corn-ethanol to energy grasses			
	0	0	39.5
•			
Land impacted for carbon sink - Aggressive	0	0	4.28
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	43.7
deployment - Total (1000 hectares)			
	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
Total (1000 tC02e/y) Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares) Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares) Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares) Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares) Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses	0 0 0	0 0	39.5 4.28 43.7

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

Item	2020	2025	2050
Land impacted for carbon sink - Moderate	0	0	20.8
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	2.14
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	22.9
deployment - Total (1000 hectares)			

able 13: <i>E+ scenario - PILLAR 6: Land sinks - For</i> Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	34.7
regeneration (1000 tCO2e/y)	0	0	34.1
Carbon sink potential - High - All (not counting overlap) (1000 tC02e/y)	0	0	6,916
Carbon sink potential - High - Avoid deforestation (1000 tC02e/y)	0	0	471
Carbon sink potential - High - Extend rotation length (1000 tC02e/y)	0	0	3,082
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	15
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	2,147
Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)	0	0	89.2
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tC02e/y)	0	0	211
Carbon sink potential - High - Restore productivity (1000 tC02e/y)	0	0	866
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	17.4
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)	0	0	2,342
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)	0	0	78.4
Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)	0	0	1,184
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	7.66
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	716
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)	0	0	31.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	С
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	16
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	292
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	26
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	4,629
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	274
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	2,133
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	11.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	1,43

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

Table 13: E+ scenario - PILLAR 6: Land sinks - Fo			
Item	2020	2025	2050
Carbon sink potential - Mid - Increase trees	0	0	60.2
outside forests (1000 tC02e/y)			
Carbon sink potential - Mid - Reforest cropland	0	0	0
(1000 tC02e/y)			447
Carbon sink potential - Mid - Reforest pasture	0	0	114
(1000 tC02e/y)			F70
Carbon sink potential - Mid - Restore	0	0	579
productivity (1000 tCO2e/y)			F (0
Land impacted for carbon sink potential - High -	0	0	5.68
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	63.7
Avoid deforestation (over 30 years) (1000			
hectares)			1.570
Land impacted for carbon sink potential - High -	0	0	1,572
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	5.54
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Increase retention of HWP (1000 hectares)	_		
Land impacted for carbon sink potential - High -	0	0	8.48
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	6
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	287
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	1,948
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	2.84
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	59.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	602
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	2.77
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	4.46
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	1.04
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	174
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	847
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.26
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	61.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,087
Extend rotation length (1000 hectares)			•
Land impacted for carbon sink potential - Mid -	0	0	4.17
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)			J
Land impacted for carbon sink potential - Mid -	0	0	6.47
Increase trees outside forests (1000 hectares)			0.41

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	7.52
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	350
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,521
Total impacted (over 30 years) (1000 hectares)			

Table 14: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal	0	128	0.149	0.149	0.142	0.085	0.004
(million 2019\$)							
Monetary damages from air pollution - Natural	0	44.4	25.7	17.7	16.4	10.4	4.62
Gas (million 2019\$)							
Monetary damages from air pollution -	0	237	222	169	97.6	43.6	15.8
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	14.4	0.017	0.017	0.016	0.01	0
(deaths)							
Premature deaths from air pollution - Natural	0	5.02	2.9	2	1.85	1.17	0.522
Gas (deaths)							
Premature deaths from air pollution -	0	26.6	25	19	11	4.91	1.78
Transportation (deaths)							

Table 15: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	74.8	86.2	175	66.9	51.9	38.1	124
By economic sector - Construction (jobs)	1,630	1,488	1,683	2,535	1,965	4,286	13,179
By economic sector - Manufacturing (jobs)	793	1,078	1,750	1,648	1,759	2,522	4,943
By economic sector - Mining (jobs)	662	522	395	278	191	130	91.3
By economic sector - Other (jobs)	185	162	149	366	249	853	2,402
By economic sector - Pipeline (jobs)	86.1	86	89	63.9	51.5	40.1	56.1
By economic sector - Professional (jobs)	927	919	1,145	1,366	1,171	2,142	5,798
By economic sector - Trade (jobs)	729	657	694	884	727	1,437	3,883
By economic sector - Utilities (jobs)	1,537	1,539	1,872	2,225	2,143	3,361	12,884
By education level - All sectors - Associates	1,989	1,970	2,424	2,957	2,613	4,758	14,138
degree or some college (jobs)							
By education level - All sectors - Bachelors	1,467	1,447	1,718	1,955	1,741	2,933	8,251
degree (jobs)							
By education level - All sectors - Doctoral degree	54	52.5	61.2	71	61	105	277
(jobs)							
By education level - All sectors - High school	2,754	2,716	3,333	3,970	3,468	6,291	18,638
diploma or less (jobs)							
By education level - All sectors - Masters or	359	352	417	479	424	722	2,058
professional degree (jobs)							
By resource sector - Biomass (jobs)	310	370	483	191	156	139	529
By resource sector - CO2 (jobs)	0	0	101	0	0	0	196
By resource sector - Coal (jobs)	208	62.1	0	0	0	0	0
By resource sector - Grid (jobs)	1,581	1,673	2,307	3,181	2,966	5,971	26,704
By resource sector - Natural Gas (jobs)	526	517	450	385	438	335	68.9
By resource sector - Nuclear (jobs)	637	627	617	607	598	347	0
By resource sector - Oil (jobs)	1,624	1,464	1,230	963	743	581	463
By resource sector - Solar (jobs)	1,564	1,509	1,264	2,337	1,631	5,749	12,794
By resource sector - Wind (jobs)	174	316	1,501	1,769	1,777	1,688	2,606
Median wages - Annual - All (\$2019 per job)	62,095	62,869	63,270	63,634	64,894	64,606	66,185
On-Site or In-Plant Training - Total jobs - 1 to 4	1,050	1,033	1,258	1,530	1,345	2,436	7,281
years (jobs)							
On-Site or In-Plant Training - Total jobs - 4 to 10	431	414	491	626	537	1,007	3,112
years (jobs)							
On-Site or In-Plant Training - Total jobs - None	1,089	1,077	1,312	1,548	1,361	2,418	6,895
(jobs)							

Table 15: E+ scenario - IMPACTS - Jobs (continued	Table 15: <i>E</i>	+ scenario -	IMPACTS	Inhs	<i>(continued</i>
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Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - Total jobs - Over 10	51.2	50.9	63.3	79.1	69.7	129	399
years (jobs)							
On-Site or In-Plant Training - Total jobs - Up to 1	4,003	3,963	4,828	5,650	4,996	8,819	25,673
year (jobs)							
On-the-Job Training - All sectors - 1 to 4 years	1,346	1,323	1,612	1,969	1,731	3,137	9,400
(jobs)							
On-the-Job Training - All sectors - 4 to 10 years	413	395	471	613	523	1,002	3,132
(jobs)							
On-the-Job Training - All sectors - None (jobs)	380	370	436	521	452	811	2,298
On-the-Job Training - All sectors - Over 10 years	64.4	64.2	78.5	94.2	82.7	147	397
(jobs)							
On-the-Job Training - All sectors - Up to 1 year	4,421	4,385	5,355	6,236	5,519	9,713	28,133
(jobs)							
Related work experience - All sectors - 1 to 4	2,411	2,374	2,872	3,389	2,988	5,293	15,519
years (jobs)							
Related work experience - All sectors - 4 to 10	1,538	1,516	1,836	2,190	1,934	3,426	10,052
years (jobs)							
Related work experience - All sectors - None	938	926	1,129	1,350	1,185	2,147	6,390
(jobs)							
Related work experience - All sectors - Over 10	413	412	504	589	528	910	2,617
years (jobs)							
Related work experience - All sectors - Up to 1	1,324	1,309	1,611	1,915	1,672	3,033	8,782
year (jobs)							
Wage income - All (million \$2019)	411	411	503	600	539	957	2,870

Table 16: E+ scenario - IMPACTS - Fossil fuel industries

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	38.1	38.6	32.6	26.1	19.7	12.4	8.58
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	787
Natural gas production - Annual (tcf)	0	0	0	0	0	0	0
Oil consumption - Annual (million bbls)	33.3	32.9	30.2	25.6	21.2	17.8	15.1
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	783
Oil production - Annual (million bbls)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF -	0	1.15	1.3	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55.4	56.6	60.7	71.4	86.4	95.6	98.8
Sales of cooking units - Gas (%)	44.6	43.4	39.3	28.6	13.6	4.4	1.18
Sales of space heating units - Electric Heat Pump	4.02	3.88	8.07	20.5	41.9	60	68.2
(%)							
Sales of space heating units - Electric Resistance	2.1	2.38	2.37	2.3	1.88	1.38	1.1
(%)							
Sales of space heating units - Fossil (%)	75.2	83.5	79.6	68.2	49.4	34.5	28.2
Sales of space heating units - Gas (%)	18.7	10.2	9.97	9.04	6.81	4.15	2.55
Sales of water heating units - Electric Heat Pump	0	0.469	1.77	5.89	14.5	24.1	29.3
(%)							
Sales of water heating units - Electric Resistance	25.3	39.9	40.7	43.4	48.7	54	56.8
(%)							
Sales of water heating units - Gas Furnace (%)	51.5	43.9	42.9	39.1	29.7	17.8	10.8
Sales of water heating units - Other (%)	23.2	15.7	14.7	11.6	7.09	4.11	3.08

Table 18: E- scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	0	41.9	87.7	296	932	1,358
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.165	0	0.854	0	2.38
Public EV charging plugs - L2 (1000 units)	0.188	0	3.97	0	20.5	0	57.2
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7

Table 18: E- scenario -	PTI I AR 1: Efficienc	v/Flectrification - `	Transnortation	(continued)

Item	2020	2025	2030	2035	2040	2045	2050
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	0.23
Vehicle sales - Light-duty - EV (%)	1.88	4.67	11.8	25.8	48.3	72	87.6
Vehicle sales - Light-duty - gasoline (%)	91.8	87.5	79.6	66.7	46.3	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.57	5.38	6.04	5.5	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	0.106	0.097	0.084	0.061	0.033	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 FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.2	36.9	35.8	34.9	33.7	32.5	31.4
Final energy use - Industry (PJ)	21.1	20.7	20.4	20.3	20.3	20.2	20
Final energy use - Residential (PJ)	67.8	61.6	57.1	53.2	48.5	43.3	38.2
Final energy use - Transportation (PJ)	93.7	87.4	79.2	72.1	66.4	59.8	52

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	2,680	2,929	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Sales of space heating units - Electric Heat Pump	3.23	7.44	10.2	18.5	35	52.2	61.5
(%)							
Sales of space heating units - Electric Resistance	1.65	2.12	3.22	6.62	12.2	16.4	17.9
(%)							
Sales of space heating units - Fossil (%)	57.4	37.1	35.2	28.1	17	9.78	7.36
Sales of space heating units - Gas Furnace (%)	37.7	53.3	51.4	46.8	35.8	21.6	13.2
Sales of water heating units - Electric Heat Pump	2.6	2.83	4	7.92	17.2	28.8	35.5
(%)							
Sales of water heating units - Electric Resistance	12.8	11.7	12.6	16.6	25.4	36.2	42.6
(%)							
Sales of water heating units - Gas Furnace (%)	77.2	80.9	79.2	71.8	54.5	32.8	19.8
Sales of water heating units - Other (%)	7.43	4.56	4.2	3.64	2.86	2.25	2.09

Table 21: E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.401	0.397	0.601	0.621	0.904	0.955
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-68.9
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-2.36
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-71.3
Total (1000 tC02e/y)			

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

Table 22. L Scenario I ILLAN G. Lana Sinks F	igi icaitai c (c	ontinacaj	
Item	2020	2025	2050
Carbon sink potential - Moderate deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-36.3
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-1.18
Permanent conservation cover (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	-37.5
Total (1000 tC02e/y)			
Land impacted for carbon sink - Aggressive	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	39.5
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	4.28
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	43.7
deployment - Total (1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	20.8
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	2.14
deployment - Permanent conservation cover		Ü	
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	22.9
deployment - Total (1000 hectares)		Ü	

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

1able 23: E- scenario - PILLAR 6: Lana Sinks - For			
Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	34.7
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting	0	0	6,916
overlap) (1000 tCO2e/y)			
Carbon sink potential - High - Avoid deforestation	0	0	471
(1000 tC02e/y)			
Carbon sink potential - High - Extend rotation	0	0	3,082
length (1000 tCO2e/y)			
Carbon sink potential - High - Improve	0	0	15
plantations (1000 tCO2e/y)			
Carbon sink potential - High - Increase retention	0	0	2,147
of HWP (1000 tCO2e/y)			
Carbon sink potential - High - Increase trees	0	0	89.2
outside forests (1000 tCO2e/y)			
Carbon sink potential - High - Reforest cropland	0	0	0
(1000 tC02e/y)			
Carbon sink potential - High - Reforest pasture	0	0	211
(1000 tCO2e/y)			
Carbon sink potential - High - Restore	0	0	866
productivity (1000 tCO2e/y)			
Carbon sink potential - Low - Accelerate	0	0	17.4
regeneration (1000 tCO2e/y)			
Carbon sink potential - Low - All (not counting	0	0	2,342
overlap) (1000 tCO2e/y)			
Carbon sink potential - Low - Avoid deforestation	0	0	78.4
(1000 tC02e/y)			
Carbon sink potential - Low - Extend rotation	0	0	1,184
length (1000 tCO2e/y)			
Carbon sink potential - Low - Improve	0	0	7.66
plantations (1000 tCO2e/y)			
-			

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

Titem 2020 Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y) Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) 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 - 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 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 - Restore productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2050 716 31.2 0 16 292 26 4,629 274 2,133 11.2 1,431 60.2 0 114 579 5.68
of HWP (1000 tCO2e/y) Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y) Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) 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 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 - Restore productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)		31.2 0 16 292 26 4,629 274 2,133 11.2 1,431 60.2 0 114 579
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y) Carbon sink potential - Low - Reforest cropland (1000 tC02e/y) Carbon sink potential - Low - Reforest pasture (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 - 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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0 0 0	0 16 292 26 4,629 274 2,133 11.2 1,431 60.2 0 114
outside forests (1000 tCO2e/y) Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) 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 trees outside forests (1000 tCO2e/y) Carbon sink potential - Mid - Reforest cropland (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 productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0 0 0	0 16 292 26 4,629 274 2,133 11.2 1,431 60.2 0 114
outside forests (1000 tCO2e/y) Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) 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 - Restore productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)		16 292 26 4,629 274 2,133 11.2 1,431 60.2 0 114
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) 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 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 productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)		16 292 26 4,629 274 2,133 11.2 1,431 60.2 0 114
Carbon sink potential - Low - Reforest pasture [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 - All (not counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid deforestation [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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0 0	292 26 4,629 274 2,133 11.2 1,431 60.2 0 114
Carbon sink potential - Low - Reforest pasture (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 - 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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0 0	292 26 4,629 274 2,133 11.2 1,431 60.2 0 114
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) 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 trees outside forests (1000 tCO2e/y) Carbon sink potential - Mid - Reforest cropland (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 productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0 0	292 26 4,629 274 2,133 11.2 1,431 60.2 0 114
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y) 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 trees outside forests (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 productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0 0	26 4,629 274 2,133 11.2 1,431 60.2 0 114 579
Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) 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 - 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 productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0 0	26 4,629 274 2,133 11.2 1,431 60.2 0 114 579
Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y) 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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0	4,629 274 2,133 11.2 1,431 60.2 0 114 579
regeneration (1000 tC02e/y) 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 olength (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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0	4,629 274 2,133 11.2 1,431 60.2 0 114 579
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 olength (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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0	274 2,133 11.2 1,431 60.2 0 114 579
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 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 productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0 0	274 2,133 11.2 1,431 60.2 0 114 579
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 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 productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0	2,133 11.2 1,431 60.2 0 114
(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 - Restore productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0	2,133 11.2 1,431 60.2 0 114
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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0	11.2 1,431 60.2 0 114 579
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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0 0	11.2 1,431 60.2 0 114 579
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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0	1,431 60.2 0 114 579
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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0 0	1,431 60.2 0 114 579
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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 - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0	60.2 0 114 579
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 productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0 0	60.2 0 114 579
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 productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0 114 579
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 productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0 114 579
Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	114 579
(1000 tCO2e/y) Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	114 579
Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	579
(1000 tCO2e/y) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	579
Carbon sink potential - Mid - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)		
productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - OAccelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - OAvoid deforestation (over 30 years) (1000 hectares)		
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - O Avoid deforestation (over 30 years) (1000 hectares)	0	5.68
Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - 0 Avoid deforestation (over 30 years) (1000 hectares)	0	5.68
Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - 0 Avoid deforestation (over 30 years) (1000 hectares)		
Land impacted for carbon sink potential - High - 0 Avoid deforestation (over 30 years) (1000 hectares)		
Avoid deforestation (over 30 years) (1000 hectares)	0	63.7
hectares)		
	0	1,572
Extend rotation length (1000 hectares)		1,012
Land impacted for carbon sink potential - High - 0	0	5.54
	0	5.54
Improve plantations (1000 hectares)		
Land impacted for carbon sink potential - High - 0	0	0
Increase retention of HWP (1000 hectares)		
Land impacted for carbon sink potential - High - 0	0	8.48
Increase trees outside forests (1000 hectares)		
Land impacted for carbon sink potential - High - 0	0	0
Reforest cropland (1000 hectares)		
Land impacted for carbon sink potential - High - 0	0	6
Reforest pasture (1000 hectares)		
Land impacted for carbon sink potential - High - 0	0	287
Restore productivity (1000 hectares)		
Land impacted for carbon sink potential - High - 0	0	1,948
Total impacted (over 30 years) (1000 hectares)		1,740
	0	2.07
Land impacted for carbon sink potential - Low - 0	0	2.84
Accelerate regeneration (1000 hectares)		
Land impacted for carbon sink potential - Low - 0	0	59.8
Avoid deforestation (over 30 years) (1000		
hectares)		
Land impacted for carbon sink potential - Low - 0	0	602
Extend rotation length (1000 hectares)		
Land impacted for carbon sink potential - Low - 0	0	2.77
Improve plantations (1000 hectares)		
Land impacted for carbon sink potential - Low - 0	0	0
Increase retention of HWP (1000 hectares)		
The case recention of fiver (1000 lieutal es)		I

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low -	0	0	4.46
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	1.04
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	174
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	847
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.26
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	61.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,087
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.17
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	6.47
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	7.52
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	350
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,521
Total impacted (over 30 years) (1000 hectares)			

Table 24: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal	0	128	0.149	0.149	0.142	0.085	0.004
(million 2019\$)							
Monetary damages from air pollution - Natural	0	43.4	20.8	8.36	3.56	1.1	1.21
Gas (million 2019\$)							
Monetary damages from air pollution -	0	241	245	239	215	171	117
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	14.4	0.017	0.017	0.016	0.01	0
(deaths)							
Premature deaths from air pollution - Natural	0	4.9	2.35	0.944	0.403	0.124	0.137
Gas (deaths)							
Premature deaths from air pollution -	0	27.1	27.5	26.8	24.1	19.2	13.2
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF -	0	1.15	1.23	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55.6	65	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.4	35	5.98	0.301	0	0	0
Sales of space heating units - Electric Heat Pump	4.02	11.4	55.4	81.6	85.2	85.5	85.5
(%)							
Sales of space heating units - Electric Resistance	2.1	2.36	1.9	0.854	0.641	0.637	0.692
(%)							
Sales of space heating units - Fossil (%)	75.2	76.2	35.5	16.4	14	13.8	13.7
Sales of space heating units - Gas (%)	18.7	10	7.16	1.21	0.152	0.086	0.084
Sales of water heating units - Electric Heat Pump	0	1.91	15.5	34.6	37.8	38	38.1
(%)							

Table 25: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance	25.3	41.2	50.4	60.2	61.8	61.9	61.8
(%)							
Sales of water heating units - Gas Furnace (%)	51.5	43.4	31.5	5.04	0.297	0	0
Sales of water heating units - Other (%)	23.2	13.5	2.63	0.195	0.089	0.089	0.089

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	258	662	1,071	1,624	1,766	1,685
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.528	0	2.3	0	3.72
Public EV charging plugs - L2 (1000 units)	0.188	0	12.7	0	55.3	0	89.3
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 (%)	1.55	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	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.41	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 FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.2	36.8	35.1	32.8	30.3	28.7	27.8
Final energy use - Industry (PJ)	21.1	20.7	20.2	19.9	19.6	19.6	19.5
Final energy use - Residential (PJ)	67.8	61.4	54.8	46.6	38.7	33	29.6
Final energy use - Transportation (PJ)	93.6	86.6	75.2	60.9	47.9	39.6	35.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	2,680	2,926	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump	3.23	11	39.6	72.4	77.7	77.9	78
(%)							
Sales of space heating units - Electric Resistance	1.65	4.4	16.6	21.3	22	22.1	22
(%)							
Sales of space heating units - Fossil (%)	57.4	32	6.13	0.259	0	0	0
Sales of space heating units - Gas Furnace (%)	37.7	52.7	37.7	6.03	0.358	0	0
Sales of water heating units - Electric Heat Pump	2.6	3.52	16	41.1	45.6	45.9	45.9
(%)							
Sales of water heating units - Electric Resistance	12.8	12.4	24	48	52.3	52.5	52.5
(%)							
Sales of water heating units - Gas Furnace (%)	77.2	79.9	58.1	9.27	0.548	0	0
Sales of water heating units - Other (%)	7.43	4.15	1.94	1.59	1.57	1.57	1.59

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.537	0.548	1.07	1.14	1.01	1.05
Cumulative 5-yr (billion \$2018)							

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 \$2018)	0	0	0.863	2.4	0	5.76	4.95
Capital invested - Wind - Base (billion \$2018)	0	0.375	2.99	0.454	0.711	0.14	0.856

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	1,284	3,896	0	10,270	9,255
Solar - Constrained land use assumptions (GWh)	0	0	0	1,738	727	14,441	13,239
Wind - Base land use assumptions (GWh)	912	572	4,794	771	1,244	261	1,683
Wind - Constrained land use assumptions (GWh)	912	572	5,502	1,726	1,241	439	1,045

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

Table 32. L+NL+ 3cellal to - FILLAN G. Land Siliks	•		
Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-68.9
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-2.36
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-71.3
Total (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-36.3
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-1.18
Permanent conservation cover (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	-37.5
Total (1000 tC02e/y)			
Land impacted for carbon sink - Aggressive	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	39.5
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	4.28
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	43.7
deployment - Total (1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	20.8
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	2.14
deployment - Permanent conservation cover		-	
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	22.9
deployment - Total (1000 hectares)			
· , · · · · · · · · · · · · · · · · · ·	1		

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

2025 0 0 0 0 0 0 0	2050 34.7 6,916 471 3,082 15 2,147 89.2
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	211
0	866
0	17.4
0	2,342
0	78.4
0	1,184
	1,104
0	7.66
0	1.00
0	71/
U	716
-	01.0
0	31.2
0	0
0	16
0	292
0	26
0	4,629
0	274
0	2,133
	2,100
0	11.2
0	11.2
-	1 / 01
U	1,431
0	60.2
0	0
0	114
0	579
	1
0	5.68

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

Table 33: E+RE+ scenario - PILLAR 6: Land sinks	•		
Item	2020	2025	2050
Land impacted for carbon sink potential - High -	0	0	63.7
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	1,572
Extend rotation length (1000 hectares)			,-
Land impacted for carbon sink potential - High -	0	0	5.54
Improve plantations (1000 hectares)	0	0	3.34
	0		0
Land impacted for carbon sink potential - High -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	8.48
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	6
Reforest pasture (1000 hectares)			· ·
Land impacted for carbon sink potential - High -	0	0	287
	0	0	201
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	1,948
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	2.84
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	59.8
Avoid deforestation (over 30 years) (1000			07.0
hectares)			
•	0	0	/00
Land impacted for carbon sink potential - Low -	0	0	602
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	2.77
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	4.46
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Reforest cropland (1000 hectares)	0	0	U
	0	-	1.07
Land impacted for carbon sink potential - Low -	0	0	1.04
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	174
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	847
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.26
Accelerate regeneration (1000 hectares)	0	0	4.20
Land impacted for carbon sink potential - Mid -	0	0	61.8
	U	U	01.0
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,087
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.17
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)	0	0	U
	0		
Land impacted for carbon sink potential - Mid -	0	0	6.47
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	7.52
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	350
Restore productivity (1000 hectares)	5	١ -	330
			1 501
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	1,521

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal	0	128	0.149	0.149	0.142	0.085	0.004
(million 2019\$)							
Monetary damages from air pollution - Natural	0	41.3	22.9	12.9	10.4	3.69	1.27
Gas (million 2019\$)							
Monetary damages from air pollution -	0	237	222	169	97.6	43.6	15.8
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	14.4	0.017	0.017	0.016	0.01	0
(deaths)							
Premature deaths from air pollution - Natural	0	4.67	2.59	1.46	1.17	0.417	0.144
Gas (deaths)							
Premature deaths from air pollution -	0	26.6	25	19	11	4.91	1.78
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF -	0	1.15	1.23	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55.6	65	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.4	35	5.98	0.301	0	0	0
Sales of space heating units - Electric Heat Pump	4.02	11.4	55.4	81.6	85.2	85.5	85.5
(%)							
Sales of space heating units - Electric Resistance	2.1	2.36	1.9	0.854	0.641	0.637	0.692
(%)							
Sales of space heating units - Fossil (%)	75.2	76.2	35.5	16.4	14	13.8	13.7
Sales of space heating units - Gas (%)	18.7	10	7.16	1.21	0.152	0.086	0.084
Sales of water heating units - Electric Heat Pump	0	1.91	15.5	34.6	37.8	38	38.1
(%)							
Sales of water heating units - Electric Resistance	25.3	41.2	50.4	60.2	61.8	61.9	61.8
(%)							
Sales of water heating units - Gas Furnace (%)	51.5	43.4	31.5	5.04	0.297	0	0
Sales of water heating units - Other (%)	23.2	13.5	2.63	0.195	0.089	0.089	0.089

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	258	662	1,071	1,624	1,766	1,685
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.528	0	2.3	0	3.72
Public EV charging plugs - L2 (1000 units)	0.188	0	12.7	0	55.3	0	89.3
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 (%)	1.55	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	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.41	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 FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.2	36.8	35.1	32.8	30.3	28.7	27.8
Final energy use - Industry (PJ)	21.1	20.7	20.2	19.9	19.6	19.6	19.5
Final energy use - Residential (PJ)	67.8	61.4	54.8	46.6	38.7	33	29.6
Final energy use - Transportation (PJ)	93.6	86.6	75.2	60.9	47.9	39.6	35.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	2,680	2,926	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump	3.23	11	39.6	72.4	77.7	77.9	78
(%)							
Sales of space heating units - Electric Resistance	1.65	4.4	16.6	21.3	22	22.1	22
(%)							
Sales of space heating units - Fossil (%)	57.4	32	6.13	0.259	0	0	0
Sales of space heating units - Gas Furnace (%)	37.7	52.7	37.7	6.03	0.358	0	0
Sales of water heating units - Electric Heat Pump	2.6	3.52	16	41.1	45.6	45.9	45.9
(%)							
Sales of water heating units - Electric Resistance	12.8	12.4	24	48	52.3	52.5	52.5
(%)							
Sales of water heating units - Gas Furnace (%)	77.2	79.9	58.1	9.27	0.548	0	0
Sales of water heating units - Other (%)	7.43	4.15	1.94	1.59	1.57	1.57	1.59

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.537	0.548	1.07	1.14	1.01	1.05
Cumulative 5-yr (billion \$2018)							

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 \$2018)	0	0	0	0.424	0	0	0.436
Capital invested - Solar PV - Constrained (billion \$2018)	0	0	0.104	0	0.589	0	0
Capital invested - Wind - Base (billion \$2018)	0	0.282	1.51	0	0	0.47	0.738
Capital invested - Wind - Constrained (billion \$2018)	0	0.282	1.99	0	0	0.248	0.912

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	683	0	0	833
Solar - Constrained land use assumptions (GWh)	0	0	152	0	1,005	0	0
Wind - Base land use assumptions (GWh)	912	432	2,474	0	0	885	1,460
Wind - Constrained land use assumptions (GWh)	912	432	3,208	0	0	456	1,795

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-68.9
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-2.36
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-71.3
Total (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tC02e/y)			

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

Table 12: ETAE decitation TIEETAN C. Edita office	7197704764	o (commu	
Item	2020	2025	2050
Carbon sink potential - Moderate deployment -	0	0	-36.3
Cropland measures (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	-1.18
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-37.5
Total (1000 tC02e/y)			
Land impacted for carbon sink - Aggressive	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	39.5
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	4.28
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	43.7
deployment - Total (1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	20.8
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	2.14
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	22.9
deployment - Total (1000 hectares)			
· · · · · · · · · · · · · · · · · · ·			

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

Table 45. LTRE-Scenario - FILLAN O. Luna Sinks			
Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	34.7
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting	0	0	6,916
overlap) (1000 tCO2e/y)			
Carbon sink potential - High - Avoid deforestation	0	0	471
(1000 tCO2e/y)			
Carbon sink potential - High - Extend rotation	0	0	3,082
length (1000 tCO2e/y)			
Carbon sink potential - High - Improve	0	0	15
plantations (1000 tCO2e/y)			
Carbon sink potential - High - Increase retention	0	0	2,147
of HWP (1000 tCO2e/y)			
Carbon sink potential - High - Increase trees	0	0	89.2
outside forests (1000 tCO2e/y)			
Carbon sink potential - High - Reforest cropland	0	0	0
(1000 tCO2e/y)			
Carbon sink potential - High - Reforest pasture	0	0	211
(1000 tCO2e/y)			
Carbon sink potential - High - Restore	0	0	866
productivity (1000 tCO2e/y)			
Carbon sink potential - Low - Accelerate	0	0	17.4
regeneration (1000 tCO2e/y)			
Carbon sink potential - Low - All (not counting	0	0	2,342
overlap) (1000 tCO2e/y)			
Carbon sink potential - Low - Avoid deforestation	0	0	78.4
(1000 tCO2e/y)			
Carbon sink potential - Low - Extend rotation	0	0	1,184
length (1000 tCO2e/y)			
Carbon sink potential - Low - Improve	0	0	7.66
plantations (1000 tCO2e/y)			
Carbon sink potential - Low - Increase retention	0	0	716
of HWP (1000 tCO2e/y)			
·	l l		

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

Table 43: E+RE- scenario - PILLAR 6: Land sinks	- Forests (co	intinued)	
Item	2020	2025	2050
Carbon sink potential - Low - Increase trees	0	0	31.2
outside forests (1000 tCO2e/y)			
Carbon sink potential - Low - Reforest cropland	0	0	0
(1000 tC02e/y)			
Carbon sink potential - Low - Reforest pasture	0	0	16
(1000 tC02e/y)			
Carbon sink potential - Low - Restore	0	0	292
productivity (1000 tCO2e/y)		0	272
Carbon sink potential - Mid - Accelerate	0	0	26
regeneration (1000 tCO2e/y)	0	0	20
Carbon sink potential - Mid - All (not counting	0	0	/. / 20
	U	U	4,629
overlap) (1000 tC02e/y)	0		07/
Carbon sink potential - Mid - Avoid deforestation	0	0	274
(1000 tC02e/y)			0.100
Carbon sink potential - Mid - Extend rotation	0	0	2,133
length (1000 tC02e/y)			
Carbon sink potential - Mid - Improve plantations	0	0	11.2
(1000 tC02e/y)			
Carbon sink potential - Mid - Increase retention	0	0	1,431
of HWP (1000 tCO2e/y)			
Carbon sink potential - Mid - Increase trees	0	0	60.2
outside forests (1000 tCO2e/y)			
Carbon sink potential - Mid - Reforest cropland	0	0	0
(1000 tC02e/y)			
Carbon sink potential - Mid - Reforest pasture	0	0	114
(1000 tC02e/y)			
Carbon sink potential - Mid - Restore	0	0	579
productivity (1000 tCO2e/y)	0	0	317
Land impacted for carbon sink potential - High -	0	0	5.68
Accelerate regeneration (1000 hectares)	U	0	5.00
Land impacted for carbon sink potential - High -	0	0	63.7
	0	0	03.7
Avoid deforestation (over 30 years) (1000			
hectares)			1.570
Land impacted for carbon sink potential - High -	0	0	1,572
Extend rotation length (1000 hectares)	_	_	
Land impacted for carbon sink potential - High -	0	0	5.54
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	8.48
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	6
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	287
Restore productivity (1000 hectares)		0	201
Land impacted for carbon sink potential - High -	0	0	1,948
Total impacted (over 30 years) (1000 hectares)	0	0	1,740
	0	0	0.07
Land impacted for carbon sink potential - Low -	0	0	2.84
Accelerate regeneration (1000 hectares)	0		50.0
Land impacted for carbon sink potential - Low -	0	0	59.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	602
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	2.77
Land impacted for carbon sink potential - Low -			
Improve plantations (1000 hectares)		-	0
Improve plantations (1000 hectares)	0	0	U
Improve plantations (1000 hectares) Land impacted for carbon sink potential - Low -	0	0	U
Improve plantations (1000 hectares)	0	0	4.46

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	1.04
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	174
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	847
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.26
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	61.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,087
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.17
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	6.47
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	7.52
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	350
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,521
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 - Coal (million 2019\$)	0	128	0.149	0.149	0.142	0.085	0.004
Monetary damages from air pollution - Natural Gas (million 2019\$)	0	43.7	25.2	28	21.6	10.9	2.47
Monetary damages from air pollution - Transportation (million 2019\$)	0	237	222	169	97.6	43.6	15.8
Premature deaths from air pollution - Coal (deaths)	0	14.4	0.017	0.017	0.016	0.01	0
Premature deaths from air pollution - Natural Gas (deaths)	0	4.94	2.85	3.16	2.44	1.23	0.279
Premature deaths from air pollution - Transportation (deaths)	0	26.6	25	19	11	4.91	1.78

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF -	0	1.15	1.3	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55.4	56.6	60.7	71.4	86.4	95.6	98.8
Sales of cooking units - Gas (%)	44.6	43.4	39.3	28.6	13.6	4.4	1.18
Sales of space heating units - Electric Heat Pump	4.02	3.88	8.07	20.5	41.9	60	68.2
(%)							
Sales of space heating units - Electric Resistance	2.1	2.38	2.37	2.3	1.88	1.38	1.1
(%)							
Sales of space heating units - Fossil (%)	75.2	83.5	79.6	68.2	49.4	34.5	28.2
Sales of space heating units - Gas (%)	18.7	10.2	9.97	9.04	6.81	4.15	2.55
Sales of water heating units - Electric Heat Pump	0	0.469	1.77	5.89	14.5	24.1	29.3
(%)							
Sales of water heating units - Electric Resistance	25.3	39.9	40.7	43.4	48.7	54	56.8
(%)							

Table 45: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	51.5	43.9	42.9	39.1	29.7	17.8	10.8
Sales of water heating units - Other (%)	23.2	15.7	14.7	11.6	7.09	4.11	3.08

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	0	41.9	87.7	296	932	1,358
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.165	0	0.854	0	2.38
Public EV charging plugs - L2 (1000 units)	0.188	0	3.97	0	20.5	0	57.2
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	0.23
Vehicle sales - Light-duty - EV (%)	1.88	4.67	11.8	25.8	48.3	72	87.6
Vehicle sales - Light-duty - gasoline (%)	91.8	87.5	79.6	66.7	46.3	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.57	5.38	6.04	5.5	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	0.106	0.097	0.084	0.061	0.033	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 FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.2	36.9	35.8	34.9	33.7	32.5	31.4
Final energy use - Industry (PJ)	21.1	20.7	20.4	20.3	20.3	20.2	20
Final energy use - Residential (PJ)	67.8	61.6	57.1	53.2	48.5	43.3	38.2
Final energy use - Transportation (PJ)	93.7	87.4	79.2	72.1	66.4	59.8	52

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

2020	2025	2030	2035	2040	2045	2050
0	2,680	2,929	0	0	0	0
36.9	40.7	44.7	56.5	72.7	82.9	86.4
63.1	59.3	55.3	43.5	27.3	17.1	13.6
3.23	7.44	10.2	18.5	35	52.2	61.5
1.65	2.12	3.22	6.62	12.2	16.4	17.9
57.4	37.1	35.2	28.1	17	9.78	7.36
37.7	53.3	51.4	46.8	35.8	21.6	13.2
2.6	2.83	4	7.92	17.2	28.8	35.5
12.8	11.7	12.6	16.6	25.4	36.2	42.6
77.2	80.9	79.2	71.8	54.5	32.8	19.8
7.43	4.56	4.2	3.64	2.86	2.25	2.09
	36.9 63.1 3.23 1.65 57.4 37.7 2.6 12.8	36.9 40.7 63.1 59.3 3.23 7.44 1.65 2.12 57.4 37.1 37.7 53.3 2.6 2.83 12.8 11.7	36.9 40.7 44.7 63.1 59.3 55.3 3.23 7.44 10.2 1.65 2.12 3.22 57.4 37.1 35.2 37.7 53.3 51.4 2.6 2.83 4 12.8 11.7 12.6 77.2 80.9 79.2	36.9 40.7 44.7 56.5 63.1 59.3 55.3 43.5 3.23 7.44 10.2 18.5 1.65 2.12 3.22 6.62 57.4 37.1 35.2 28.1 37.7 53.3 51.4 46.8 2.6 2.83 4 7.92 12.8 11.7 12.6 16.6 77.2 80.9 79.2 71.8	36.9 40.7 44.7 56.5 72.7 63.1 59.3 55.3 43.5 27.3 3.23 7.44 10.2 18.5 35 1.65 2.12 3.22 6.62 12.2 57.4 37.1 35.2 28.1 17 37.7 53.3 51.4 46.8 35.8 2.6 2.83 4 7.92 17.2 12.8 11.7 12.6 16.6 25.4 77.2 80.9 79.2 71.8 54.5	36.9 40.7 44.7 56.5 72.7 82.9 63.1 59.3 55.3 43.5 27.3 17.1 3.23 7.44 10.2 18.5 35 52.2 1.65 2.12 3.22 6.62 12.2 16.4 57.4 37.1 35.2 28.1 17 9.78 37.7 53.3 51.4 46.8 35.8 21.6 2.6 2.83 4 7.92 17.2 28.8 12.8 11.7 12.6 16.6 25.4 36.2 77.2 80.9 79.2 71.8 54.5 32.8

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

	•		•				
Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.401	0.397	0.601	0.621	0.904	0.955
Cumulative 5-yr (billion \$2018)							

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	0	0	0	0	0	0	0
\$2018)							
Capital invested - Biomass w/ccu allam power	0	0	0	0	0	0	0
plant (billion \$2018)							
Capital invested - Biomass w/ccu power plant	0	0	0	0	0	0	0
(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	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	0	0	0	264
Conversion capital investment - Cumulative 5-yr	0	0	0	0	0	0	3,152
(million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	2
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 (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
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	0	0	0	0	0	4.05
Annual - BECCS (MMT)	0	0	0	0	0	0	4.05
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	0	4.05
Cumulative - BECCS (MMT)	0	0	0	0	0	0	4.05
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
Cumulative - NGCC (MMT)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)	0	0	0	0	0	0	0
Injection wells (wells)	0	0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million \$2020)	0	0	0	0	0	0	0
Wells and facilities construction costs (million \$2020)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	55.8	55.8	55.8	55.8	236
Cumulative investment - All (million \$2018)	0	0	101	101	101	101	252
Cumulative investment - Spur (million \$2018)	0	0	0	0	0	0	151
Cumulative investment - Trunk (million \$2018)	0	0	101	101	101	101	101
Spur (km)	0	0	0	0	0	0	180
Trunk (km)	0	0	55.8	55.8	55.8	55.8	55.8

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

Table 56: E-B+ scenario - PILLAR 6: Land sinks	- Agriculture		
Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-68.9
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	0
Cropland to woody energy crops (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	0
Pasture to energy crops (1000 tC02e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-2.36
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-71.3
Total (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	-36.3
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Cropland to woody energy crops (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Pasture to energy crops (1000 tC02e/y)			<u> </u>
Carbon sink potential - Moderate deployment -	0	0	-1.18
Permanent conservation cover (1000 tCO2e/y)		0	1.10
Carbon sink potential - Moderate deployment -	0	0	-37.5
Total (1000 tCO2e/y)		0	-51.5
Land impacted for carbon sink - Aggressive	0	0	0
deployment - Corn-ethanol to energy grasses	0	0	0
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	97.4
deployment - Cropland measures (1000	0	0	91.4
hectares)			
	0	0	0
Land impacted for carbon sink - Aggressive	0	U	U
deployment - Cropland to woody energy crops			
(1000 hectares)		0	0.070
Land impacted for carbon sink - Aggressive	0	0	0.272
deployment - Pasture to energy crops (1000			
hectares)		-	
Land impacted for carbon sink - Aggressive	0	0	4.28
deployment - Permanent conservation cover			
(1000 hectares)			400
Land impacted for carbon sink - Aggressive	0	0	102
deployment - Total (1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	20.8
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	0
deployment - Cropland to woody energy crops			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	0.272
deployment - Pasture to energy crops (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	2.14
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	23.2
deployment - Total (1000 hectares)			

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

Table 57: E-B+ scenario - PILLAR 6: Land sinks -	- Forests		
Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	34.7
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting	0	0	6,916
overlap) (1000 tC02e/y)			
Carbon sink potential - High - Avoid deforestation	0	0	471
(1000 tCO2e/y)			
Carbon sink potential - High - Extend rotation	0	0	3,082
length (1000 tCO2e/y)			
Carbon sink potential - High - Improve	0	0	15
plantations (1000 tCO2e/y)			
Carbon sink potential - High - Increase retention	0	0	2,147
of HWP (1000 tCO2e/y)			
Carbon sink potential - High - Increase trees	0	0	89.2
outside forests (1000 tCO2e/y)			
Carbon sink potential - High - Reforest cropland	0	0	0
(1000 tC02e/y)			
Carbon sink potential - High - Reforest pasture	0	0	211
(1000 tC02e/y)			
Carbon sink potential - High - Restore	0	0	866
productivity (1000 tCO2e/y)			
Carbon sink potential - Low - Accelerate	0	0	17.4
regeneration (1000 tCO2e/y)			
Carbon sink potential - Low - All (not counting	0	0	2,342
overlap) (1000 tCO2e/y)			
Carbon sink potential - Low - Avoid deforestation	0	0	78.4
(1000 tC02e/y)			
Carbon sink potential - Low - Extend rotation	0	0	1,184
length (1000 tC02e/y)			
Carbon sink potential - Low - Improve	0	0	7.66
plantations (1000 tC02e/y)			71/
Carbon sink potential - Low - Increase retention	0	0	716
of HWP (1000 tCO2e/y)			01.0
Carbon sink potential - Low - Increase trees	0	0	31.2
outside forests (1000 tC02e/y)	0	0	0
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	U	U
The state of the s	0	0	16
Carbon sink potential - Low - Reforest pasture	0	0	10
(1000 tC02e/y)	0	0	202
carbon sink potential - Low - Restore productivity (1000 tC02e/y)	0	0	292
Carbon sink potential - Mid - Accelerate	0	0	26
regeneration (1000 tC02e/y)	"	0	20
Carbon sink potential - Mid - All (not counting	0	0	4,629
overlap) (1000 tCO2e/y)	"	0	4,029
Carbon sink potential - Mid - Avoid deforestation	0	0	274
(1000 tCO2e/y)		0	214
Carbon sink potential - Mid - Extend rotation	0	0	2,133
length (1000 tCO2e/y)		0	2,133
Carbon sink potential - Mid - Improve plantations	0	0	11.2
(1000 tC02e/y)	"	0	11.2
Carbon sink potential - Mid - Increase retention	0	0	1,431
of HWP (1000 tCO2e/y)		0	1,431
Carbon sink potential - Mid - Increase trees	0	0	60.2
outside forests (1000 tCO2e/y)		0	00.2
Carbon sink potential - Mid - Reforest cropland	0	0	0
(1000 tC02e/y)	"	U	U
Carbon sink potential - Mid - Reforest pasture	0	0	114
	"	U	114
(1000 tCO2e/y) Carbon sink potential - Mid - Restore	0	0	579
	"	U	519
productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High -	0	0	E / O
	"	U	5.68
Accelerate regeneration (1000 hectares)			

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

Table 57: E-B+ scenario - PILLAR 6: Land sinks	- Forests (con	tinuedJ	
Item	2020	2025	2050
Land impacted for carbon sink potential - High -	0	0	63.7
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	1,572
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	5.54
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Increase retention of HWP (1000 hectares)			•
Land impacted for carbon sink potential - High -	0	0	8.48
Increase trees outside forests (1000 hectares)		0	0.40
Land impacted for carbon sink potential - High -	0	0	0
Reforest cropland (1000 hectares)	0	0	0
	0	0	
Land impacted for carbon sink potential - High -	0	U	6
Reforest pasture (1000 hectares)		-	007
Land impacted for carbon sink potential - High -	0	0	287
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	1,948
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	2.84
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	59.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	602
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	2.77
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Increase retention of HWP (1000 hectares)			•
Land impacted for carbon sink potential - Low -	0	0	4.46
Increase trees outside forests (1000 hectares)		0	4.40
Land impacted for carbon sink potential - Low -	0	0	0
Reforest cropland (1000 hectares)	0	0	0
	0	0	1.04
Land impacted for carbon sink potential - Low -	U	U	1.04
Reforest pasture (1000 hectares)		-	47/
Land impacted for carbon sink potential - Low -	0	0	174
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	847
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.26
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	61.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,087
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	4.17
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)		0	0
Land impacted for carbon sink potential - Mid -	0	0	6.47
Increase trees outside forests (1000 hectares)		0	0.41
Land impacted for carbon sink potential - Mid -	0	0	0
	"	0	U
Reforest cropland (1000 hectares)	0		7.50
Land impacted for carbon sink potential - Mid -	0	0	7.52
Reforest pasture (1000 hectares)			050
Land impacted for carbon sink potential - Mid -	0	0	350
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	1,521
Total impacted (over 30 years) (1000 hectares)			
	· · · · · · · · · · · · · · · · · · ·		

Table 58: REF scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF -	0	1.13	1.17	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55	55	55	55	55	55	55
Sales of cooking units - Gas (%)	45	45	45	45	45	45	45
Sales of space heating units - Electric Heat Pump	3.84	6.34	6.59	6.97	7.07	7.14	7.27
(%)							
Sales of space heating units - Electric Resistance	2.1	2.29	2.33	2.38	2.34	2.25	2.16
(%)							
Sales of space heating units - Fossil (%)	75.3	74.5	50.1	33.3	32.3	32.1	32.2
Sales of space heating units - Gas (%)	18.7	16.9	40.9	57.3	58.3	58.5	58.4
Sales of water heating units - Electric Heat Pump	0	0	0	0	0	0	0
(%)							
Sales of water heating units - Electric Resistance	25.3	39.6	39.4	39.4	39.3	39.3	39.2
(%)							
Sales of water heating units - Gas Furnace (%)	51.5	44.3	44.5	44.5	44.6	44.7	44.8
Sales of water heating units - Other (%)	23.2	16.1	16.1	16	16	16	16

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.119	0.138	0.16	0.186	0.216	0.25	0.29
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.56	1.97	2.19	2.03	1.83	1.71	1.62
Vehicle sales - Light-duty - EV (%)	3.55	5.58	6.36	7.82	9.52	11	12.2
Vehicle sales - Light-duty - gasoline (%)	90.3	86.7	84.6	82.7	80.6	78.7	77.1
Vehicle sales - Light-duty - hybrid (%)	4.43	5.27	6.45	7.02	7.59	8.17	8.63
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.377	0.346	0.307	0.305	0.305	0.316
Vehicle sales - Light-duty - other (%)	0.102	0.106	0.102	0.103	0.103	0.101	0.104
Vehicle sales - Medium-duty - diesel (%)	65.2	63.5	61.6	59.6	58	56.5	55.2
Vehicle sales - Medium-duty - EV (%)	0.027	0.105	0.329	0.671	0.895	0.973	0.993
Vehicle sales - Medium-duty - gasoline (%)	34	35.5	37	38.5	39.7	40.8	41.7
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen FC (%)	0.175	0.208	0.242	0.285	0.339	0.409	0.487
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

Table 60: REF scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.2	37.6	37.4	36.9	36.4	36.8	38
Final energy use - Industry (PJ)	21.1	21.5	21.9	22.8	23.8	24.9	25.8
Final energy use - Residential (PJ)	67.8	61.9	58	55.1	52.9	51.1	49.7
Final energy use - Transportation (PJ)	93.6	87.4	79.7	74.8	74.3	76.1	78.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	2,647	2,721	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	36.9	39	38.6	38.5	38.3	38.5	38.4
Sales of cooking units - Gas (%)	63.1	61	61.4	61.5	61.7	61.5	61.6
Sales of space heating units - Electric Heat Pump	3.23	13	41.2	64.3	67.9	68.2	68.3
(%)							
Sales of space heating units - Electric Resistance	1.65	2.61	7.4	19.7	29.9	31.7	31.7
(%)							
Sales of space heating units - Fossil (%)	57.4	35.6	25	9.75	1.4	0.11	0
Sales of space heating units - Gas Furnace (%)	37.7	48.8	26.5	6.29	0.795	0.043	0
Sales of water heating units - Electric Heat Pump	2.6	2.39	2.36	2.36	2.34	2.37	2.37
(%)							

Table 61: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance	12.8	11.3	11	11.3	11.2	11.1	11.2
(%)							
Sales of water heating units - Gas Furnace (%)	77.2	81.6	82.1	81.9	81.9	82.2	82.2
Sales of water heating units - Other (%)	7.43	4.63	4.47	4.42	4.51	4.27	4.25

Table 62: REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
	2020			2000			
Electricity distribution capital invested -	0	0.457	0.459	0.61	0.629	0.612	0.627
Cumulative 5-yr (billion \$2018)							

Table 63: REF scenario - PILLAR 6: Land sinks - Forests

Table 63: REF scenario - PILLAR 6: Land sinks - F				
Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	1.14	0	-4.14	-3.7
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.584	0	-1.05	-1.09
Business-as-usual carbon sink - Total (Mt CO2e/y)	0.556	0	-5.19	-4.8
Carbon sink potential - High - Accelerate	0	0	0	34.7
regeneration (1000 tCO2e/y)	0	0	0	
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	6,916
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	471
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	3,082
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	15
Carbon sink potential - High - Increase retention of HWP (1000 tC02e/y)	0	0	0	2,147
Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)	0	0	0	89.2
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tC02e/y)	0	0	0	211
Carbon sink potential - High - Restore productivity (1000 tC02e/y)	0	0	0	866
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	17.4
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	2,342
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	78.4
Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)	0	0	0	1,184
Carbon sink potential - Low - Improve	0	0	0	7.66
plantations (1000 tCO2e/y) Carbon sink potential - Low - Increase retention of LIWR (1000 tCO2e/y)	0	0	0	716
of HWP (1000 tCO2e/y) Carbon sink potential - Low - Increase trees	0	0	0	31.2
outside forests (1000 tCO2e/y) Carbon sink potential - Low - Reforest cropland	0	0	0	0
(1000 tCO2e/y) Carbon sink potential - Low - Reforest pasture	0	0	0	16
(1000 tCO2e/y) Carbon sink potential - Low - Restore	0	0	0	292
productivity (1000 tCO2e/y) Carbon sink potential - Mid - Accelerate	0	0	0	26
regeneration (1000 tCO2e/y) Carbon sink potential - Mid - All (not counting	0	0	0	4,629
overlap) (1000 tC02e/y)	-	-	-	.,,

Table 63: REF scenario - PILLAR 6: Land sinks - Forests (continued)

Table 63: REF scenario - PILLAR 6: Land sinks - I	•	ntinued)		
Item	2020	2025	2030	2050
Carbon sink potential - Mid - Avoid deforestation	0	0	0	274
(1000 tC02e/y)				
Carbon sink potential - Mid - Extend rotation	0	0	0	2,133
length (1000 tC02e/y)				44.0
Carbon sink potential - Mid - Improve plantations	0	0	0	11.2
(1000 tC02e/y)	0		0	1 / 01
Carbon sink potential - Mid - Increase retention	0	0	0	1,431
of HWP (1000 tCO2e/y)	0	0	0	(0.0
Carbon sink potential - Mid - Increase trees	0	0	U	60.2
outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest cropland	0	0	0	0
(1000 tCO2e/y)	0	"	0	0
Carbon sink potential - Mid - Reforest pasture	0	0	0	114
(1000 tCO2e/y)				"14
Carbon sink potential - Mid - Restore	0	0	0	579
productivity (1000 tC02e/y)				317
Land impacted for carbon sink potential - High -	0	0	0	5.68
Accelerate regeneration (1000 hectares)				0.00
Land impacted for carbon sink potential - High -	0	0	0	63.7
Avoid deforestation (over 30 years) (1000				00.1
hectares)				
Land impacted for carbon sink potential - High -	0	0	0	1,572
Extend rotation length (1000 hectares)				.,
Land impacted for carbon sink potential - High -	0	0	0	5.54
Improve plantations (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	0
Increase retention of HWP (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	8.48
Increase trees outside forests (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	0
Reforest cropland (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	6
Reforest pasture (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	287
Restore productivity (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	1,948
Total impacted (over 30 years) (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	2.84
Accelerate regeneration (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	59.8
Avoid deforestation (over 30 years) (1000				
hectares)	_	_	_	
Land impacted for carbon sink potential - Low -	0	0	0	602
Extend rotation length (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	2.77
Improve plantations (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	0
Increase retention of HWP (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	4.46
Increase trees outside forests (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Low -	U	0	U	0
Reforest cropland (1000 hectares)	0	0	0	1.07
Land impacted for carbon sink potential - Low -	0	0	0	1.04
Reforest pasture (1000 hectares) Land impacted for carbon sink potential - Low -	0	0	0	174
Restore productivity (1000 hectares)	0		"	1/4
Land impacted for carbon sink potential - Low -	0	0	0	847
Total impacted (over 30 years) (1000 hectares)				041
Land impacted for carbon sink potential - Mid -	0	0	0	4.26
Accelerate regeneration (1000 hectares)				7.20
Land impacted for carbon sink potential - Mid -	0	0	0	61.8
Avoid deforestation (over 30 years) (1000				01.0
hectares)				
		<u> </u>	I	<u> </u>

Table 63: REF scenario - PILLAR 6: Land sinks - Forests (continued)

Thom	2020	2025	2030	2050
Item	2020	2025	2030	
Land impacted for carbon sink potential - Mid -	0	0	0	1,087
Extend rotation length (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	4.17
Improve plantations (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	0
Increase retention of HWP (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	6.47
Increase trees outside forests (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	0
Reforest cropland (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	7.52
Reforest pasture (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	350
Restore productivity (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	1,521
Total impacted (over 30 years) (1000 hectares)				

Table 64: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)	0	423	289	272	266	262	225
Monetary damages from air pollution - Natural Gas (million 2019\$)	0	32.9	27.5	35.4	37.3	36	34.2
Monetary damages from air pollution - Transportation (million 2019\$)	0	241	248	254	260	267	274
Premature deaths from air pollution - Coal (deaths)	0	47.4	32.4	30.5	29.9	29.4	25.3
Premature deaths from air pollution - Natural Gas (deaths)	0	3.72	3.11	3.99	4.21	4.06	3.86
Premature deaths from air pollution - Transportation (deaths)	0	27.1	27.9	28.5	29.3	30	30.8