Net-Zero America - rhode island 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).

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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	0.886	0.975	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55.1	64.6	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.9	35.4	6.05	0.305	0	0	0
Sales of space heating units - Electric Heat Pump	4.86	12.4	57.2	90.9	95.9	96.2	96.2
(%)							
Sales of space heating units - Electric Resistance	3.87	5.87	4.58	1.99	1.51	1.47	1.61
(%)							
Sales of space heating units - Fossil (%)	37.2	45.9	12.9	2.88	2.05	2.02	1.96
Sales of space heating units - Gas (%)	54.1	35.8	25.3	4.26	0.506	0.272	0.257
Sales of water heating units - Electric Heat Pump	0	1.46	13.8	34.6	38.2	38.4	38.4
(%)							
Sales of water heating units - Electric Resistance	22.1	39.5	47.7	59.4	61.4	61.5	61.5
(%)							
Sales of water heating units - Gas Furnace (%)	65.5	51	36.9	5.9	0.348	0	0
Sales of water heating units - Other (%)	12.4	7.96	1.57	0.146	0.084	0.085	0.085

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	167	429	695	1,053	1,145	1,092
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.024	0	0.247	0	1.08	0	1.74
Public EV charging plugs - L2 (1000 units)	0.374	0	5.92	0	25.9	0	41.8
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 (%)	1.21	1.51	1.13	0.357	0.069	0.013	0
Vehicle sales - Light-duty - EV (%)	5.05	18.7	51.6	83.8	96.6	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88	74	43.5	14.5	3.02	0.582	0
Vehicle sales - Light-duty - hybrid (%)	5.53	5.35	3.58	1.29	0.321	0.072	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.108	0.32	0.176	0.053	0.011	0.002	0
Vehicle sales - Light-duty - other (%)	0.086	0.082	0.05	0.017	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)	37.9	36	34.2	31.9	29.5	27.8	26.7
Final energy use - Industry (PJ)	7.41	7.1	7.08	7.12	7.25	7.42	7.63
Final energy use - Residential (PJ)	45.6	42.8	39.4	34.2	28.6	24.4	21.9
Final energy use - Transportation (PJ)	58.1	53.8	47.4	39.2	31.8	27.1	24.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	1,952	2,131	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	2.71	10.5	38.5	72.1	77.6	77.9	78
(%)							
Sales of space heating units - Electric Resistance	1.36	4.58	16.4	21.3	22	22.1	22
(%)							
Sales of space heating units - Fossil (%)	27.4	29.9	5.75	0.244	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	68.5	55	39.3	6.28	0.373	0	0
Sales of water heating units - Electric Heat Pump (%)	1.43	3.46	15.8	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	7.28	12.2	23.8	48	52.2	52.5	52.5
Sales of water heating units - Gas Furnace (%)	88.4	80.6	58.5	9.33	0.552	0	0
Sales of water heating units - Other (%)	2.9	3.75	1.86	1.55	1.53	1.53	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.337	0.347	1.19	1.3	1.08	1.15
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 \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Offshore Wind - Base (billion \$2018)	0	0	0.829	1.04	0.454	0	0
Capital invested - Offshore Wind - Constrained (billion \$2018)	0	2.08	0.546	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)	0	0	0.656	0	0	0	0
Capital invested - Solar PV - Constrained (billion \$2018)	0	0.137	0.725	0	0	0	0
Capital invested - Wind - Base (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Wind - Constrained (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	1,073	1,644	914	0	0
OffshoreWind - Constrained land use	0	0	1,073	1,644	914	0	0
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	220	0	983	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	1,788	0	0	0	0
Wind - Base land use assumptions (GWh)	371	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	371	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	0	0	0	46.4
Conversion capital investment - Cumulative 5-yr (million \$2018)	0	0	0	0	0	0	1,155
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	1
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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0	0	0	0	1.48
Annual - BECCS (MMT)	0	0	0	0	0	0	1.48
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	1.48
Cumulative - BECCS (MMT)	0	0	0	0	0	0	1.48
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 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 11: E+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	0	0	0	79.2
Cumulative investment - All (million \$2018)	0	0	0	0	0	0	59.3
Cumulative investment - Spur (million \$2018)	0	0	0	0	0	0	59.3
Cumulative investment - Trunk (million \$2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	79.2
Trunk (km)	0	0	0	0	0	0	0

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

Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Doubleton - 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 - Cropland measures (1000 hectares) Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - 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		0	0	0
Cropland measures (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Aggressive deployment - O O -10.7 Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - O O O O O O O O O O O O O O O O O O				
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Double to 1000 tCO2e/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		0	0	-10.3
Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Aggressive deployment - 0 0 -10.7 Total (1000 tCO2e/y) Carbon sink potential - Moderate deployment - 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Total (1000 tCO2e/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		0	0	-0.327
Total (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Potal (1000 tCO2e/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	Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Total (1000 tCO2e/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	Carbon sink potential - Aggressive deployment -	0	0	-10.7
Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Total (1000 tCO2e/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	Total (1000 tC02e/y)			
Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - 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	Carbon sink potential - Moderate deployment -	0	0	0
Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - O O -5.55 Total (1000 tC02e/y) Land impacted for carbon sink - Aggressive O O O O O O O O O O O O O O O O O O O	Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - 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	Carbon sink potential - Moderate deployment -	0	0	-5.39
Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment -	Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment - 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	Carbon sink potential - Moderate deployment -	0	0	-0.164
Total (1000 tCO2e/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	Permanent conservation cover (1000 tCO2e/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	Carbon sink potential - Moderate deployment -	0	0	-5.55
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	Total (1000 tC02e/y)			
(1000 hectares) Land impacted for carbon sink - Aggressive 0 0 6.55 deployment - Cropland measures (1000 hectares) Land impacted for carbon sink - Aggressive 0 0 0.595 deployment - Permanent conservation cover	Land impacted for carbon sink - Aggressive	0	0	0
Land impacted for carbon sink - Aggressive 0 0 6.55 deployment - Cropland measures (1000 hectares) Land impacted for carbon sink - Aggressive 0 0 0.595 deployment - Permanent conservation cover	deployment - Corn-ethanol to energy grasses			
deployment - Cropland measures (1000 hectares) Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover	(1000 hectares)			
hectares) Land impacted for carbon sink - Aggressive 0 0.595 deployment - Permanent conservation cover	Land impacted for carbon sink - Aggressive	0	0	6.55
Land impacted for carbon sink - Aggressive 0 0.595 deployment - Permanent conservation cover	deployment - Cropland measures (1000			
deployment - Permanent conservation cover	hectares)			
·	Land impacted for carbon sink - Aggressive	0	0	0.595
(1000 hectares)	deployment - Permanent conservation cover			
	(1000 hectares)			

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

Item	2020	2025	2050
Land impacted for carbon sink - Aggressive	0	0	7.15
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	3.43
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	0.298
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	3.72
deployment - Total (1000 hectares)			

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

Table 13: E+ scenario - PILLAR 6: Land sinks - For	rests		
Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	8.13
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	617
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	165
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	246
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	54.9
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	28.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	50.3
Carbon sink potential - High - Restore productivity (1000 tC02e/y)	0	0	63.9
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	4.07
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	180
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)	0	0	27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	94.6
Carbon sink potential - Low - Improve plantations (1000 tC02e/y)	0	0	0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	9.99
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)	0	0	3.81
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	21.5
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	6.1
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	399
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	96.5
• • • • • • • • • • • • • • • • • • • •			

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

Table 13: E+ scenario - PILLAR 6: Land sinks - Fo	•		2050
Item	2020	2025	2050
Carbon sink potential - Mid - Extend rotation	0	0	170
length (1000 tCO2e/y)	_		
Carbon sink potential - Mid - Improve plantations	0	0	0
(1000 tC02e/y)			
Carbon sink potential - Mid - Increase retention	0	0	36.6
of HWP (1000 tCO2e/y)			
Carbon sink potential - Mid - Increase trees	0	0	19.3
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	27
(1000 tCO2e/y)	o	0	21
Carbon sink potential - Mid - Restore	0	0	42.7
	o	0	42.1
productivity (1000 tC02e/y)		-	1.00
Land impacted for carbon sink potential - High -	0	0	1.33
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	22.4
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	126
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Improve plantations (1000 hectares)	o	0	U
	0	0	0
Land impacted for carbon sink potential - High -	U	U	U
Increase retention of HWP (1000 hectares)	_	_	
Land impacted for carbon sink potential - High -	0	0	2.71
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	1.43
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	21.2
Restore productivity (1000 hectares)	o	0	21.2
Land impacted for carbon sink potential - High -	0	0	175
	U	U	175
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.665
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	21
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	48.1
Extend rotation length (1000 hectares)	o	0	70.1
Land impacted for carbon sink potential - Low -	0	0	0
	U	0	U
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	1.43
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	0.247
Reforest pasture (1000 hectares)	o	0	0.241
	0	0	10.0
Land impacted for carbon sink potential - Low -	0	0	12.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	84.3
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.997
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	21.7
Avoid deforestation (over 30 years) (1000	5	5	١.١
hectares)			
			0/0
Land impacted for carbon sink potential - Mid -	0	0	86.8
Extend rotation length (1000 hectares)			

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid -	0	0	0
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	2.07
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	1.79
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	25.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	139
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 (million 2019\$)	0	98.9	0.104	0.103	0.098	0.06	0.003
Monetary damages from air pollution - Natural Gas (million 2019\$)	0	56.9	28.2	19.5	23.7	14.7	8.7
Monetary damages from air pollution - Transportation (million 2019\$)	0	330	306	231	132	59.1	21.5
Premature deaths from air pollution - Coal (deaths)	0	11.1	0.012	0.012	0.011	0.007	0
Premature deaths from air pollution - Natural Gas (deaths)	0	6.43	3.18	2.2	2.68	1.66	0.983
Premature deaths from air pollution - Transportation (deaths)	0	37.1	34.4	26	14.9	6.64	2.42

Table 15: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	12.2	14.1	28.6	10.9	8.49	6.24	78
By economic sector - Construction (jobs)	1,433	1,127	1,360	1,278	1,702	1,559	2,007
By economic sector - Manufacturing (jobs)	495	607	920	878	1,035	1,292	1,856
By economic sector - Mining (jobs)	545	428	300	186	105	51.4	21.4
By economic sector - Other (jobs)	165	130	186	143	190	191	320
By economic sector - Pipeline (jobs)	104	101	85	65.4	46.5	28.2	27.1
By economic sector - Professional (jobs)	540	465	575	581	825	756	1,076
By economic sector - Trade (jobs)	518	434	457	406	509	464	641
By economic sector - Utilities (jobs)	882	797	823	1,169	2,041	1,835	2,093
By education level - All sectors - Associates	1,456	1,282	1,487	1,510	2,113	2,020	2,624
degree or some college (jobs)							
By education level - All sectors - Bachelors	972	856	955	943	1,277	1,214	1,594
degree (jobs)							
By education level - All sectors - Doctoral degree	33.1	28.4	32.1	30.6	41	37.6	51.8
(jobs)							
By education level - All sectors - High school	2,002	1,736	2,035	2,009	2,720	2,620	3,465
diploma or less (jobs)							
By education level - All sectors - Masters or	231	201	225	225	311	291	384
professional degree (jobs)							
By resource sector - Biomass (jobs)	50.7	60.5	79	31.2	25.6	22.8	333
By resource sector - CO2 (jobs)	0	0	0	0	0	0	84.7
By resource sector - Grid (jobs)	1,016	558	1,107	1,940	3,132	3,110	3,649
By resource sector - Natural Gas (jobs)	969	1,212	685	545	1,083	684	568
By resource sector - Nuclear (jobs)	0	0	0	0	0	0	0
By resource sector - Oil (jobs)	1,195	1,004	772	517	310	166	63.6
By resource sector - Solar (jobs)	1,385	1,177	1,605	870	1,004	1,331	2,086
By resource sector - Wind (jobs)	78.5	92.2	486	814	908	870	1,334
Median wages - Annual - All (\$2019 per job)	66,614	67,361	67,136	69,084	70,830	71,152	71,296

Table 15: E+ scenario - IMPACTS - Jobs (continued)

Table 15. L'i Scenario 11/11 A015 5005 (continue	uj						
Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	769	671	773	781	1,086	1,033	1,335
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	331	284	317	324	460	423	535
On-Site or In-Plant Training - Total jobs - None (jobs)	759	665	772	757	1,030	989	1,315
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)	39.3	34.6	40	41.7	59.8	56.4	72.3
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	2,795	2,448	2,832	2,814	3,827	3,681	4,862
On-the-Job Training - All sectors - 1 to 4 years (jobs)	990	864	991	1,007	1,408	1,335	1,719
On-the-Job Training - All sectors - 4 to 10 years (jobs)	323	275	311	319	457	420	531
On-the-Job Training - All sectors - None (jobs)	263	227	260	250	334	319	427
On-the-Job Training - All sectors - Over 10 years (jobs)	46.9	41.4	48.8	46.2	60.7	59.5	79.1
On-the-Job Training - All sectors - Up to 1 year (jobs)	3,072	2,696	3,123	3,096	4,203	4,049	5,363
Related work experience - All sectors - 1 to 4 years (jobs)	1,696	1,484	1,697	1,695	2,324	2,215	2,895
Related work experience - All sectors - 4 to 10 years (jobs)	1,096	961	1,095	1,102	1,524	1,448	1,878
Related work experience - All sectors - None (jobs)	679	595	684	684	945	900	1,181
Related work experience - All sectors - Over 10 years (jobs)	287	254	293	294	402	389	507
Related work experience - All sectors - Up to 1 year (jobs)	935	810	965	943	1,268	1,232	1,658
Wage income - All (million \$2019)	313	276	318	326	458	440	579

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	77.6	78.8	66.4	53.3	40.1	25.2	17.5
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	1,604
Natural gas production - Annual (tcf)	0	0	0	0	0	0	0
Oil consumption - Annual (million bbls)	24.5	22.6	18.9	13.7	8.88	5.07	2.07
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	426
Oil production - Annual (million bbls)	0	0	0	0	0	0	0

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

ijioacion i	(OO) a O) TETAT					
2020	2025	2030	2035	2040	2045	2050
0	0.888	1.03	0	0	0	0
54.9	56.1	60.2	71.1	86.2	95.6	98.8
45.1	43.9	39.8	28.9	13.8	4.45	1.2
4.86	5.74	10.9	26.2	53.8	78.8	90.8
3.87	5.91	5.68	5.25	4.15	2.68	1.92
37.2	52.1	48.5	37.5	20.3	8.33	3.72
54.1	36.3	34.9	31	21.7	10.2	3.52
0	0.513	1.93	6.5	16.6	28.5	35.2
22.1	38.7	39.7	42.7	48.9	55.9	59.7
65.5	51.6	49.9	44.4	31.3	14.6	4.75
12.4	9.19	8.47	6.4	3.18	1.08	0.344
	2020 0 54.9 45.1 4.86 3.87 37.2 54.1 0 22.1 65.5	2020 2025 0 0.888 54.9 56.1 45.1 43.9 4.86 5.74 3.87 5.91 37.2 52.1 54.1 36.3 0 0.513 22.1 38.7 65.5 51.6	2020 2025 2030 0 0.888 1.03 54.9 56.1 60.2 45.1 43.9 39.8 4.86 5.74 10.9 3.87 5.91 5.68 37.2 52.1 48.5 54.1 36.3 34.9 0 0.513 1.93 22.1 38.7 39.7 65.5 51.6 49.9	2020 2025 2030 2035 0 0.888 1.03 0 54.9 56.1 60.2 71.1 45.1 43.9 39.8 28.9 4.86 5.74 10.9 26.2 3.87 5.91 5.68 5.25 37.2 52.1 48.5 37.5 54.1 36.3 34.9 31 0 0.513 1.93 6.5 22.1 38.7 39.7 42.7 65.5 51.6 49.9 44.4	2020 2025 2030 2035 2040 0 0.888 1.03 0 0 54.9 56.1 60.2 71.1 86.2 45.1 43.9 39.8 28.9 13.8 4.86 5.74 10.9 26.2 53.8 3.87 5.91 5.68 5.25 4.15 37.2 52.1 48.5 37.5 20.3 54.1 36.3 34.9 31 21.7 0 0.513 1.93 6.5 16.6 22.1 38.7 39.7 42.7 48.9 65.5 51.6 49.9 44.4 31.3	0 0.888 1.03 0 0 0 54.9 56.1 60.2 71.1 86.2 95.6 45.1 43.9 39.8 28.9 13.8 4.45 4.86 5.74 10.9 26.2 53.8 78.8 3.87 5.91 5.68 5.25 4.15 2.68 37.2 52.1 48.5 37.5 20.3 8.33 54.1 36.3 34.9 31 21.7 10.2 0 0.513 1.93 6.5 16.6 28.5 22.1 38.7 39.7 42.7 48.9 55.9 65.5 51.6 49.9 44.4 31.3 14.6

Table 18: E-scenario -	PILLAR 1. Efficiency	/Flectrification -	Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	0	27.1	56.8	192	604	880
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.024	0	0.077	0	0.4	0	1.12
Public EV charging plugs - L2 (1000 units)	0.374	0	1.84	0	9.6	0	26.8
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 (%)	1.22	1.69	2	1.57	0.98	0.498	0.214
Vehicle sales - Light-duty - EV (%)	2.29	5.57	13.6	28.7	51.4	74	88.4
Vehicle sales - Light-duty - gasoline (%)	90.5	85.8	76.9	63.1	42.8	22.8	10.1
Vehicle sales - Light-duty - hybrid (%)	5.76	6.51	7.15	6.34	4.59	2.61	1.24
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.37	0.307	0.227	0.157	0.086	0.04
Vehicle sales - Light-duty - other (%)	0.088	0.091	0.082	0.07	0.05	0.027	0.012
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)	37.9	36	35	34.2	33.1	31.9	30.6
Final energy use - Industry (PJ)	7.41	7.1	7.11	7.23	7.42	7.57	7.74
Final energy use - Residential (PJ)	45.6	43	41.1	39.3	36.3	32.3	28
Final energy use - Transportation (PJ)	58.2	54.4	49.9	45.9	42.7	38.8	34.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	1,952	2,132	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	2.71	7.42	10.6	20.5	40.4	61.4	72.8
(%)							
Sales of space heating units - Electric Resistance	1.36	2.46	3.76	7.72	14.3	19.2	21.2
(%)							
Sales of space heating units - Fossil (%)	27.4	34.6	32.4	24.5	11.9	3.78	0.991
Sales of space heating units - Gas Furnace (%)	68.5	55.5	53.2	47.3	33.4	15.6	5.09
Sales of water heating units - Electric Heat Pump	1.43	2.87	4.27	8.98	20.1	34	42.1
(%)							
Sales of water heating units - Electric Resistance	7.28	11.6	12.8	17.4	28	41.1	48.8
(%)							
Sales of water heating units - Gas Furnace (%)	88.4	81.4	79.2	70.3	49.5	23.1	7.55
Sales of water heating units - Other (%)	2.9	4.09	3.79	3.25	2.39	1.79	1.62

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.246	0.245	0.466	0.491	0.969	1.05
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)			

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	-10.3
Cropland measures (1000 tCO2e/y)			10.0
Carbon sink potential - Aggressive deployment -	0	0	-0.327
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-10.7
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	-5.39
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-0.164
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-5.55
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	6.55
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	0.595
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	7.15
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	3.43
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	0.298
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	3.72
deployment - Total (1000 hectares)			

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

2020	2025	2050
0	0	8.13
0	0	617
0	0	165
0	0	246
0	0	0
0	0	54.9
0	0	28.5
0	0	0
0	0	50.3
0	0	63.9
0	0	4.07
0	0	180
	0 0 0 0 0 0 0	

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

Table 23: <i>E- scenario - PILLAR 6: Land sinks - Fc</i> Item	2020	2025	2050
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)	0	0	27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	94.6
Carbon sink potential - Low - Improve plantations (1000 tC02e/y)	0	0	0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)	0	0	9.99
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture [1000 tCO2e/y]	0	0	3.81
Carbon sink potential - Low - Restore productivity (1000 tC02e/y)	0	0	21.5
Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)	0	0	6.1
Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)	0	0	399
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	96.5
Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y)	0	0	170
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	36.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)	0	0	19.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	27
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	42.7
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	1.33
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	22.4
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	126
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	2.71
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	1.43
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	21.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	175
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0.665
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	21

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low -	0	0	48.1
Extend rotation length (1000 hectares)		Ŭ	70.1
Land impacted for carbon sink potential - Low -	0	0	0
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	1.43
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	0.247
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	12.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	84.3
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.997
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	21.7
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	86.8
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
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	2.07
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	1.79
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	25.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	139
Total impacted (over 30 years) (1000 hectares)			
-			

Table 24: E- scenario - IMPACTS - Health

Table 24. L Scenario Init Aoro Ticalen							
Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal	0	98.9	0.104	0.103	0.098	0.06	0.003
(million 2019\$)							
Monetary damages from air pollution - Natural	0	56	22	8.26	3.44	1.06	2.17
Gas (million 2019\$)							
Monetary damages from air pollution -	0	336	338	327	292	231	157
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	11.1	0.012	0.012	0.011	0.007	0
(deaths)							
Premature deaths from air pollution - Natural	0	6.32	2.49	0.933	0.388	0.119	0.245
Gas (deaths)							
Premature deaths from air pollution -	0	37.8	38	36.8	32.9	26	17.7
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	0.886	0.975	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55.1	64.6	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.9	35.4	6.05	0.305	0	0	0
Sales of space heating units - Electric Heat Pump	4.86	12.4	57.2	90.9	95.9	96.2	96.2
(%)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Resistance	3.87	5.87	4.58	1.99	1.51	1.47	1.61
(%)							
Sales of space heating units - Fossil (%)	37.2	45.9	12.9	2.88	2.05	2.02	1.96
Sales of space heating units - Gas (%)	54.1	35.8	25.3	4.26	0.506	0.272	0.257
Sales of water heating units - Electric Heat Pump	0	1.46	13.8	34.6	38.2	38.4	38.4
(%)							
Sales of water heating units - Electric Resistance	22.1	39.5	47.7	59.4	61.4	61.5	61.5
(%)							
Sales of water heating units - Gas Furnace (%)	65.5	51	36.9	5.9	0.348	0	0
Sales of water heating units - Other (%)	12.4	7.96	1.57	0.146	0.084	0.085	0.085

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 (million \$2018)	0	167	429	695	1,053	1,145	1,092
Public EV charging plugs - DC Fast (1000 units)	0.024	0	0.247	0	1.08	0	1.74
Public EV charging plugs - L2 (1000 units)	0.374	0	5.92	0	25.9	0	41.8
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 (%)	1.21	1.51	1.13	0.357	0.069	0.013	0
Vehicle sales - Light-duty - EV (%)	5.05	18.7	51.6	83.8	96.6	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88	74	43.5	14.5	3.02	0.582	0
Vehicle sales - Light-duty - hybrid (%)	5.53	5.35	3.58	1.29	0.321	0.072	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.108	0.32	0.176	0.053	0.011	0.002	0
Vehicle sales - Light-duty - other (%)	0.086	0.082	0.05	0.017	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)	37.9	36	34.2	31.9	29.5	27.8	26.7
Final energy use - Industry (PJ)	7.41	7.1	7.08	7.12	7.25	7.42	7.63
Final energy use - Residential (PJ)	45.6	42.8	39.4	34.2	28.6	24.4	21.9
Final energy use - Transportation (PJ)	58.1	53.8	47.4	39.2	31.8	27.1	24.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	1,952	2,131	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	2.71	10.5	38.5	72.1	77.6	77.9	78
(%)							
Sales of space heating units - Electric Resistance	1.36	4.58	16.4	21.3	22	22.1	22
(%)							
Sales of space heating units - Fossil (%)	27.4	29.9	5.75	0.244	0	0	0
Sales of space heating units - Gas Furnace (%)	68.5	55	39.3	6.28	0.373	0	0
Sales of water heating units - Electric Heat Pump	1.43	3.46	15.8	41.2	45.7	46	46
(%)							
Sales of water heating units - Electric Resistance	7.28	12.2	23.8	48	52.2	52.5	52.5
(%)							
Sales of water heating units - Gas Furnace (%)	88.4	80.6	58.5	9.33	0.552	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	2.9	3.75	1.86	1.55	1.53	1.53	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.337	0.347	1.19	1.3	1.08	1.15
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 - Offshore Wind - Base (billion \$2018)	0	0	0.829	1.6	0	0	0
Capital invested - Solar PV - Base (billion \$2018)	0	0	0.656	0	0	0	0

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

Item	2020	2025	2030	2035
OffshoreWind - Base land use assumptions (GWh)	0	0	1,073	2,558
OffshoreWind - Constrained land use assumptions (GWh)	297	1,938	936	0
Solar - Base land use assumptions (GWh)	220	0	987	0
Solar - Constrained land use assumptions (GWh)	220	0	1,399	0
Wind - Base land use assumptions (GWh)	371	0	0	0
Wind - Constrained land use assumptions (GWh)	371	0	0	0

Table 32: 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	-10.3
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-0.327
Permanent conservation cover (1000 tC02e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-10.7
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	-5.39
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-0.164
Permanent conservation cover (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	-5.55
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	6.55
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	0.595
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	7.15
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	3.43
deployment - Cropland measures (1000			
hectares)			

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

Item	2020	2025	2050
Land impacted for carbon sink - Moderate	0	0	0.298
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	3.72
deployment - Total (1000 hectares)			

Table 33: E+RE+ scenario - PILLAR 6: Land sinks	- Forests		
Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	8.13
Carbon sink potential - High - All (not counting overlap) (1000 tC02e/y)	0	0	617
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	165
Carbon sink potential - High - Extend rotation	0	0	246
length (1000 tCO2e/y) Carbon sink potential - High - Improve	0	0	0
plantations (1000 tC02e/y) Carbon sink potential - High - Increase retention	0	0	54.9
of HWP (1000 tCO2e/y) Carbon sink potential - High - Increase trees	0	0	28.5
outside forests (1000 tC02e/y) Carbon sink potential - High - Reforest cropland	0	0	0
(1000 tC02e/y) Carbon sink potential - High - Reforest pasture	0	0	50.3
(1000 tC02e/y) Carbon sink potential - High - Restore	0	0	63.9
productivity (1000 tC02e/y) Carbon sink potential - Low - Accelerate	0	0	4.07
regeneration (1000 tCO2e/y)			
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	180
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	27.6
Carbon sink potential - Low - Extend rotation length (1000 tC02e/y)	0	0	94.6
Carbon sink potential - Low - Improve plantations (1000 tC02e/y)	0	0	0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	18.3
Carbon sink potential - Low - Increase trees	0	0	9.99
outside forests (1000 tC02e/y) Carbon sink potential - Low - Reforest cropland	0	0	0
(1000 tC02e/y) Carbon sink potential - Low - Reforest pasture	0	0	3.81
(1000 tC02e/y) Carbon sink potential - Low - Restore	0	0	21.5
productivity (1000 tCO2e/y) Carbon sink potential - Mid - Accelerate	0	0	6.1
regeneration (1000 tCO2e/y) Carbon sink potential - Mid - All (not counting	0	0	399
overlap) (1000 tCO2e/y) Carbon sink potential - Mid - Avoid deforestation	0	0	96.5
(1000 tCO2e/y) Carbon sink potential - Mid - Extend rotation	0	0	170
length (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations	0	0	0
(1000 tCO2e/y) Carbon sink potential - Mid - Increase retention	0	0	36.6
of HWP (1000 tCO2e/y)			
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	19.3

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

Table 33: E+RE+ scenario - PILLAR 6: Land sinks	3 - Forests (co	ntinued)	
Item	2020	2025	2050
Carbon sink potential - Mid - Reforest cropland	0	0	0
(1000 tC02e/y)			· ·
Carbon sink potential - Mid - Reforest pasture	0	0	27
· · · · · · · · · · · · · · · · · · ·		١	21
(1000 tC02e/y)		0	407
Carbon sink potential - Mid - Restore	0	0	42.7
productivity (1000 tCO2e/y)			
Land impacted for carbon sink potential - High -	0	0	1.33
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	22.4
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	126
Extend rotation length (1000 hectares)		0	120
	0		0
Land impacted for carbon sink potential - High -	0	0	0
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	2.71
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Reforest cropland (1000 hectares)		Ŭ	J
	0	0	1.43
Land impacted for carbon sink potential - High -	0	U	1.43
Reforest pasture (1000 hectares)	_		
Land impacted for carbon sink potential - High -	0	0	21.2
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	175
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.665
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	21
		١	21
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	48.1
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
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	1.43
	0	0	1.43
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	0.247
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	12.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	84.3
Total impacted (over 30 years) (1000 hectares)		0	04.5
		0	0.007
Land impacted for carbon sink potential - Mid -	0	0	0.997
Accelerate regeneration (1000 hectares)			_
Land impacted for carbon sink potential - Mid -	0	0	21.7
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	86.8
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
		١	U
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	2.07
Increase trees outside forests (1000 hectares)			
	_	0	0
Land impacted for carbon sink notential - Mid -	0	11 1	
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	"	0	U

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid -	0	0	1.79
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	25.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	139
Total impacted (over 30 years) (1000 hectares)			

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal	0	98.9	0.104	0.103	0.098	0.06	0.003
(million 2019\$)							
Monetary damages from air pollution - Natural	0	53.9	24.7	13.9	14.4	5.11	3.01
Gas (million 2019\$)							
Monetary damages from air pollution -	0	330	306	231	132	59.1	21.5
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	11.1	0.012	0.012	0.011	0.007	0
(deaths)							
Premature deaths from air pollution - Natural	0	6.09	2.79	1.57	1.63	0.577	0.339
Gas (deaths)							
Premature deaths from air pollution -	0	37.1	34.4	26	14.9	6.64	2.42
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	0.886	0.975	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	55.1	64.6	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.9	35.4	6.05	0.305	0	0	0
Sales of space heating units - Electric Heat Pump	4.86	12.4	57.2	90.9	95.9	96.2	96.2
(%)							
Sales of space heating units - Electric Resistance	3.87	5.87	4.58	1.99	1.51	1.47	1.61
(%)							
Sales of space heating units - Fossil (%)	37.2	45.9	12.9	2.88	2.05	2.02	1.96
Sales of space heating units - Gas (%)	54.1	35.8	25.3	4.26	0.506	0.272	0.257
Sales of water heating units - Electric Heat Pump	0	1.46	13.8	34.6	38.2	38.4	38.4
(%)							
Sales of water heating units - Electric Resistance	22.1	39.5	47.7	59.4	61.4	61.5	61.5
(%)							
Sales of water heating units - Gas Furnace (%)	65.5	51	36.9	5.9	0.348	0	0
Sales of water heating units - Other (%)	12.4	7.96	1.57	0.146	0.084	0.085	0.085

${\it Table~36:}~\textit{E+RE-scenario-PILLAR~1:}~\textit{Efficiency/Electrification-Transportation}$

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	167	429	695	1,053	1,145	1,092
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.024	0	0.247	0	1.08	0	1.74
Public EV charging plugs - L2 (1000 units)	0.374	0	5.92	0	25.9	0	41.8
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 (%)	1.21	1.51	1.13	0.357	0.069	0.013	0
Vehicle sales - Light-duty - EV (%)	5.05	18.7	51.6	83.8	96.6	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88	74	43.5	14.5	3.02	0.582	0
Vehicle sales - Light-duty - hybrid (%)	5.53	5.35	3.58	1.29	0.321	0.072	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.108	0.32	0.176	0.053	0.011	0.002	0
Vehicle sales - Light-duty - other (%)	0.086	0.082	0.05	0.017	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0

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

Item	2020	2025	2030	2035	2040	2045	2050
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)	37.9	36	34.2	31.9	29.5	27.8	26.7
Final energy use - Industry (PJ)	7.41	7.1	7.08	7.12	7.25	7.42	7.63
Final energy use - Residential (PJ)	45.6	42.8	39.4	34.2	28.6	24.4	21.9
Final energy use - Transportation (PJ)	58.1	53.8	47.4	39.2	31.8	27.1	24.9

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

· · · · · · · · · · · · · · · · · · ·									
Item	2020	2025	2030	2035	2040	2045	2050		
Commercial HVAC investment in 2020s -	0	1,952	2,131	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	2.71	10.5	38.5	72.1	77.6	77.9	78		
(%)									
Sales of space heating units - Electric Resistance	1.36	4.58	16.4	21.3	22	22.1	22		
(%)									
Sales of space heating units - Fossil (%)	27.4	29.9	5.75	0.244	0	0	0		
Sales of space heating units - Gas Furnace (%)	68.5	55	39.3	6.28	0.373	0	0		
Sales of water heating units - Electric Heat Pump	1.43	3.46	15.8	41.2	45.7	46	46		
(%)									
Sales of water heating units - Electric Resistance	7.28	12.2	23.8	48	52.2	52.5	52.5		
(%)									
Sales of water heating units - Gas Furnace (%)	88.4	80.6	58.5	9.33	0.552	0	0		
Sales of water heating units - Other (%)	2.9	3.75	1.86	1.55	1.53	1.53	1.55		

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.337	0.347	1.19	1.3	1.08	1.15
Cumulative 5-yr (billion \$2018)							

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

		,				
2020	2025	2030	2035	2040	2045	2050
0	0	1.22	0.529	0	0	0.271
0	2.75	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
	2020 0 0 0 0	2020 2025 0 0 0 2.75 0 0 0 0	2020 2025 2030 0 0 1.22 0 2.75 0 0 0 0 0 0 0 0 0 0 0 0 0	2020 2025 2030 2035 0 0 1.22 0.529 0 2.75 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2020 2025 2030 2035 2040 0 0 1.22 0.529 0 0 2.75 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 1.22 0.529 0 0 0 2.75 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

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

Item	2020	2025	2030	2035	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	1,567	837	833
OffshoreWind - Constrained land use	297	2,874	0	0	0
assumptions (GWh)					
Solar - Base land use assumptions (GWh)	220	0	0	0	0
Solar - Constrained land use assumptions (GWh)	583	0	0	0	0

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

Item	2020	2025	2030	2035	2050
Wind - Base land use assumptions (GWh)	371	0	0	0	0
Wind - Constrained land use assumptions (GWh)	371	0	0	0	0

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

Table 42: E+RE- Scenario - PILLAR 6: Lana Sinks	•		
Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tC02e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-10.3
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-0.327
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-10.7
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	-5.39
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-0.164
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-5.55
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	6.55
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	0.595
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	7.15
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	3.43
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	0.298
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	3.72
deployment - Total (1000 hectares)			
deployment - rotal (1000 nectal es)			

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	8.13
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting	0	0	617
overlap) (1000 tCO2e/y)			
Carbon sink potential - High - Avoid deforestation	0	0	165
(1000 tC02e/y)			
Carbon sink potential - High - Extend rotation	0	0	246
length (1000 tCO2e/y)			
Carbon sink potential - High - Improve	0	0	0
plantations (1000 tCO2e/y)			
Carbon sink potential - High - Increase retention	0	0	54.9
of HWP (1000 tCO2e/y)			
Carbon sink potential - High - Increase trees	0	0	28.5
outside forests (1000 tCO2e/y)			
Carbon sink potential - High - Reforest cropland	0	0	0
(1000 tC02e/y)			

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

Lem	Table 43: E+RE- scenario - PILLAR 6: Land sinks	- Forests (c	ontinued)	
Grabon sink potential - High - Restore 0 0 63.9 productivity (1000 tC02e/y) Carbon sink potential - Low - Accelerate 0 0 4.07 carbon sink potential - Low - Accelerate 0 0 4.07 carbon sink potential - Low - All (not counting 0 0 180 carbon sink potential - Low - All (not counting 0 0 180 carbon sink potential - Low - All (not counting 0 0 27.6 (1000 tC02e/y) Carbon sink potential - Low - Avoid deforestation 0 0 27.6 (1000 tC02e/y) Carbon sink potential - Low - Improve 0 0 0 0 carbon sink potential - Low - Improve 0 0 0 0 carbon sink potential - Low - Increase retention 0 0 18.3 carbon sink potential - Low - Increase retention 0 0 18.3 carbon sink potential - Low - Increase retention 0 0 18.3 carbon sink potential - Low - Increase retens 0 0 9.99 carbon sink potential - Low - Increase retens 0 0 9.99 carbon sink potential - Low - Reforest cropland 0 0 0 (1000 tC02e/y) Carbon sink potential - Low - Reforest cropland 0 0 0 0 (1000 tC02e/y) Carbon sink potential - Low - Reforest pasture 0 0 3.81 (1000 tC02e/y) Carbon sink potential - Low - Restore 0 0 2.1.5 (2.2.6 (2.	Item	2020	2025	2050
Carbon sink potential - High - Restore 0 0 63.9 productivity (1000 tC02e/v)	Carbon sink potential - High - Reforest pasture	0	0	50.3
Carbon sink potential - High - Restore 0 0 63.9 productivity (1000 tC02e/v)	(1000 tCO2e/y)			
Droductivity (1000 tC02e/y) Carbon sink potential - Low - Accelerate 0		0	0	63.9
Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)				
Regeneration (1000 tC02e/y)		0	0	4 07
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)		Ŭ	ŭ	7.01
Overlap (1000 tCO2e/y) Carbon sink potential - Low - Avoid deforestation O O O O O O O O O		0	0	190
Carbon sink potential - Low - Avoid deforestation		o	0	100
(1000 tCO2e/y) Carbon sink potential - Low - Extend rotation 0 94.6 length (1000 tCO2e/y) Carbon sink potential - Low - Improve 0 0 0 0 0 0 0 0 0		0	0	077
Carbon sink potential - Low - Extend rotation Carbon sink potential - Low - Improve Dantations (1000 tCO2e/y) Carbon sink potential - Low - Increase retention Dantations (1000 tCO2e/y) Carbon sink potential - Low - Increase trees Dantations Dant	·	U	U	21.0
Interpret Carbon sink potential - Low - Improve Dentations (1000 t002e/v) Dent		-		0/ /
Carbon sink potential - Low - Improve		U	U	94.6
Dantations (1000 tCO2e/y)				
Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y) 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 - Reforest pasture (1000 tC02e/y) Carbon sink potential - Low - Restore o		U	U	U
Grbon sink potential - Low - Increase trees				
Carbon sink potential - Low - Increase trees		0	0	18.3
Dutside forests (1000 tCO2e/y)				
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)		0	0	9.99
(1000 tC02e/y) Carbon sink potential - Low - Reforest pasture 0				
Carbon sink potential - Low - Reforest pasture	Carbon sink potential - Low - Reforest cropland	0	0	0
(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 vorelap) (1000 tC02e/y) Carbon sink potential - Mid - All (not counting vorelap) (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 - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase trees of the provided for the p				
Carbon sink potential - Low - Restore productivity (1000 tC02e/y)	Carbon sink potential - Low - Reforest pasture	0	0	3.81
Description Contential Mid Accelerate Company Carbon sink potential Mid Accelerate Company Carbon sink potential Mid Accelerate Company Carbon sink potential Mid All (not counting Company Carbon sink potential Mid Avoid deforestation Company Carbon sink potential Mid Avoid deforestation Company Carbon sink potential Mid Extend rotation Company Carbon sink potential Mid Extend rotation Company Carbon sink potential Mid Improve plantations Company Carbon sink potential Mid Improve plantations Company Carbon sink potential Mid Improve plantations Company Carbon sink potential Mid Increase retention Company Carbon sink potential Mid Increase trees Company Carbon sink potential Mid Increase trees Company Carbon sink potential Mid Reforest cropland Company Carbon sink potential Mid Reforest pasture Company Carbon sink potential Mid Reforest pasture Company Carbon sink potential Mid Restore Company Carbon sink potential High	(1000 tC02e/y)			
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	Carbon sink potential - Low - Restore	0	0	21.5
Pegeneration (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 O O O 170	productivity (1000 tCO2e/y)			
Pegeneration (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 O O O 170	Carbon sink potential - Mid - Accelerate	0	0	6.1
Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)				
Overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Mid - Extend rotation O		0	0	399
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 - 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) 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 - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)				
Carbon sink potential - Mid - Extend rotation O O O O O O O O O		0	0	96.5
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 outco2e/y) Carbon sink potential - Mid - Reforest pasture outco2e/y) Carbon sink potential - Mid - Reforest pasture outco2e/y) Carbon sink potential - Mid - Restore outco2e/y) Land impacted for carbon sink potential - High - outco2e/y) Land impacted for carbon sink potential - High - outco2e/y Land impacted for carbon sink potential - High				70.0
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 outside for carbon sink potential - High - Outside for carbon sink potentia		Ω	n	170
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 outside for carbon sink potential - High - Outside for				
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)		0	n	<u> </u>
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase trees of the potential of the p		Ŭ	9	9
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) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside for carbon sink potential - High - Increase trees outside for carbon sink potential - High - Increase trees outside for carbon sink potential - High - Increase trees outside for carbon sink potential - High - Increase trees outside for carbon sink potential - High - Increase trees outside for carbon sink potential - High - Increase trees outside for carbon sink potential - High - Increase trees outside for carbon sink potential - High - Increase trees outside for carbon sink		Ω	n	36.6
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) Land impacted for carbon sink potential - High - O O O O O O O O O O O O O O O O O O		o	0	50.0
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 - O O O O O O O O O O O O O O O O O O		0	0	10.3
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 - Avoid deforestation (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)		U	0	17.3
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) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)		0	0	
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 - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	· · · · · · · · · · · · · · · · · · ·	U	U	U
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 - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Improve plantation of HWP (1000 hectares) Land impacted for carbon sink potential - High - Improve trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Improve trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Improve trees outside for carbon sink				
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 - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares) Land impacted for carbon sink potential - High - Dectares (1000 hectares)		U	0	27
productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - 0 0 1.33 Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - 0 0 22.4 Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - High - 0 0 126 Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - 0 0 0 0 0 126 Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	•		_	
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Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - O O 21.2	Avoid deforestation (over 30 years) (1000			
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Land impacted for carbon sink potential - High - 0 0 21.2		U	υ	1.43
		0		01.0
kesture productivity (1000 nectares)		U	U	21.2
	kestore productivity (1000 nectares)			

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

Table 43: E+RE- scenario - PILLAR 6: Land sinks		ntinueaj	
Item	2020	2025	2050
Land impacted for carbon sink potential - High -	0	0	175
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.665
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	21
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	48.1
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
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	1.43
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	0.247
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	12.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	84.3
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.997
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	21.7
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	86.8
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
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	2.07
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	1.79
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	25.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	139
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	0	98.9	0.104	0.103	0.098	0.06	0.003
(million 2019\$)							
Monetary damages from air pollution - Natural	0	56.4	32.3	34.1	25.9	13.8	3.36
Gas (million 2019\$)							
Monetary damages from air pollution -	0	330	306	231	132	59.1	21.5
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	11.1	0.012	0.012	0.011	0.007	0
(deaths)							
Premature deaths from air pollution - Natural	0	6.37	3.65	3.85	2.93	1.56	0.38
Gas (deaths)							
Premature deaths from air pollution -	0	37.1	34.4	26	14.9	6.64	2.42
Transportation (deaths)							

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	0.888	1.03	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	54.9	56.1	60.2	71.1	86.2	95.6	98.8
Sales of cooking units - Gas (%)	45.1	43.9	39.8	28.9	13.8	4.45	1.2
Sales of space heating units - Electric Heat Pump	4.86	5.74	10.9	26.2	53.8	78.8	90.8
(%)							
Sales of space heating units - Electric Resistance	3.87	5.91	5.68	5.25	4.15	2.68	1.92
(%)							
Sales of space heating units - Fossil (%)	37.2	52.1	48.5	37.5	20.3	8.33	3.72
Sales of space heating units - Gas (%)	54.1	36.3	34.9	31	21.7	10.2	3.52
Sales of water heating units - Electric Heat Pump	0	0.513	1.93	6.5	16.6	28.5	35.2
(%)							
Sales of water heating units - Electric Resistance	22.1	38.7	39.7	42.7	48.9	55.9	59.7
(%)							
Sales of water heating units - Gas Furnace (%)	65.5	51.6	49.9	44.4	31.3	14.6	4.75
Sales of water heating units - Other (%)	12.4	9.19	8.47	6.4	3.18	1.08	0.344

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	27.1	56.8	192	604	880
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.024	0	0.077	0	0.4	0	1.12
Public EV charging plugs - L2 (1000 units)	0.374	0	1.84	0	9.6	0	26.8
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 (%)	1.22	1.69	2	1.57	0.98	0.498	0.214
Vehicle sales - Light-duty - EV (%)	2.29	5.57	13.6	28.7	51.4	74	88.4
Vehicle sales - Light-duty - gasoline (%)	90.5	85.8	76.9	63.1	42.8	22.8	10.1
Vehicle sales - Light-duty - hybrid (%)	5.76	6.51	7.15	6.34	4.59	2.61	1.24
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.37	0.307	0.227	0.157	0.086	0.04
Vehicle sales - Light-duty - other (%)	0.088	0.091	0.082	0.07	0.05	0.027	0.012
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)	37.9	36	35	34.2	33.1	31.9	30.6
Final energy use - Industry (PJ)	7.41	7.1	7.11	7.23	7.42	7.57	7.74
Final energy use - Residential (PJ)	45.6	43	41.1	39.3	36.3	32.3	28
Final energy use - Transportation (PJ)	58.2	54.4	49.9	45.9	42.7	38.8	34.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	1,952	2,132	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 (%)	2.71	7.42	10.6	20.5	40.4	61.4	72.8
Sales of space heating units - Electric Resistance (%)	1.36	2.46	3.76	7.72	14.3	19.2	21.2
Sales of space heating units - Fossil (%)	27.4	34.6	32.4	24.5	11.9	3.78	0.991

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	68.5	55.5	53.2	47.3	33.4	15.6	5.09
Sales of water heating units - Electric Heat Pump (%)	1.43	2.87	4.27	8.98	20.1	34	42.1
Sales of water heating units - Electric Resistance (%)	7.28	11.6	12.8	17.4	28	41.1	48.8
Sales of water heating units - Gas Furnace (%)	88.4	81.4	79.2	70.3	49.5	23.1	7.55
Sales of water heating units - Other (%)	2.9	4.09	3.79	3.25	2.39	1.79	1.62

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.246	0.245	0.466	0.491	0.969	1.05
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	114
Conversion capital investment - Cumulative 5-yr	0	0	0	0	0	0	1,510
(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	1
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	1.94
Annual - BECCS (MMT)	0	0	0	0	0	0	1.94
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	1.94
Cumulative - BECCS (MMT)	0	0	0	0	0	0	1.94
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	0	0	0	0	79.2
Cumulative investment - All (million \$2018)	0	0	0	0	0	0	65.6
Cumulative investment - Spur (million \$2018)	0	0	0	0	0	0	65.6
Cumulative investment - Trunk (million \$2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	79.2
Trunk (km)	0	0	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	2030
Corn-ethanol to energy grasses (1000 tC02e/y)		0	U
Carbon sink potential - Aggressive deployment -	0	0	-10.3
Cropland measures (1000 tC02e/y)		0	10.0
Carbon sink potential - Aggressive deployment -	0	0	0
Cropland to woody energy crops (1000 tC02e/y)			ŭ
Carbon sink potential - Aggressive deployment -	0	0	0
Pasture to energy crops (1000 tC02e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-0.327
Permanent conservation cover (1000 tC02e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-10.7
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	-5.39
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Cropland to woody energy crops (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Pasture to energy crops (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-0.164
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-5.55
Total (1000 tC02e/y)			
Land impacted for carbon sink - Aggressive	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			1/ 0
Land impacted for carbon sink - Aggressive	0	0	16.2
deployment - Cropland measures (1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	0
deployment - Cropland to woody energy crops	0	0	U
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	0.047
deployment - Pasture to energy crops (1000			0.041
hectares)			
Land impacted for carbon sink - Aggressive	0	0	0.595
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	16.8
deployment - Total (1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			

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

Item	2020	2025	2050
Land impacted for carbon sink - Moderate	0	0	3.43
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	0.047
deployment - Pasture to energy crops (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	0.298
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	3.77
deployment - Total (1000 hectares)			

Item	orests 2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	8.13
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	617
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	165
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	246
Carbon sink potential - High - Improve plantations (1000 tC02e/y)	0	0	С
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	54.9
Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)	0	0	28.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	C
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	50.3
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	63.9
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	4.0
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	180
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	94.6
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	(
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	9.99
Carbon sink potential - Low - Reforest cropland [1000 tCO2e/y]	0	0	(
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	3.8
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	21.5
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	6.
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	399
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	96.5

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

Table 57: E-B+ scenario - PILLAR 6: Land sinks -	Forests (co	ntinued)	
Item	2020	2025	2050
Carbon sink potential - Mid - Extend rotation	0	0	170
length (1000 tCO2e/y)			
Carbon sink potential - Mid - Improve plantations	0	0	0
(1000 tC02e/y)			
Carbon sink potential - Mid - Increase retention	0	0	36.6
of HWP (1000 tCO2e/y)			00.0
Carbon sink potential - Mid - Increase trees	0	0	19.3
outside forests (1000 tC02e/y)		0	17.5
		0	
Carbon sink potential - Mid - Reforest cropland	0	0	0
(1000 tC02e/y)			
Carbon sink potential - Mid - Reforest pasture	0	0	27
(1000 tC02e/y)			
Carbon sink potential - Mid - Restore	0	0	42.7
productivity (1000 tCO2e/y)			
Land impacted for carbon sink potential - High -	0	0	1.33
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	22.4
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	126
Extend rotation length (1000 hectares)		0	120
		0	
Land impacted for carbon sink potential - High -	0	0	0
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	2.71
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	1.43
Reforest pasture (1000 hectares)		•	
Land impacted for carbon sink potential - High -	0	0	21.2
Restore productivity (1000 hectares)		0	21.2
		0	175
Land impacted for carbon sink potential - High -	0	0	175
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.665
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	21
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	48.1
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Improve plantations (1000 hectares)		0	0
	0	0	0
Land impacted for carbon sink potential - Low -		U	U
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	1.43
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	0.247
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	12.8
Restore productivity (1000 hectares)		0	12.0
Land impacted for carbon sink potential - Low -	0	0	84.3
		U	04.3
Total impacted (over 30 years) (1000 hectares)			0.007
Land impacted for carbon sink potential - Mid -	0	0	0.997
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	21.7
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	86.8
Extend rotation length (1000 hectares)			
	<u> </u>		

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid -	0	0	0
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	2.07
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	1.79
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	25.8
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	139
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	0.864	0.9	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	54.5	54.5	54.5	54.5	54.5	54.5	54.5
Sales of cooking units - Gas (%)	45.5	45.5	45.5	45.5	45.5	45.5	45.5
Sales of space heating units - Electric Heat Pump	4.66	8.08	8.4	8.88	9.08	9.28	9.55
(%)							
Sales of space heating units - Electric Resistance	3.9	5.72	5.6	5.54	5.52	5.25	5.08
(%)							
Sales of space heating units - Fossil (%)	37.3	45.1	23.2	7.8	6.77	6.71	6.7
Sales of space heating units - Gas (%)	54.2	41.1	62.8	77.8	78.6	78.8	78.7
Sales of water heating units - Electric Heat Pump	0	0	0	0	0	0	0
(%)							
Sales of water heating units - Electric Resistance	22.1	38.4	38.4	38.4	38.4	38.4	38.4
(%)							
Sales of water heating units - Gas Furnace (%)	65.5	52.1	52.2	52.1	52.1	52.1	52.1
Sales of water heating units - Other (%)	12.4	9.45	9.45	9.48	9.5	9.51	9.52

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 (%)	1.21	1.68	2.13	1.99	1.78	1.65	1.57
Vehicle sales - Light-duty - EV (%)	4.69	7.07	7.9	9.78	11.8	13.3	14.6
Vehicle sales - Light-duty - gasoline (%)	88.4	84.4	81.9	79.7	77.4	75.6	74.1
Vehicle sales - Light-duty - hybrid (%)	5.55	6.35	7.66	8.19	8.67	9.07	9.32
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.365	0.326	0.285	0.28	0.279	0.288
Vehicle sales - Light-duty - other (%)	0.087	0.09	0.087	0.087	0.086	0.085	0.087
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)	37.8	36.8	37.1	37.1	37.2	38.2	39.8
Final energy use - Industry (PJ)	7.42	7.31	7.55	7.93	8.42	8.89	9.39
Final energy use - Residential (PJ)	45.6	43.2	42	41.3	40.8	40.5	40.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	58.1	54.5	50.5	48.1	48.2	49.7	51.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	1,928	1,983	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 (%)	2.71	12.7	40.8	63.9	67.6	67.9	68
Sales of space heating units - Electric Resistance (%)	1.36	2.89	7.67	20	30.2	31.9	32
Sales of space heating units - Fossil (%)	27.4	33.4	23.6	9.33	1.34	0.106	0
Sales of space heating units - Gas Furnace (%)	68.5	51	27.9	6.76	0.86	0.048	0
Sales of water heating units - Electric Heat Pump (%)	1.43	2.35	2.32	2.33	2.32	2.34	2.33
Sales of water heating units - Electric Resistance (%)	7.28	11.1	10.9	11.1	11.1	11	11
Sales of water heating units - Gas Furnace (%)	88.4	82.4	82.7	82.5	82.5	82.7	82.6
Sales of water heating units - Other (%)	2.9	4.16	4.07	4.09	4.16	4	4.05

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.245	0.243	0.8	0.865	0.782	0.829
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-1.01	0	-0.322	-0.288
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.015	0	-0.027	-0.028
Business-as-usual carbon sink - Total (Mt CO2e/y)	-1.02	0	-0.349	-0.316
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	8.13
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	617
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	165
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	246
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	54.9
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	28.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	50.3
Carbon sink potential - High - Restore productivity (1000 tC02e/y)	0	0	0	63.9
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	4.07
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	180
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	27.6

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

Table 63: REF scenario - PILLAR 6: Land sinks - F	-orests (con	tınued)		
Item	2020	2025	2030	2050
Carbon sink potential - Low - Extend rotation	0	0	0	94.6
length (1000 tCO2e/y)				
Carbon sink potential - Low - Improve	0	0	0	0
plantations (1000 tCO2e/y)				
Carbon sink potential - Low - Increase retention	0	0	0	18.3
of HWP (1000 tCO2e/y)				
Carbon sink potential - Low - Increase trees	0	0	0	9.99
outside forests (1000 tCO2e/y)				
Carbon sink potential - Low - Reforest cropland	0	0	0	0
(1000 tC02e/y)	Ŭ	ı ı	•	Ü
Carbon sink potential - Low - Reforest pasture	0	0	0	3.81
(1000 tC02e/y)	o	0	0	5.01
Carbon sink potential - Low - Restore	0	0	0	21.5
	U	U	0	21.5
productivity (1000 tCO2e/y)	-	-		
Carbon sink potential - Mid - Accelerate	0	0	0	6.1
regeneration (1000 tCO2e/y)		_	_	
Carbon sink potential - Mid - All (not counting	0	0	0	399
overlap) (1000 tCO2e/y)				
Carbon sink potential - Mid - Avoid deforestation	0	0	0	96.5
(1000 tCO2e/y)				
Carbon sink potential - Mid - Extend rotation	0	0	0	170
length (1000 tCO2e/y)				
Carbon sink potential - Mid - Improve plantations	0	0	0	0
(1000 tCO2e/y)				
Carbon sink potential - Mid - Increase retention	0	0	0	36.6
of HWP (1000 tC02e/y)				
Carbon sink potential - Mid - Increase trees	0	0	0	19.3
outside forests (1000 tCO2e/y)				.,,,
Carbon sink potential - Mid - Reforest cropland	0	0	0	0
(1000 tCO2e/y)	0	0	0	O
Carbon sink potential - Mid - Reforest pasture	0	0	0	27
(1000 tCO2e/y)	o	0	0	21
	0	0		/.07
Carbon sink potential - Mid - Restore	0	0	0	42.7
productivity (1000 tC02e/y)	-			1.00
Land impacted for carbon sink potential - High -	0	0	0	1.33
Accelerate regeneration (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	22.4
Avoid deforestation (over 30 years) (1000				
hectares)				
Land impacted for carbon sink potential - High -	0	0	0	126
Extend rotation length (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	0
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	2.71
Increase trees outside forests (1000 hectares)			-	
Land impacted for carbon sink potential - High -	0	0	0	0
Reforest cropland (1000 hectares)	Ŭ	ı ı	•	Ü
Land impacted for carbon sink potential - High -	0	0	0	1.43
Reforest pasture (1000 hectares)	U	0	0	1.43
	0	0	0	21.2
Land impacted for carbon sink potential - High -	U	U	U	21.2
Restore productivity (1000 hectares)				475
Land impacted for carbon sink potential - High -	0	0	0	175
Total impacted (over 30 years) (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	0.665
Accelerate regeneration (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	21
Avoid deforestation (over 30 years) (1000				
hectares)				
	0	0	0	48.1

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

Table 63: REF SCENUTO - PILLAR 6: LUNU SINKS - I	•	•		
Item	2020	2025	2030	2050
Land impacted for carbon sink potential - Low -	0	0	0	0
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	1.43
Increase trees outside forests (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	0
Reforest cropland (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	0.247
Reforest pasture (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	12.8
Restore productivity (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	84.3
Total impacted (over 30 years) (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	0.997
Accelerate regeneration (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	21.7
Avoid deforestation (over 30 years) (1000				
hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	86.8
Extend rotation length (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	0
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	2.07
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	1.79
Reforest pasture (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	25.8
Restore productivity (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	139
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	273	171	159	155	152	135
Monetary damages from air pollution - Natural Gas (million 2019\$)	0	44.4	29	38.7	54.3	50.4	45.8
Monetary damages from air pollution - Transportation (million 2019\$)	0	335	342	348	355	362	369
Premature deaths from air pollution - Coal (deaths)	0	30.7	19.2	17.8	17.4	17	15.2
Premature deaths from air pollution - Natural Gas (deaths)	0	5.02	3.28	4.37	6.14	5.69	5.17
Premature deaths from air pollution - Transportation (deaths)	0	37.7	38.5	39.1	39.9	40.7	41.5