Net-Zero America - delaware state report

Larson et al. 2020

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

Notes

- These data are a subset of all data from the study available at https://netzeroamerica.princeton.edu.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one "no new policies" reference scenario. In this document, state-level results are grouped by scenario. For some scenarios, the study generated national, but not state-level results.
- Within results for a given scenario, data tables are organized into corresponding sections of the full net-zero study (e.g., Pillar 1, Pillar 2, etc.)
- Some results are not model outputs, but rather they are limits that apply across all scenarios (e.g., maximum carbon storage potential in agricultural soils).

List of Tables

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF -	0	0.774	0.771	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Sales of space heating units - Electric Heat Pump	14.3	32.1	79.9	90.6	91	91	91
(%)							
Sales of space heating units - Electric Resistance	9.9	10.8	4.53	3.11	3.02	3.06	3.07
(%)							
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of water heating units - Electric Heat Pump	0	9.43	49.9	59	59.4	59.4	59.4
(%)							
Sales of water heating units - Electric Resistance	30.2	45.9	40.3	39	38.9	38.9	38.9
(%)							
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7

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	193	496	803	1,217	1,325	1,263
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.324	0	1.42	0	2.3
Public EV charging plugs - L2 (1000 units)	0.118	0	7.8	0	34.2	0	55.3
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.43	1.71	1.21	0.386	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.31	16.4	48.3	82.5	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.9	15.8	3.2	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.8	4.82	3.34	1.23	0.301	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.194	0.06	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.096	0.092	0.059	0.021	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)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	3,472	3,883	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	1.53	28.2	70.6	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0

Table 4: E+ scenario	- PTI I AR 1: FHiciency	//Flertritiration -	Commercial	(Irontinued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of water heating units - Electric Heat Pump (%)	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Sales of water heating units - Gas Furnace (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.526	0.536	0.919	0.973	0.907	0.947
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion	0	0	0	0	0	0	0
\$2018)							
Capital invested - Biomass w/ccu allam power	0	0	0	0	0	0	0
plant (billion \$2018)							
Capital invested - Biomass w/ccu power plant	0	0	0	0	0	0	0
(billion \$2018)							
Capital invested - Offshore Wind - Base (billion	0	0	0	0	0	5.99	5.64
\$2018)							
Capital invested - Offshore Wind - Constrained	0	0	0	0	0	3.3	8.06
(billion \$2018)							
Capital invested - Solar PV - Base (billion \$2018)	0	0.167	0.173	0.318	0	0	0
Capital invested - Solar PV - Constrained (billion	0	0.144	0.276	0.328	0	0	0
\$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	17,643	19,972
OffshoreWind - Constrained land use	0	0	0	0	0	17,643	19,972
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	75.2	233	271	543	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	180	342	0	0	0
Wind - Base land use assumptions (GWh)	8.07	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	8.07	0	0	0	0	0	0

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

•	0,						
Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr	0	0	0	0	0	0	0
(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	0
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 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	0
Annual - BECCS (MMT)	0	0	0	0	0	0	0
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	0
Cumulative - BECCS (MMT)	0	0	0	0	0	0	0
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	166
Cumulative investment - All (million \$2018)	0	0	0	0	0	0	122
Cumulative investment - Spur (million \$2018)	0	0	0	0	0	0	122
Cumulative investment - Trunk (million \$2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	166
Trunk (km)	0	0	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tC02e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-244
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-6.43
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-250
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	-126
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-3.22
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-129
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	171
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	11.7
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	183
deployment - Total (1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	0
deployment - Corn-ethanol to energy grasses			
(1000 hectares)			
,			

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

Item	2020	2025	2050
Land impacted for carbon sink - Moderate	0	0	88.6
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	5.85
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	94.5
deployment - Total (1000 hectares)			

Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	6.94
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	901
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tC02e/y)	0	0	76.6
Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)	0	0	3.48
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	263
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	77.3
Carbon sink potential - Low - Improve plantations (1000 tC02e/y)	0	0	13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2.
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	6.5
Carbon sink potential - Low - Restore productivity (1000 tC02e/y)	0	0	25.8
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	5.2
Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)	0	0	58
Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y)	0	0	120
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	139

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

Table 13: E+ scenario - PILLAR 6: Land sinks - F			
Item	2020	2025	2050
Carbon sink potential - Mid - Increase trees	0	0	56.4
outside forests (1000 tC02e/y)			
Carbon sink potential - Mid - Reforest cropland	0	0	4.05
(1000 tC02e/y)			
Carbon sink potential - Mid - Reforest pasture	0	0	46.2
(1000 tC02e/y)			
Carbon sink potential - Mid - Restore	0	0	51.2
productivity (1000 tCO2e/y)		_	
Land impacted for carbon sink potential - High -	0	0	1.13
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	27.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	103
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	10.1
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	7.93
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0.357
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	2.44
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	25.4
Restore productivity (1000 hectares)			_0
Land impacted for carbon sink potential - High -	0	0	178
Total impacted (over 30 years) (1000 hectares)			110
Land impacted for carbon sink potential - Low -	0	0	0.567
Accelerate regeneration (1000 hectares)		9	0.001
Land impacted for carbon sink potential - Low -	0	0	26.1
Avoid deforestation (over 30 years) (1000		0	20.1
hectares)			
Land impacted for carbon sink potential - Low -	0	0	39.3
Extend rotation length (1000 hectares)		0	37.3
Land impacted for carbon sink potential - Low -	0	0	5.03
Improve plantations (1000 hectares)		0	5.05
	0	0	0
Land impacted for carbon sink potential - Low -	0	0	0
Increase retention of HWP (1000 hectares)		0	/ 17
Land impacted for carbon sink potential - Low -	0	0	4.17
Increase trees outside forests (1000 hectares)			0.470
Land impacted for carbon sink potential - Low -	0	0	0.179
Reforest cropland (1000 hectares)		_	
Land impacted for carbon sink potential - Low -	0	0	0.423
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	15.4
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	91.2
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.851
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	27
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	71
Extend rotation length (1000 hectares)		-	
Land impacted for carbon sink potential - Mid -	0	0	7.57
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)			3
Land impacted for carbon sink potential - Mid -	0	0	6.05
		0 1	0.00
Increase trees outside forests (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	0.268
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	3.06
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	30.9
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	147
Total impacted (over 30 years) (1000 hectares)			

Table 14: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal	0	130	0.091	0.09	0.083	0.057	0.005
(million 2019\$)							
Monetary damages from air pollution - Natural	0	52.5	38.6	25.7	23.3	15.7	6.51
Gas (million 2019\$)							
Monetary damages from air pollution -	0	232	218	166	96.2	43.7	16.6
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	14.6	0.01	0.01	0.009	0.006	0.001
(deaths)							
Premature deaths from air pollution - Natural	0	5.93	4.36	2.9	2.63	1.77	0.736
Gas (deaths)							
Premature deaths from air pollution -	0	26.1	24.5	18.7	10.8	4.91	1.87
Transportation (deaths)							

Table 15: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	3.29	3.8	7.71	2.95	2.29	1.68	1.25
By economic sector - Construction (jobs)	1,159	1,159	1,095	1,419	1,414	4,193	7,337
By economic sector - Manufacturing (jobs)	779	1,426	2,601	2,635	2,094	2,841	2,826
By economic sector - Mining (jobs)	395	287	197	119	64.2	27.8	8.9
By economic sector - Other (jobs)	126	116	123	181	172	423	786
By economic sector - Pipeline (jobs)	83.7	81.8	67.9	52	36.7	21.4	39.3
By economic sector - Professional (jobs)	482	476	427	558	573	2,181	4,081
By economic sector - Trade (jobs)	414	359	317	376	364	1,221	2,325
By economic sector - Utilities (jobs)	1,085	1,300	1,156	1,571	1,840	5,242	8,746
By education level - All sectors - Associates	1,443	1,678	1,926	2,244	2,150	5,290	8,572
degree or some college (jobs)							
By education level - All sectors - Bachelors	925	1,049	1,188	1,348	1,271	3,178	5,187
degree (jobs)							
By education level - All sectors - Doctoral degree	28.9	29.2	28.5	33.8	32.7	102	183
(jobs)							
By education level - All sectors - High school	1,913	2,216	2,597	2,993	2,820	6,801	10,887
diploma or less (jobs)							
By education level - All sectors - Masters or	216	238	253	295	286	782	1,321
professional degree (jobs)							
By resource sector - Biomass (jobs)	13.7	16.3	21.3	8.39	6.88	6.13	5.33
By resource sector - CO2 (jobs)	0	0	0	0	0	0	224
By resource sector - Coal (jobs)	188	60.3	0	0	0	0	0
By resource sector - Grid (jobs)	981	1,544	1,578	2,444	2,815	10,088	16,956
By resource sector - Natural Gas (jobs)	1,273	1,224	934	898	1,048	701	713
By resource sector - Nuclear (jobs)	0	0	0	0	0	0	0
By resource sector - Oil (jobs)	706	583	435	275	147	58.8	0
By resource sector - Solar (jobs)	1,363	1,777	2,924	3,212	2,308	2,259	2,349
By resource sector - Wind (jobs)	1.9	4.99	99.5	77	236	3,040	5,904
Median wages - Annual - All (\$2019 per job)	63,848	64,185	63,423	64,501	66,169	68,740	70,482
On-Site or In-Plant Training - Total jobs - 1 to 4	748	860	972	1,135	1,091	2,713	4,412
years (jobs)							
On-Site or In-Plant Training - Total jobs - 4 to 10	312	338	340	414	417	1,130	1,912
years (jobs)							
On-Site or In-Plant Training - Total jobs - None	730	840	979	1,121	1,053	2,568	4,154
(jobs)							

Table 15: E+ scenario - IMPACTS - Jobs (continued	Table 15: <i>E</i>	+ scenario -	IMPACTS	Inhs	<i>(continued</i>
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Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - Total jobs - Over 10	39.2	45.4	50.2	59.7	58.7	150	246
years (jobs)							
On-Site or In-Plant Training - Total jobs - Up to 1	2,698	3,126	3,652	4,184	3,941	9,592	15,426
year (jobs)							
On-the-Job Training - All sectors - 1 to 4 years	966	1,107	1,241	1,453	1,403	3,514	5,735
(jobs)							
On-the-Job Training - All sectors - 4 to 10 years	305	329	328	404	411	1,127	1,916
(jobs)							
On-the-Job Training - All sectors - None (jobs)	243	272	311	356	334	827	1,349
On-the-Job Training - All sectors - Over 10 years	45.2	53.6	66.8	74.5	67.3	150	233
(jobs)							
On-the-Job Training - All sectors - Up to 1 year	2,968	3,447	4,047	4,626	4,345	10,535	16,918
(jobs)							
Related work experience - All sectors - 1 to 4	1,633	1,867	2,125	2,453	2,336	5,797	9,419
years (jobs)							
Related work experience - All sectors - 4 to 10	1,063	1,218	1,376	1,592	1,524	3,800	6,192
years (jobs)							
Related work experience - All sectors - None	656	754	856	994	952	2,345	3,805
(jobs)							
Related work experience - All sectors - Over 10	283	335	399	453	424	1,014	1,614
years (jobs)							
Related work experience - All sectors - Up to 1	891	1,036	1,238	1,421	1,325	3,197	5,121
year (jobs)							
Wage income - All (million \$2019)	289	334	380	446	434	1,110	1,843

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	72.9	73.9	62.3	50	37.6	23.7	16.4
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	1,505
Natural gas production - Annual (tcf)	0	0	0	0	0	0	0
Oil consumption - Annual (million bbls)	14.5	13.1	10.7	7.3	4.21	1.8	0
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	229
Oil production - Annual (million bbls)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF -	0	0.769	0.798	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	49.9	51.2	55.8	67.9	84.7	95.1	98.7
Sales of cooking units - Gas (%)	50.1	48.8	44.2	32.1	15.3	4.94	1.33
Sales of space heating units - Electric Heat Pump	14.3	22.9	28.3	44	68	83.7	89.1
(%)							
Sales of space heating units - Electric Resistance	9.9	12	11.2	9.09	5.93	3.95	3.26
(%)							
Sales of space heating units - Fossil (%)	20.5	29.9	27.8	21.5	11.8	5.49	3.29
Sales of space heating units - Gas (%)	55.3	35.2	32.6	25.4	14.2	6.89	4.33
Sales of water heating units - Electric Heat Pump	0	1.62	6.23	19.5	39.9	53.2	57.8
(%)							
Sales of water heating units - Electric Resistance	30.2	47	46.3	44.4	41.6	39.8	39.1
(%)							
Sales of water heating units - Gas Furnace (%)	65.2	47.8	44	33.1	16.2	5.18	1.35
Sales of water heating units - Other (%)	4.6	3.59	3.44	3	2.33	1.9	1.75

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	0	31.3	65.7	222	699	1,018
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.1	0	0.527	0	1.47
Public EV charging plugs - L2 (1000 units)	0.118	0	2.42	0	12.7	0	35.4
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7

Table 18: E- scenario -	PTI I AR 1: Efficience	v/Flectrification - `	Transnortation	(continued)
Table 10. L- 3Cellul 10	FILLAN I. LIIICIGIIC	V/ LIGGLI IIIGULIOII = .	ii aiisboi tatioii	loonlinacai

2020	2025	2030	2035	2040	2045	2050
0.498	1.45	4.11	10.8	23.6	39.5	51
0.228	0.236	0.239	0.225	0.179	0.109	0.051
0.083	0.094	0.104	0.107	0.092	0.06	0.03
0.332	0.969	2.74	7.17	15.7	26.3	34
1.5	1.28	1.46	1.95	2.25	1.96	1.14
1.45	1.88	2.04	1.61	1.02	0.523	0.225
2.03	4.99	12.5	26.8	49.4	72.7	87.8
91.3	86.9	78.6	65.4	45	24.1	10.7
4.99	5.77	6.44	5.81	4.29	2.5	1.2
0.112	0.377	0.319	0.241	0.169	0.094	0.044
0.098	0.101	0.091	0.079	0.057	0.031	0.014
64.8	62.2	57.7	49.4	35.6	19.6	8.37
0.664	1.94	5.49	14.3	31.4	52.6	68
33.8	34.7	34.7	31.9	24.4	14.2	6.33
0.363	0.418	0.464	0.478	0.414	0.275	0.141
0.166	0.485	1.37	3.58	7.86	13.2	17
0.253	0.266	0.279	0.286	0.258	0.184	0.102
	0.498 0.228 0.083 0.332 1.5 1.45 2.03 91.3 4.99 0.112 0.098 64.8 0.664 33.8 0.363 0.166	0.498 1.45 0.228 0.236 0.083 0.094 0.332 0.969 1.5 1.28 1.45 1.88 2.03 4.99 91.3 86.9 4.99 5.77 0.112 0.377 0.098 0.101 64.8 62.2 0.664 1.94 33.8 34.7 0.363 0.418 0.166 0.485	0.498 1.45 4.11 0.228 0.236 0.239 0.083 0.094 0.104 0.332 0.969 2.74 1.5 1.28 1.46 1.45 1.88 2.04 2.03 4.99 12.5 91.3 86.9 78.6 4.99 5.77 6.44 0.112 0.377 0.319 0.098 0.101 0.091 64.8 62.2 57.7 0.664 1.94 5.49 33.8 34.7 34.7 0.363 0.418 0.464 0.166 0.485 1.37	0.498 1.45 4.11 10.8 0.228 0.236 0.239 0.225 0.083 0.094 0.104 0.107 0.332 0.969 2.74 7.17 1.5 1.28 1.46 1.95 1.45 1.88 2.04 1.61 2.03 4.99 12.5 26.8 91.3 86.9 78.6 65.4 4.99 5.77 6.44 5.81 0.112 0.377 0.319 0.241 0.098 0.101 0.091 0.079 64.8 62.2 57.7 49.4 0.664 1.94 5.49 14.3 33.8 34.7 34.7 31.9 0.363 0.418 0.464 0.478 0.166 0.485 1.37 3.58	0.498 1.45 4.11 10.8 23.6 0.228 0.236 0.239 0.225 0.179 0.083 0.094 0.104 0.107 0.092 0.332 0.969 2.74 7.17 15.7 1.5 1.28 1.46 1.95 2.25 1.45 1.88 2.04 1.61 1.02 2.03 4.99 12.5 26.8 49.4 91.3 86.9 78.6 65.4 45 4.99 5.77 6.44 5.81 4.29 0.112 0.377 0.319 0.241 0.169 0.098 0.101 0.091 0.079 0.057 64.8 62.2 57.7 49.4 35.6 0.664 1.94 5.49 14.3 31.4 33.8 34.7 34.7 31.9 24.4 0.363 0.418 0.464 0.478 0.414 0.166 0.485 1.37	0.498 1.45 4.11 10.8 23.6 39.5 0.228 0.236 0.239 0.225 0.179 0.109 0.083 0.094 0.104 0.107 0.092 0.06 0.332 0.969 2.74 7.17 15.7 26.3 1.5 1.28 1.46 1.95 2.25 1.96 1.45 1.88 2.04 1.61 1.02 0.523 2.03 4.99 12.5 26.8 49.4 72.7 91.3 86.9 78.6 65.4 45 24.1 4.99 5.77 6.44 5.81 4.29 2.5 0.112 0.377 0.319 0.241 0.169 0.094 0.098 0.101 0.091 0.079 0.057 0.031 64.8 62.2 57.7 49.4 35.6 19.6 0.664 1.94 5.49 14.3 31.4 52.6 33.8 34.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	29.9	29.9	29.5	28.9	28	27	26.5
Final energy use - Industry (PJ)	16	16.3	16.7	17.1	17.5	17.9	18.4
Final energy use - Residential (PJ)	41.7	39.5	38.4	37	34.6	31.5	28.6
Final energy use - Transportation (PJ)	81.5	76.4	70.2	64.9	60.8	55.9	50.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	3,468	3,852	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump	1.53	20.1	24.9	38.9	61.1	76.8	82.8
(%)							
Sales of space heating units - Electric Resistance	1.94	8.06	8.33	9.15	10.6	12	12.8
(%)							
Sales of space heating units - Fossil (%)	12.2	4.9	4.55	3.47	1.71	0.536	0.14
Sales of space heating units - Gas Furnace (%)	84.3	66.9	62.2	48.4	26.6	10.7	4.3
Sales of water heating units - Electric Heat Pump	0.078	2.03	7.05	21.5	43.6	58.1	63.1
(%)							
Sales of water heating units - Electric Resistance	1.96	7.38	9.33	15.1	24	29.7	31.7
(%)							
Sales of water heating units - Gas Furnace (%)	93.3	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	4.67	4.49	4.43	3.93	3.32	2.91	2.76

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.457	0.458	0.597	0.614	0.89	0.939
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-244
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-6.43
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-250
Total (1000 tC02e/y)			

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

Item	2020	2025	2050
Carbon sink potential - Moderate deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-126
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-3.22
Permanent conservation cover (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-129
Total (1000 tCO2e/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	171
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	11.7
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	183
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	88.6
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	5.85
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	94.5
deployment - Total (1000 hectares)			

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

Table 23: E- Scendrio - PILLAR 6: Land Sinks - Fo			
Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	6.94
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting	0	0	901
overlap) (1000 tCO2e/y)			
Carbon sink potential - High - Avoid deforestation	0	0	206
(1000 tC02e/y)			
Carbon sink potential - High - Extend rotation	0	0	201
length (1000 tCO2e/y)			
Carbon sink potential - High - Improve	0	0	27.3
plantations (1000 tCO2e/y)			
Carbon sink potential - High - Increase retention	0	0	208
of HWP (1000 tCO2e/y)			
Carbon sink potential - High - Increase trees	0	0	83.5
outside forests (1000 tCO2e/y)			
Carbon sink potential - High - Reforest cropland	0	0	5.4
(1000 tC02e/y)			
Carbon sink potential - High - Reforest pasture	0	0	85.9
(1000 tC02e/y)			
Carbon sink potential - High - Restore	0	0	76.6
productivity (1000 tCO2e/y)			
Carbon sink potential - Low - Accelerate	0	0	3.48
regeneration (1000 tCO2e/y)			
Carbon sink potential - Low - All (not counting	0	0	263
overlap) (1000 tCO2e/y)			
Carbon sink potential - Low - Avoid deforestation	0	0	34.3
(1000 tC02e/y)			
Carbon sink potential - Low - Extend rotation	0	0	77.3
length (1000 tC02e/y)			
Carbon sink potential - Low - Improve	0	0	13.9
plantations (1000 tCO2e/y)			

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

Table 23: E- scenario - PILLAR 6: Land sinks - Fo			0050
Item Carbon sink notantial Low Ingresse retention	2020	2025	2050 69.4
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)		0	09.4
Carbon sink potential - Low - Increase trees	0	0	29.2
outside forests (1000 tCO2e/y)			27.2
Carbon sink potential - Low - Reforest cropland	0	0	2.7
(1000 tC02e/y)			
Carbon sink potential - Low - Reforest pasture	0	0	6.51
(1000 tC02e/y)			
Carbon sink potential - Low - Restore	0	0	25.8
productivity (1000 tCO2e/y)			
Carbon sink potential - Mid - Accelerate	0	0	5.21
regeneration (1000 tC02e/y)			F.0.1
Carbon sink potential - Mid - All (not counting	0	0	581
overlap) (1000 tC02e/y)	0	0	100
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	120
Carbon sink potential - Mid - Extend rotation	0	0	139
length (1000 tC02e/y)		0	137
Carbon sink potential - Mid - Improve plantations	0	0	20.4
(1000 tCO2e/y)		0	20.4
Carbon sink potential - Mid - Increase retention	0	0	139
of HWP (1000 tC02e/y)			
Carbon sink potential - Mid - Increase trees	0	0	56.4
outside forests (1000 tCO2e/y)			
Carbon sink potential - Mid - Reforest cropland	0	0	4.05
(1000 tC02e/y)			
Carbon sink potential - Mid - Reforest pasture	0	0	46.2
(1000 tC02e/y)			
Carbon sink potential - Mid - Restore	0	0	51.2
productivity (1000 tCO2e/y)			
Land impacted for carbon sink potential - High -	0	0	1.13
Accelerate regeneration (1000 hectares)			07.0
Land impacted for carbon sink potential - High -	0	0	27.8
Avoid deforestation (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	103
Extend rotation length (1000 hectares)		0	103
Land impacted for carbon sink potential - High -	0	0	10.1
Improve plantations (1000 hectares)		0	10.1
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	7.93
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0.357
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	2.44
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	25.4
Restore productivity (1000 hectares)		_	
Land impacted for carbon sink potential - High -	0	0	178
Total impacted (over 30 years) (1000 hectares)			0.5/7
Land impacted for carbon sink potential - Low -	0	0	0.567
Accelerate regeneration (1000 hectares)	0	0	0/1
Land impacted for carbon sink potential - Low -	0	0	26.1
Avoid deforestation (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	39.3
	"	U	37.3
Extend rotation length (1000 hectares)		0	5.03
Extend rotation length (1000 hectares) Land impacted for carbon sink notential - Low -	n		0.00
Land impacted for carbon sink potential - Low -	0	•	
	0	0	0

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low -	0	0	4.17
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.179
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.423
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	15.4
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	91.2
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.851
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	27
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	71
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	7.57
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	6.05
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.268
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	3.06
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	30.9
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	147
Total impacted (over 30 years) (1000 hectares)			

Table 24: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal	0	130	0.091	0.09	0.083	0.057	0.005
(million 2019\$)							
Monetary damages from air pollution - Natural	0	47.6	30.8	13.4	5.76	1.89	1.29
Gas (million 2019\$)							
Monetary damages from air pollution -	0	237	240	234	212	169	116
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	14.6	0.01	0.01	0.009	0.006	0.001
(deaths)							
Premature deaths from air pollution - Natural	0	5.37	3.48	1.51	0.651	0.213	0.146
Gas (deaths)							
Premature deaths from air pollution -	0	26.6	27	26.4	23.8	19	13.1
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	0.774	0.771	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Sales of space heating units - Electric Heat Pump	14.3	32.1	79.9	90.6	91	91	91
(%)							
Sales of space heating units - Electric Resistance	9.9	10.8	4.53	3.11	3.02	3.06	3.07
(%)							
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of water heating units - Electric Heat Pump	0	9.43	49.9	59	59.4	59.4	59.4
(%)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance	30.2	45.9	40.3	39	38.9	38.9	38.9
(%)							
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	193	496	803	1,217	1,325	1,263
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.324	0	1.42	0	2.3
Public EV charging plugs - L2 (1000 units)	0.118	0	7.8	0	34.2	0	55.3
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.43	1.71	1.21	0.386	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.31	16.4	48.3	82.5	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.9	15.8	3.2	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.8	4.82	3.34	1.23	0.301	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.194	0.06	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.096	0.092	0.059	0.021	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)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	3,472	3,883	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump	1.53	28.2	70.6	83.7	85	85.1	85.1
(%)							
Sales of space heating units - Electric Resistance	1.94	8.4	10.6	12.7	13.1	13.1	13.1
(%)							
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of space heating units - Gas Furnace (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of water heating units - Electric Heat Pump	0.078	10.5	54.6	64.4	64.9	64.9	64.9
(%)							
Sales of water heating units - Electric Resistance	1.96	10.8	28.3	32.2	32.4	32.4	32.4
(%)							
Sales of water heating units - Gas Furnace (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.526	0.536	0.919	0.973	0.907	0.947
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	0	3.88	7.84	1.02
Capital invested - Solar PV - Base (billion \$2018)	0	0	0.242	0	0	0	2.91
Capital invested - Wind - Base (billion \$2018)	0	0	0	0	0	0	0.246

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

Item	2020	2025	2030	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	9,506	24,461	3,648
OffshoreWind - Constrained land use	0	0	0	9,526	0	28,109
assumptions (GWh)						
Solar - Base land use assumptions (GWh)	75.2	0	378	0	0	5,898
Solar - Constrained land use assumptions (GWh)	75.2	199	1,119	0	0	5,572
Wind - Base land use assumptions (GWh)	8.07	0	0	0	0	395
Wind - Constrained land use assumptions (GWh)	8.07	0	0	0	0	0

Table 32: E+RE+ 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	0	U
Carbon sink potential - Aggressive deployment -	0	0	-244
Cropland measures (1000 tC02e/y)	o	0	-244
Carbon sink potential - Aggressive deployment -	0	0	-6.43
Permanent conservation cover (1000 tC02e/y)	o	0	-0.43
Carbon sink potential - Aggressive deployment -	0	0	-250
Total (1000 tCO2e/y)	o	0	-230
Carbon sink potential - Moderate deployment -	0	0	0
	U	0	U
Corn-ethanol to energy grasses (1000 tC02e/y)	0	0	107
Carbon sink potential - Moderate deployment -	0	0	-126
Cropland measures (1000 tC02e/y)	0		0.00
Carbon sink potential - Moderate deployment -	0	0	-3.22
Permanent conservation cover (1000 tC02e/y)	-		100
Carbon sink potential - Moderate deployment -	0	0	-129
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	171
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	11.7
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	183
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	88.6
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	5.85
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	94.5
deployment - Total (1000 hectares)			

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

Table 33: E+RE+ scenario - PILLAR 6: Land sinks	- Forests		
Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	6.94
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting	0	0	901
overlap) (1000 tCO2e/y)			
Carbon sink potential - High - Avoid deforestation	0	0	206
(1000 tC02e/y)			
Carbon sink potential - High - Extend rotation	0	0	201
length (1000 tC02e/y)			
Carbon sink potential - High - Improve	0	0	27.3
plantations (1000 tCO2e/y)			
Carbon sink potential - High - Increase retention	0	0	208
of HWP (1000 tCO2e/y)			
Carbon sink potential - High - Increase trees	0	0	83.5
outside forests (1000 tC02e/y)			
Carbon sink potential - High - Reforest cropland	0	0	5.4
(1000 tC02e/y)			.
Carbon sink potential - High - Reforest pasture	0	0	85.9
(1000 tC02e/y)		Ŭ	00.7
Carbon sink potential - High - Restore	0	0	76.6
productivity (1000 tC02e/y)	0	0	10.0
Carbon sink potential - Low - Accelerate	0	0	3.48
regeneration (1000 tC02e/y)	0	0	3.40
Carbon sink potential - Low - All (not counting	0	0	263
	U	U	203
overlap) (1000 tC02e/y)	0	0	0/0
Carbon sink potential - Low - Avoid deforestation	0	0	34.3
(1000 tC02e/y)			77.0
Carbon sink potential - Low - Extend rotation	0	0	77.3
length (1000 tC02e/y)			
Carbon sink potential - Low - Improve	0	0	13.9
plantations (1000 tCO2e/y)	_		
Carbon sink potential - Low - Increase retention	0	0	69.4
of HWP (1000 tC02e/y)			
Carbon sink potential - Low - Increase trees	0	0	29.2
outside forests (1000 tC02e/y)			
Carbon sink potential - Low - Reforest cropland	0	0	2.7
(1000 tC02e/y)			
Carbon sink potential - Low - Reforest pasture	0	0	6.51
(1000 tC02e/y)			
Carbon sink potential - Low - Restore	0	0	25.8
productivity (1000 tCO2e/y)			
Carbon sink potential - Mid - Accelerate	0	0	5.21
regeneration (1000 tCO2e/y)			
Carbon sink potential - Mid - All (not counting	0	0	581
overlap) (1000 tC02e/y)			
Carbon sink potential - Mid - Avoid deforestation	0	0	120
(1000 tC02e/y)			
Carbon sink potential - Mid - Extend rotation	0	0	139
length (1000 tC02e/y)			
Carbon sink potential - Mid - Improve plantations	0	0	20.4
(1000 tCO2e/y)			_0
Carbon sink potential - Mid - Increase retention	0	0	139
of HWP (1000 tCO2e/y)			107
Carbon sink potential - Mid - Increase trees	0	0	56.4
outside forests (1000 tC02e/y)	0	0	50.4
Carbon sink potential - Mid - Reforest cropland	0	0	4.05
	U	0	4.00
(1000 tC02e/y)			// 0
Carbon sink potential - Mid - Reforest pasture	0	0	46.2
(1000 tC02e/y)			F4 0
Carbon sink potential - Mid - Restore	0	0	51.2
productivity (1000 tCO2e/y)			4
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	1.13

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

Table 33: E+RE+ scenario - PILLAR 6: Land sinks	•		
Item	2020	2025	2050
Land impacted for carbon sink potential - High -	0	0	27.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	103
Extend rotation length (1000 hectares)			.00
= ',	0	0	10.1
Land impacted for carbon sink potential - High -	U	U	10.1
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	7.93
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0.357
Reforest cropland (1000 hectares)	_		
Land impacted for carbon sink potential - High -	0	0	2.44
	o	0	2.44
Reforest pasture (1000 hectares)			05.7
Land impacted for carbon sink potential - High -	0	0	25.4
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	178
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.567
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	26.1
	o	0	20.1
Avoid deforestation (over 30 years) (1000			
hectares)		_	
Land impacted for carbon sink potential - Low -	0	0	39.3
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	5.03
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Increase retention of HWP (1000 hectares)			· ·
Land impacted for carbon sink potential - Low -	0	0	4.17
	o	0	4.17
Increase trees outside forests (1000 hectares)			0.470
Land impacted for carbon sink potential - Low -	0	0	0.179
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.423
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	15.4
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	91.2
Total impacted (over 30 years) (1000 hectares)	0	0	71.2
	0	0	0.051
Land impacted for carbon sink potential - Mid -	0	0	0.851
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	27
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	71
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	7.57
Improve plantations (1000 hectares)	o	0	1.51
		0	
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	6.05
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.268
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	3.06
	0	١	3.00
Reforest pasture (1000 hectares)			200
Land impacted for carbon sink potential - Mid -	0	0	30.9
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	147
Total impacted (over 30 years) (1000 hectares)			
rotar impacted (over 50 years) (1000 nectares)			

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal	0	130	0.091	0.09	0.083	0.057	0.005
(million 2019\$)							
Monetary damages from air pollution - Natural	0	43.7	32.3	19.8	13.5	4.78	0.945
Gas (million 2019\$)							
Monetary damages from air pollution -	0	232	218	166	96.2	43.7	16.6
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	14.6	0.01	0.01	0.009	0.006	0.001
(deaths)							
Premature deaths from air pollution - Natural	0	4.93	3.65	2.23	1.52	0.539	0.107
Gas (deaths)							
Premature deaths from air pollution -	0	26.1	24.5	18.7	10.8	4.91	1.87
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	0.774	0.771	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	50.1	60.7	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Sales of space heating units - Electric Heat Pump	14.3	32.1	79.9	90.6	91	91	91
(%)							
Sales of space heating units - Electric Resistance	9.9	10.8	4.53	3.11	3.02	3.06	3.07
(%)							
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of water heating units - Electric Heat Pump	0	9.43	49.9	59	59.4	59.4	59.4
(%)							
Sales of water heating units - Electric Resistance	30.2	45.9	40.3	39	38.9	38.9	38.9
(%)							
Sales of water heating units - Gas Furnace (%)	65.2	41.3	7.81	0.329	0	0	0
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr	0	193	496	803	1,217	1,325	1,263
(million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.324	0	1.42	0	2.3
Public EV charging plugs - L2 (1000 units)	0.118	0	7.8	0	34.2	0	55.3
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.43	1.71	1.21	0.386	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.31	16.4	48.3	82.5	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.2	76.6	46.9	15.8	3.2	0.587	0
Vehicle sales - Light-duty - hybrid (%)	4.8	4.82	3.34	1.23	0.301	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.333	0.194	0.06	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.096	0.092	0.059	0.021	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	3,472	3,883	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump	1.53	28.2	70.6	83.7	85	85.1	85.1
(%)							
Sales of space heating units - Electric Resistance	1.94	8.4	10.6	12.7	13.1	13.1	13.1
(%)							
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of space heating units - Gas Furnace (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of water heating units - Electric Heat Pump	0.078	10.5	54.6	64.4	64.9	64.9	64.9
(%)							
Sales of water heating units - Electric Resistance	1.96	10.8	28.3	32.2	32.4	32.4	32.4
(%)							
Sales of water heating units - Gas Furnace (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.526	0.536	0.919	0.973	0.907	0.947
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Constrained	0	0	0	0	0	0.356	0.106
(billion \$2018)							
Capital invested - Solar PV - Base (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion	0	0	0.127	0.275	0	0.217	0
\$2018)							
Capital invested - Wind - Base (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Wind - Constrained (billion	0	0	0	0	0	0	0
\$2018)							

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

Item	2020	2025	2030	2035	2045	2050
OffshoreWind - Constrained land use	0	0	0	0	1,008	340
assumptions (GWh)						
Solar - Base land use assumptions (GWh)	75.2	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	75.2	0	199	469	414	0
Wind - Base land use assumptions (GWh)	8.07	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	8.07	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-244
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Aggressive deployment -	0	0	-6.43
Permanent conservation cover (1000 tCO2e/y)			

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

		2007	
Item	2020	2025	2050
Carbon sink potential - Aggressive deployment -	0	0	-250
Total (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	0
Corn-ethanol to energy grasses (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	-126
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment -	0	0	-3.22
Permanent conservation cover (1000 tC02e/y)			
Carbon sink potential - Moderate deployment -	0	0	-129
Total (1000 tCO2e/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	171
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Aggressive	0	0	11.7
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Aggressive	0	0	183
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	88.6
deployment - Cropland measures (1000			
hectares)			
Land impacted for carbon sink - Moderate	0	0	5.85
deployment - Permanent conservation cover			
(1000 hectares)			
Land impacted for carbon sink - Moderate	0	0	94.5
deployment - Total (1000 hectares)			
deployment - Permanent conservation cover (1000 hectares) Land impacted for carbon sink - Moderate			

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

Table 10: ETRE decitation Tilletin of Land Bline	101000		
Item	2020	2025	2050
Carbon sink potential - High - Accelerate	0	0	6.94
regeneration (1000 tCO2e/y)			
Carbon sink potential - High - All (not counting	0	0	901
overlap) (1000 tCO2e/y)			
Carbon sink potential - High - Avoid deforestation	0	0	206
(1000 tCO2e/y)			
Carbon sink potential - High - Extend rotation	0	0	201
length (1000 tCO2e/y)			
Carbon sink potential - High - Improve	0	0	27.3
plantations (1000 tCO2e/y)			
Carbon sink potential - High - Increase retention	0	0	208
of HWP (1000 tCO2e/y)			
Carbon sink potential - High - Increase trees	0	0	83.5
outside forests (1000 tCO2e/y)			
Carbon sink potential - High - Reforest cropland	0	0	5.4
(1000 tC02e/y)			
Carbon sink potential - High - Reforest pasture	0	0	85.9
(1000 tC02e/y)			
Carbon sink potential - High - Restore	0	0	76.6
productivity (1000 tCO2e/y)			
Carbon sink potential - Low - Accelerate	0	0	3.48
regeneration (1000 tCO2e/y)			
Carbon sink potential - Low - All (not counting	0	0	263
overlap) (1000 tCO2e/y)			
Carbon sink potential - Low - Avoid deforestation	0	0	34.3
(1000 tC02e/y)			
Carbon sink potential - Low - Extend rotation	0	0	77.3
length (1000 tCO2e/y)			

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

Table 43: E+RE- scenario - PILLAR 6: Land sinks	- Forests (co	ntinueaj	
Item	2020	2025	2050
Carbon sink potential - Low - Improve	0	0	13.9
plantations (1000 tCO2e/y)			
Carbon sink potential - Low - Increase retention	0	0	69.4
of HWP (1000 tCO2e/y)	0	0	07.4
Carbon sink potential - Low - Increase trees	0	0	29.2
	U	0	29.2
outside forests (1000 tCO2e/y)			
Carbon sink potential - Low - Reforest cropland	0	0	2.7
(1000 tC02e/y)			
Carbon sink potential - Low - Reforest pasture	0	0	6.51
(1000 tC02e/y)			
Carbon sink potential - Low - Restore	0	0	25.8
productivity (1000 tCO2e/y)			
Carbon sink potential - Mid - Accelerate	0	0	5.21
regeneration (1000 tCO2e/y)	•	•	0.21
Carbon sink potential - Mid - All (not counting	0	0	581
	U	U	301
overlap) (1000 tCO2e/y)			400
Carbon sink potential - Mid - Avoid deforestation	0	0	120
(1000 tC02e/y)			
Carbon sink potential - Mid - Extend rotation	0	0	139
length (1000 tCO2e/y)			
Carbon sink potential - Mid - Improve plantations	0	0	20.4
(1000 tC02e/y)			
Carbon sink potential - Mid - Increase retention	0	0	139
of HWP (1000 tCO2e/y)	0	0	107
	0	0	F/ /
Carbon sink potential - Mid - Increase trees	0	0	56.4
outside forests (1000 tC02e/y)			
Carbon sink potential - Mid - Reforest cropland	0	0	4.05
(1000 tC02e/y)			
Carbon sink potential - Mid - Reforest pasture	0	0	46.2
(1000 tC02e/y)			
Carbon sink potential - Mid - Restore	0	0	51.2
productivity (1000 tCO2e/y)			•
Land impacted for carbon sink potential - High -	0	0	1.13
Accelerate regeneration (1000 hectares)	0	١	1.13
		0	07.0
Land impacted for carbon sink potential - High -	0	0	27.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	103
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	10.1
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0
Increase retention of HWP (1000 hectares)	0	١	U
	0	0	700
Land impacted for carbon sink potential - High -	0	0	7.93
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	0.357
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	2.44
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	25.4
Restore productivity (1000 hectares)	•	ŭ	20.4
	0	0	170
Land impacted for carbon sink potential - High -	0	0	178
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.567
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	26.1
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	39.3
Extend rotation length (1000 hectares)	0	١ -	07.0
			E 00
Land impacted for carbon sink potential - Low -	0	0	5.03
Improve plantations (1000 hectares)	,	1	

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

Table 40. LTRE Occidation TILETIN O. Land office	1010010 (0	-	
Item	2020	2025	2050
Land impacted for carbon sink potential - Low -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	4.17
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.179
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.423
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	15.4
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	91.2
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.851
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	27
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	71
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	7.57
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	6.05
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	0.268
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	3.06
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	30.9
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	147
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	130	0.091	0.09	0.083	0.057	0.005
(million 2019\$)							
Monetary damages from air pollution - Natural	0	51.3	41.8	48.2	36.9	14.7	4.27
Gas (million 2019\$)							
Monetary damages from air pollution -	0	232	218	166	96.2	43.7	16.6
Transportation (million 2019\$)							
Premature deaths from air pollution - Coal	0	14.6	0.01	0.01	0.009	0.006	0.001
(deaths)							
Premature deaths from air pollution - Natural	0	5.79	4.72	5.44	4.16	1.66	0.482
Gas (deaths)							
Premature deaths from air pollution -	0	26.1	24.5	18.7	10.8	4.91	1.87
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	0.769	0.798	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	49.9	51.2	55.8	67.9	84.7	95.1	98.7
Sales of cooking units - Gas (%)	50.1	48.8	44.2	32.1	15.3	4.94	1.33
Sales of space heating units - Electric Heat Pump	14.3	22.9	28.3	44	68	83.7	89.1
(%)							
Sales of space heating units - Electric Resistance	9.9	12	11.2	9.09	5.93	3.95	3.26
(%)							
Sales of space heating units - Fossil (%)	20.5	29.9	27.8	21.5	11.8	5.49	3.29
Sales of space heating units - Gas (%)	55.3	35.2	32.6	25.4	14.2	6.89	4.33

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump	0	1.62	6.23	19.5	39.9	53.2	57.8
(%)							
Sales of water heating units - Electric Resistance	30.2	47	46.3	44.4	41.6	39.8	39.1
(%)							
Sales of water heating units - Gas Furnace (%)	65.2	47.8	44	33.1	16.2	5.18	1.35
Sales of water heating units - Other (%)	4.6	3.59	3.44	3	2.33	1.9	1.75

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	31.3	65.7	222	699	1,018
(million \$2018)							•
Public EV charging plugs - DC Fast (1000 units)	0.065	0	0.1	0	0.527	0	1.47
Public EV charging plugs - L2 (1000 units)	0.118	0	2.42	0	12.7	0	35.4
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 (%)	1.45	1.88	2.04	1.61	1.02	0.523	0.225
Vehicle sales - Light-duty - EV (%)	2.03	4.99	12.5	26.8	49.4	72.7	87.8
Vehicle sales - Light-duty - gasoline (%)	91.3	86.9	78.6	65.4	45	24.1	10.7
Vehicle sales - Light-duty - hybrid (%)	4.99	5.77	6.44	5.81	4.29	2.5	1.2
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.377	0.319	0.241	0.169	0.094	0.044
Vehicle sales - Light-duty - other (%)	0.098	0.101	0.091	0.079	0.057	0.031	0.014
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)	29.9	29.9	29.5	28.9	28	27	26.5
Final energy use - Industry (PJ)	16	16.3	16.7	17.1	17.5	17.9	18.4
Final energy use - Residential (PJ)	41.7	39.5	38.4	37	34.6	31.5	28.6
Final energy use - Transportation (PJ)	81.5	76.4	70.2	64.9	60.8	55.9	50.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	3,468	3,852	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump	1.53	20.1	24.9	38.9	61.1	76.8	82.8
(%)							
Sales of space heating units - Electric Resistance	1.94	8.06	8.33	9.15	10.6	12	12.8
(%)							
Sales of space heating units - Fossil (%)	12.2	4.9	4.55	3.47	1.71	0.536	0.14
Sales of space heating units - Gas Furnace (%)	84.3	66.9	62.2	48.4	26.6	10.7	4.3
Sales of water heating units - Electric Heat Pump	0.078	2.03	7.05	21.5	43.6	58.1	63.1
(%)							
Sales of water heating units - Electric Resistance	1.96	7.38	9.33	15.1	24	29.7	31.7
(%)							
Sales of water heating units - Gas Furnace (%)	93.3	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	4.67	4.49	4.43	3.93	3.32	2.91	2.76

Table / O. F. D.	acanania DILLA	D 1. Efficiency/E	laatnifiaatian	Flectricity demand
131110 /19: F-8+		(R 1. FIIII.IDUI.V//F		

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.457	0.458	0.597	0.614	0.89	0.939
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 \$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

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	69.2
Conversion capital investment - Cumulative 5-yr (million \$2018)	0	0	0	0	0	0	772
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	0
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	1
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	0
Annual - BECCS (MMT)	0	0	0	0	0	0	0
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	0
Cumulative - BECCS (MMT)	0	0	0	0	0	0	0
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	0
Cumulative investment - All (million \$2018)	0	0	0	0	0	0	0
Cumulative investment - Spur (million \$2018)	0	0	0	0	0	0	0
Cumulative investment - Trunk (million \$2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	0
Trunk (km)	0	0	0	0	0	0	0

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

Table 56: E-B+ scenario - PILLAR 6: Land sinks -	-		
Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tC02e/y)	0	0	-25.9
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-225
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tC02e/y)	0	0	0
Carbon sink potential - Aggressive deployment -	0	0	0
Pasture to energy crops (1000 tCO2e/y) Carbon sink potential - Aggressive deployment -	0	0	-5.61
Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Aggressive deployment -	0	0	-257
Total (1000 tCO2e/y) Carbon sink potential - Moderate deployment -	0	0	-25.9
Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment -	0	0	-116
Cropland measures (1000 tCO2e/y)			
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y)	0	0	-2.8
Carbon sink potential - Moderate deployment - Total (1000 tC02e/y)	0	0	-145
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses	0	0	13.8
(1000 hectares) Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	390
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	3.07
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	0.14
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	10.2
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	417
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	13.8
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	81.5
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	3.07
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	0.14

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

Item	2020	2025	2050	
Land impacted for carbon sink - Moderate	0	0	5.1	
deployment - Permanent conservation cover (1000 hectares)				
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	104	

Table 57: E-B+ scenario - PILLAR 6: Land sinks -	Forests		
Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	6.94
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	901
Carbon sink potential - High - Avoid deforestation	0	0	206
(1000 tCO2e/y) Carbon sink potential - High - Extend rotation	0	0	201
length (1000 tCO2e/y) Carbon sink potential - High - Improve	0	0	27.3
plantations (1000 tCO2e/y) Carbon sink potential - High - Increase retention	0	0	208
of HWP (1000 tC02e/y) Carbon sink potential - High - Increase trees	0	0	83.5
outside forests (1000 tCO2e/y)			
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tC02e/y)	0	0	76.6
Carbon sink potential - Low - Accelerate	0	0	3.48
regeneration (1000 tCO2e/y) Carbon sink potential - Low - All (not counting	0	0	263
overlap) (1000 tCO2e/y) Carbon sink potential - Low - Avoid deforestation	0	0	34.3
(1000 tCO2e/y) Carbon sink potential - Low - Extend rotation	0	0	77.3
length (1000 tCO2e/y) Carbon sink potential - Low - Improve	0	0	13.9
plantations (1000 tCO2e/y)			
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	6.51
Carbon sink potential - Low - Restore	0	0	25.8
productivity (1000 tC02e/y) Carbon sink potential - Mid - Accelerate	0	0	5.21
regeneration (1000 tCO2e/y) Carbon sink potential - Mid - All (not counting	0	0	581
overlap) (1000 tCO2e/y) Carbon sink potential - Mid - Avoid deforestation	0	0	120
(1000 tCO2e/y) Carbon sink potential - Mid - Extend rotation	0	0	139
length (1000 tCO2e/y)			
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	20.4
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	139
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	56.4

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

Table 57: E-B+ scenario - PILLAR 6: Land sinks	- Forests (cont	:inued)	
Item	2020	2025	2050
Carbon sink potential - Mid - Reforest cropland	0	0	4.05
(1000 tC02e/y)			
Carbon sink potential - Mid - Reforest pasture	0	0	46.2
(1000 tC02e/y)			.5.2
Carbon sink potential - Mid - Restore	0	0	51.2
productivity (1000 tCO2e/y)		0	J1.Z
Land impacted for carbon sink potential - High -	0	0	1.13
	U	U	1.13
Accelerate regeneration (1000 hectares)			07.0
Land impacted for carbon sink potential - High -	0	0	27.8
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - High -	0	0	103
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	10.1
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	7.93
Increase trees outside forests (1000 hectares)	0	0	1.73
		0	0.057
Land impacted for carbon sink potential - High -	0	0	0.357
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	2.44
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	25.4
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - High -	0	0	178
Total impacted (over 30 years) (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.567
	0	0	0.561
Accelerate regeneration (1000 hectares)			0/1
Land impacted for carbon sink potential - Low -	0	0	26.1
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Low -	0	0	39.3
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	5.03
Improve plantations (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0
Increase retention of HWP (1000 hectares)		0	J
	0	0	4.17
Land impacted for carbon sink potential - Low -	0	0	4.17
Increase trees outside forests (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.179
Reforest cropland (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	0.423
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	15.4
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Low -	0	0	91.2
Total impacted (over 30 years) (1000 hectares)		0	71.2
		0	0.051
Land impacted for carbon sink potential - Mid -	0	0	0.851
Accelerate regeneration (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	27
Avoid deforestation (over 30 years) (1000			
hectares)			
Land impacted for carbon sink potential - Mid -	0	0	71
Extend rotation length (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	7.57
Improve plantations (1000 hectares)		·	1.01
Land impacted for carbon sink potential - Mid -	0	0	0
	0	U	U
Increase retention of HWP (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	6.05
Increase trees outside forests (1000 hectares)			
	0	0	0.268

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid -	0	0	3.06
Reforest pasture (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	30.9
Restore productivity (1000 hectares)			
Land impacted for carbon sink potential - Mid -	0	0	147
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	0.756	0.716	0	0	0	0
Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric Resistance (%)	49.4	49.4	49.4	49.4	49.4	49.4	49.4
Sales of cooking units - Gas (%)	50.6	50.6	50.6	50.6	50.6	50.6	50.6
Sales of space heating units - Electric Heat Pump (%)	11.1	37.9	39.1	40.3	41.2	41.9	42.9
Sales of space heating units - Electric Resistance (%)	10.4	9.91	9.75	9.4	9.02	8.38	7.34
Sales of space heating units - Fossil (%)	21.2	21.3	11.8	7.55	7.21	7.18	7.25
Sales of space heating units - Gas (%)	57.3	30.9	39.4	42.7	42.6	42.6	42.6
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	30.2	47.2	47.2	47.1	47	47	46.9
Sales of water heating units - Gas Furnace (%)	65.2	49.1	49.2	49.2	49.3	49.4	49.4
Sales of water heating units - Other (%)	4.6	3.64	3.64	3.65	3.66	3.66	3.67

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 (%)	1.44	1.87	2.16	2.02	1.81	1.69	1.6
Vehicle sales - Light-duty - EV (%)	3.95	6.1	6.91	8.53	10.3	11.9	13.1
Vehicle sales - Light-duty - gasoline (%)	89.6	85.9	83.6	81.6	79.5	77.5	76
Vehicle sales - Light-duty - hybrid (%)	4.82	5.65	6.89	7.44	7.98	8.51	8.88
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.373	0.339	0.3	0.296	0.295	0.306
Vehicle sales - Light-duty - other (%)	0.097	0.101	0.097	0.097	0.097	0.095	0.098
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)	29.9	30.3	30.5	30.5	30.7	31.5	33.2
Final energy use - Industry (PJ)	16	16.8	17.7	18.8	20	21.3	22.7
Final energy use - Residential (PJ)	41.7	39.3	38.7	38.6	39	40	41.1
Final energy use - Transportation (PJ)	81.4	76.3	70.4	66.8	66.7	68.4	70.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	3,421	3,558	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Sales of space heating units - Electric Heat Pump (%)	1.53	24.1	48.5	68.4	71.7	72.1	72.1
Sales of space heating units - Electric Resistance (%)	1.94	8.79	12.8	20.1	25.2	25.9	26
Sales of space heating units - Fossil (%)	12.2	4.76	3.52	1.51	0.221	0.018	0
Sales of space heating units - Gas Furnace (%)	84.3	62.4	35.2	9.91	2.84	1.91	1.84
Sales of water heating units - Electric Heat Pump (%)	0.078	0.268	0.265	0.267	0.268	0.267	0.268
Sales of water heating units - Electric Resistance (%)	1.96	6.67	6.62	6.62	6.65	6.63	6.65
Sales of water heating units - Gas Furnace (%)	93.3	88.5	88.5	88.6	88.5	88.5	88.5
Sales of water heating units - Other (%)	4.67	4.54	4.63	4.53	4.56	4.58	4.53

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -	0	0.488	0.492	0.647	0.67	0.83	0.869
Cumulative 5-yr (billion \$2018)							

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

rabio dei NEI deditario il 1227 III di 2011 No	. 0. 0010			
Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-0.69	0	-0.314	-0.281
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.057	0	-0.102	-0.106
Business-as-usual carbon sink - Total (Mt CO2e/y)	-0.747	0	-0.416	-0.387
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	6.94
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	901
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	206
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	201
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	27.3
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	208
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	83.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	5.4
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	85.9
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	76.6
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	3.48
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	263
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	2.7

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

Table 63: REF scenario - PILLAR 6: Land sinks - F		tinued)		
Item	2020	2025	2030	2050
Carbon sink potential - Low - Reforest pasture	0	0	0	6.51
(1000 tCO2e/y)				
Carbon sink potential - Low - Restore	0	0	0	25.8
productivity (1000 tCO2e/y)				
Carbon sink potential - Mid - Accelerate	0	0	0	5.21
regeneration (1000 tCO2e/y)				
Carbon sink potential - Mid - All (not counting	0	0	0	581
overlap) (1000 tC02e/y)			J	
Carbon sink potential - Mid - Avoid deforestation	0	0	0	120
(1000 tC02e/y)	9	o	Ü	120
Carbon sink potential - Mid - Extend rotation	0	0	0	139
length (1000 tC02e/y)	0	o	U	137
Carbon sink potential - Mid - Improve plantations	0	0	0	20.4
	0	U	U	20.4
(1000 tC02e/y)	0	0	0	100
Carbon sink potential - Mid - Increase retention	0	0	0	139
of HWP (1000 tC02e/y)				- ()
Carbon sink potential - Mid - Increase trees	0	0	0	56.4
outside forests (1000 tCO2e/y)				
Carbon sink potential - Mid - Reforest cropland	0	0	0	4.05
(1000 tC02e/y)				
Carbon sink potential - Mid - Reforest pasture	0	0	0	46.2
(1000 tCO2e/y)				
Carbon sink potential - Mid - Restore	0	0	0	51.2
productivity (1000 tCO2e/y)				
Land impacted for carbon sink potential - High -	0	0	0	1.13
Accelerate regeneration (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	27.8
Avoid deforestation (over 30 years) (1000				
hectares)				
Land impacted for carbon sink potential - High -	0	0	0	103
Extend rotation length (1000 hectares)	9	o	Ü	100
Land impacted for carbon sink potential - High -	0	0	0	10.1
Improve plantations (1000 hectares)	0	0	U	10.1
Land impacted for carbon sink potential - High -	0	0	0	0
Increase retention of HWP (1000 hectares)	0	U	U	U
Land impacted for carbon sink potential - High -	0	0	0	7.93
	U	U	U	1.93
Increase trees outside forests (1000 hectares)		0		0.057
Land impacted for carbon sink potential - High -	0	0	0	0.357
Reforest cropland (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	2.44
Reforest pasture (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	25.4
Restore productivity (1000 hectares)				
Land impacted for carbon sink potential - High -	0	0	0	178
Total impacted (over 30 years) (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	0.567
Accelerate regeneration (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	26.1
Avoid deforestation (over 30 years) (1000			-	_
hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	39.3
Extend rotation length (1000 hectares)		o	J	07.0
Land impacted for carbon sink potential - Low -	0	0	0	5.03
Improve plantations (1000 hectares)	0	0	U	3.03
Land impacted for carbon sink potential - Low -	0	0	0	0
	U	U	U	U
Increase retention of HWP (1000 hectares)				/ 17
Land impacted for carbon sink potential - Low -	0	0	0	4.17
Increase trees outside forests (1000 hectares)				•
Land impacted for carbon sink potential - Low -	0	0	0	0.179
Reforest cropland (1000 hectares)				
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	0.423

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

Item	2020	2025	2030	2050
Land impacted for carbon sink potential - Low -	0	0	0	15.4
Restore productivity (1000 hectares)				
Land impacted for carbon sink potential - Low -	0	0	0	91.2
Total impacted (over 30 years) (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	0.851
Accelerate regeneration (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	27
Avoid deforestation (over 30 years) (1000				
hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	71
Extend rotation length (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	7.57
Improve plantations (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	0
Increase retention of HWP (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	6.05
Increase trees outside forests (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	0.268
Reforest cropland (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	3.06
Reforest pasture (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	30.9
Restore productivity (1000 hectares)				
Land impacted for carbon sink potential - Mid -	0	0	0	147
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	346	216	203	198	194	178
Monetary damages from air pollution - Natural Gas (million 2019\$)	0	36.8	41	53.8	55.8	55.9	52.2
Monetary damages from air pollution - Transportation (million 2019\$)	0	236	243	249	257	265	272
Premature deaths from air pollution - Coal (deaths)	0	38.9	24.3	22.8	22.2	21.8	19.9
Premature deaths from air pollution - Natural Gas (deaths)	0	4.15	4.63	6.08	6.31	6.31	5.9
Premature deaths from air pollution - Transportation (deaths)	0	26.6	27.3	28.1	28.9	29.8	30.6