

# Net-Zero America - maryland state report

2021-03-15

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 <a href="https://netzeroamerica.princeton.edu">https://netzeroamerica.princeton.edu</a>.

#### Notes

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

## Data by category and subcategory

1	E+ scenario - PILLAR I: Efficiency/Electrification - Commercial	I
2	E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	1
3	E+ scenario - PILLAR 1: Efficiency/Electrification - Overview	1
4	E+ scenario - PILLAR 1: Efficiency/Electrification - Residential	1
5	E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	2
6	E+ scenario - PILLAR 2: Clean Electricity - Generating capacity	2
7	E+ scenario - PILLAR 2: Clean Electricity - Generation	3
8	E+ scenario - PILLAR 3: Clean fuels - Bioenergy	3
9	E+ scenario - PILLAR 4: CCUS - CO2 capture	3
10	E+ scenario - PILLAR 4: CCUS - CO2 pipelines	3
11	E+ scenario - PILLAR 4: CCUS - CO2 storage	4
12	E+ scenario - PILLAR 6: Land sinks - Agriculture	4
13	E+ scenario - PILLAR 6: Land sinks - Forests	5
14	E+ scenario - IMPACTS - Fossil fuel industries	7
15	E+ scenario - IMPACTS - Health	7
16	E+ scenario - IMPACTS - Jobs	7
17	E- scenario - PILLAR 1: Efficiency/Electrification - Commercial	9
18	E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	9
19	E- scenario - PILLAR 1: Efficiency/Electrification - Overview	9
20	E- scenario - PILLAR 1: Efficiency/Electrification - Residential	9
21	E- scenario - PILLAR 1: Efficiency/Electrification - Transportation 10	J
22	E- scenario - PILLAR 6: Land sinks - Agriculture	J
23	E- scenario - PILLAR 6: Land sinks - Forests	1
24	E- scenario - IMPACTS - Health	3
25	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	4
26	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand . 14	4
27	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview 14	4
28	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential	4
29	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation 1	5
30	E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity	5
31	E+RE+ scenario - PILLAR 2: Clean Electricity - Generation	5
32	E+RE+ scenario - PILLAR 6: Land sinks - Agriculture	6
33	E+RE+ scenario - PILLAR 6: Land sinks - Forests	5
34	E+RE+ scenario - IMPACTS - Health	9
35	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial 19	9
36	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand 20	J
37	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview	J
38	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential	J
39	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation 20	J
40	E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity	1
41	E+RE- scenario - PILLAR 2: Clean Electricity - Generation	1
42	E+RE- scenario - PILLAR 6: Land sinks - Agriculture	1
/.2	E-DE scanario - DILLAP 6-Land sinks - Egreets	^

44	E+RE- scenario - IMPACTS - Health	25
45	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	25
46	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	25
47	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview	25
48	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential	25
49	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	26
50	E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity	26
51	E-B+ scenario - PILLAR 2: Clean Electricity - Generation	26
52	E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy	27
53	E-B+ scenario - PILLAR 4: CCUS - CO2 capture	27
54	E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines	27
55	E-B+ scenario - PILLAR 4: CCUS - CO2 storage	27
56	E-B+ scenario - PILLAR 6: Land sinks - Agriculture	27
57	E-B+ scenario - PILLAR 6: Land sinks - Forests	29
58	E-B+ scenario - IMPACTS - Health	31
59	REF scenario - PILLAR 1: Efficiency/Electrification - Commercial	31
60	REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	32
61	REF scenario - PILLAR 1: Efficiency/Electrification - Overview	32
62	REF scenario - PILLAR 1: Efficiency/Electrification - Residential	32
63	REF scenario - PILLAR 1: Efficiency/Electrification - Transportation	32
64	REF scenario - PILLAR 6: Land sinks - Forests	33
65	REF scenario - PILLAR 6: Land sinks - Forests - REF only	35
66	REF scenario - IMPACTS - Health	35

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		21,776	24,347				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric	2.22	28.1	70.4	83.7	85	85.1	85.1
Heat Pump (%)							
Sales of space heating units - Electric	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Resistance (%)							
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of space heating units - Gas Furnace	84.3	59.3	18.3	3.58	1.9	1.86	1.85
(%)							
Sales of water heating units - Electric	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Heat Pump (%)							
Sales of water heating units - Electric	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Resistance (%)							
Sales of water heating units - Gas Furnace	93	74.5	14.3	0.646	0.003	0	0
(%)							
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.99	3.04	6	6.39	5.4	5.63
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		4.8	4.71				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	59.2	67.9	94.5	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Sales of space heating units - Electric	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Heat Pump (%)							
Sales of space heating units - Electric	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Resistance (%)							
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of water heating units - Electric	0	9.19	48.7	57.6	58	58	58
Heat Pump (%)							
Sales of water heating units - Electric	35.7	51	42.2	40.3	40.2	40.2	40.2
Resistance (%)							
Sales of water heating units - Gas Furnace	59.5	36.5	7.04	0.317	0.002	0	0
(%)							
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		800	2,073	3,321	5,046	5,475	5,229
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.402		1.31		5.5		8.84
units)							
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212
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 (%)	1.29	1.58	1.16	0.367	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.79	17.9	50.4	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.5	75	44.7	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.27	5.16	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC	0.109	0.325	0.182	0.055	0.011	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.019	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Offshore Wind - Base (billion \$2018)		0	0	0	0	6.33	14.7
Capital invested - Offshore Wind - Constrained (billion \$2018)		0	0	0	0	1.46	19.1
Capital invested - Solar PV - Base (billion \$2018)		4.41	2.06	2.19	1.12	1.28	0.169
Capital invested - Solar PV - Constrained (billion \$2018)		2.9	0.138	0.35	0	1.23	1.46
Capital invested - Wind - Constrained (billion \$2018)		0	0	0.457	3.71	0	0
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	4,288	15,370
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	4,288	15,370
Installed renewables - Rooftop PV (MW)	851	1,276	1,695	2,240	2,899	3,650	4,510
Installed renewables - Solar - Base land use assumptions (MW)	899	4,757	6,771	9,100	10,360	11,890	12,104
Installed renewables - Solar - Constrained land use assumptions (MW)	490	4,348	4,944	6,249	6,913	8,499	9,219
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Wind - Constrained land use assumptions (MW)	191	191	191	263	2,997	3,512	3,512

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	0	0	0	0	0	19,084	72,114
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	19,084	72,114
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	1,524	7,647	10,854	14,593	16,586	18,938	19,283
Solar - Constrained land use assumptions	845	6,984	7,931	9,956	10,973	13,309	14,379
(GWh)							
Wind - Base land use assumptions (GWh)	786	786	786	786	786	786	786
Wind - Constrained land use assumptions	786	786	786	1,049	9,514	10,735	10,735
(GWh)							

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

		37					
Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)		0	0	0	0	0	222
Conversion capital investment -		0	0	0	0	0	4,833
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	0	4
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	3.32	3.42	9.75
Annual - BECCS (MMT)		0	0	0	0	0	6.21
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	3.32	6.74	16.5
Cumulative - BECCS (MMT)		0	0	0	0	0	6.21
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	0	112	197	197	429
Cumulative investment - All (million \$2018)		0	0	667	748	749	961
Cumulative investment - Spur (million \$2018)		0	0	0	81.3	82.7	294
Cumulative investment - Trunk (million \$2018)		0	0	667	667	667	667
Spur (km)		0	0	0	85.1	85.1	317
Trunk (km)		0	0	112	112	112	112

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-595
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-29
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-624
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-313
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-14.5
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-327
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							_
energy grasses (1000 hectares)							
Land impacted for carbon sink -							525
Aggressive deployment - Cropland							020
measures (1000 hectares)							
Land impacted for carbon sink -							52.7
Aggressive deployment - Permanent							02
conservation cover (1000 hectares)							
Land impacted for carbon sink -							578
Aggressive deployment - Total (1000							010
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							Ü
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							276
deployment - Cropland measures (1000							210
hectares)							
Land impacted for carbon sink - Moderate							26.4
deployment - Permanent conservation							20.4
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							302
deployment - Total (1000 hectares)							302
uepioyment - rotar (1000 nectares)							

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

Table 13: E+ scenario - PILLAR 6: Land sin	ks - Forests						
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-37.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-5,324
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,101
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-1,332
rotation length (1000 tCO2e/y)							.,002
Carbon sink potential - High - Improve							-140
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-864
retention of HWP (1000 tCO2e/y)							-004
Carbon sink potential - High - Increase							-356
·							-336
trees outside forests (1000 tC02e/y)							(01
Carbon sink potential - High - Reforest							-62.1
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-886
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-546
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-18.8
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-1,480
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-183
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-511
rotation length (1000 tC02e/y)							311
Carbon sink potential - Low - Improve							-71.1
plantations (1000 tCO2e/y)							-11.1
Carbon sink potential - Low - Increase							-288
							-200
retention of HWP (1000 tC02e/y)							105
Carbon sink potential - Low - Increase							-125
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-31.1
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-67.1
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-184
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-28.2
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-3,401
counting overlap) (1000 tCO2e/y)							-,
Carbon sink potential - Mid - Avoid							-642
deforestation (1000 tCO2e/y)							042
Carbon sink potential - Mid - Extend							-922
rotation length (1000 tCO2e/y)							-722
Carbon sink potential - Mid - Improve							-104
·							-104
plantations (1000 tC02e/y)							
Carbon sink potential - Mid - Increase							-576
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-240
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-46.6
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-477
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-365
productivity (1000 tCO2e/y)							
p 32221111 (1200 10020/1)	[	I					

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

lable 13: E+ scenario - PILLAR 6: Land sini		<u> </u>		000=			
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							6.15
High - Accelerate regeneration (1000							
hectares) Land impacted for carbon sink potential -							149
High - Avoid deforestation (over 30 years)							149
(1000 hectares)							
Land impacted for carbon sink potential -							679
High - Extend rotation length (1000							017
hectares)							
Land impacted for carbon sink potential -							51.5
High - Improve plantations (1000							31.3
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							33.8
High - Increase trees outside forests							33.0
(1000 hectares)							
Land impacted for carbon sink potential -							4.11
High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential -							25.2
High - Reforest pasture (1000 hectares)							23.2
Land impacted for carbon sink potential -							181
							101
High - Restore productivity (1000 hectares)							
Land impacted for carbon sink potential -							1,130
							1,130
High - Total impacted (over 30 years)							
(1000 hectares)  Land impacted for carbon sink potential -							3.08
							3.08
Low - Accelerate regeneration (1000							
hectares) Land impacted for carbon sink potential -							140
							140
Low - Avoid deforestation (over 30 years) (1000 hectares)							
							260
Land impacted for carbon sink potential -							260
Low - Extend rotation length (1000 hectares)							
Land impacted for carbon sink potential -							25.8
Low - Improve plantations (1000							23.0
•							
hectares)							0
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							17.8
							17.0
Low - Increase trees outside forests (1000 hectares)							
Land impacted for carbon sink potential -							2.05
·							2.05
Low - Reforest cropland (1000 hectares)  Land impacted for carbon sink potential -							4.36
							4.30
Low - Reforest pasture (1000 hectares)							110
Land impacted for carbon sink potential -							110
Low - Restore productivity (1000							
hectares)							F/0
Land impacted for carbon sink potential -							563
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.61
Mid - Accelerate regeneration (1000							
hectares)							

Tahla 13. Fx	econario -	DTIIAP 6.	Land sinks -	Forests	(continued)
Table 15. E+	scenuro -	PILLAR O.	Luiiu Siiiks -	Furests	lconunueur

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							144
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							470
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							38.8
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							25.8
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							3.08
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							31.5
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							221
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							938
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		233	196	157	118	74.6	51.7
Natural gas consumption - Cumulative							4,741
(tcf)							
Natural gas production - Annual (tcf)		0.029	0.028	0.024	0.02	0.016	0.013
Oil consumption - Annual (million bbls)		69.1	59.1	44.6	31.1	20.6	12.5
Oil consumption - Cumulative (million							1,382
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0

#### Table 15: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		743	0.504	0.499	0.457	0.318	0.027
Monetary damages from air pollution - Natural Gas (million 2019\$)		248	185	123	112	65.6	27.4
Monetary damages from air pollution - Transportation (million 2019\$)		2,187	2,036	1,542	889	398	147
Premature deaths from air pollution - Coal (deaths)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Natural Gas (deaths)		28	20.9	13.9	12.6	7.41	3.09
Premature deaths from air pollution - Transportation (deaths)		246	229	173	100	44.8	16.5

## Table 16: E+ scenario - IMPACTS - Jobs

2020	2025	2030	2035	2040	2045	2050
	49.8	101	38.7	30	22	324
	8,177	6,965	8,178	8,092	10,411	20,267
	6,920	12,734	12,785	10,098	11,764	11,071
	1,387	923	589	350	190	100
	2020	49.8 8,177 6,920	49.8 101 8,177 6,965 6,920 12,734	49.8         101         38.7           8,177         6,965         8,178           6,920         12,734         12,785	49.8         101         38.7         30           8,177         6,965         8,178         8,092           6,920         12,734         12,785         10,098	49.8         101         38.7         30         22           8,177         6,965         8,178         8,092         10,411           6,920         12,734         12,785         10,098         11,764

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

Table 10. L+ Scellul 10 - IMPACTS - Jobs (col	•					
Item	2020 2025		2035	2040	2045	2050
By economic sector - Other (jobs)	1,195		1,308	1,398	1,767	3,128
By economic sector - Pipeline (jobs)	304		280	153	102	100
By economic sector - Professional (jobs)	3,366		3,203	3,313	4,882	11,061
By economic sector - Trade (jobs)	2,506		2,245	2,286	3,158	6,652
By economic sector - Utilities (jobs)	5,91 <sup>-</sup>		6,814	7,153	9,692	20,441
By education level - All sectors -	9,450	10,362	11,399	10,661	13,643	23,749
Associates degree or some college (jobs)						
By education level - All sectors - Bachelors degree (jobs)	5,984	6,519	6,921	6,349	8,182	14,417
By education level - All sectors - Doctoral	193	3 180	190	181	248	507
degree (jobs)  By education level - All sectors - High	12,803	3 14,136	15,396	14,236	18,005	30,863
school diploma or less (jobs)						
By education level - All sectors - Masters or professional degree (jobs)	1,392	1,433	1,535	1,446	1,912	3,608
By resource sector - Biomass (jobs)	214	+ 279	110	90.3	80.4	1,382
By resource sector - CO2 (jobs)		) 0	655	56	72.2	326
			000	0		0
By resource sector - Coal (jobs)	803		_	_	10.077	_
By resource sector - Grid (jobs)	7,244		10,558	12,271	18,066	40,246
By resource sector - Natural Gas (jobs)	3,25		2,312	2,623	1,856	1,306
By resource sector - Nuclear (jobs)	923		527	0	0	0
By resource sector - Oil (jobs)	3,07		1,678	1,089	673	385
By resource sector - Solar (jobs)	14,159		19,117	15,493	15,638	16,688
By resource sector - Wind (jobs)	154		483	1,250	5,605	12,811
Median wages - Annual - All (\$2019 per job)	62,912	63,005	63,816	64,974	66,381	68,724
On-Site or In-Plant Training - Total jobs - 1	4,87	1 5,255	5,779	5,410	6,920	12,158
to 4 years (jobs)	10//	1.07/	0.107	0.070	0.400	F 100
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	1,945	1,876	2,126	2,070	2,689	5,108
On-Site or In-Plant Training - Total jobs -	4,886	5,387	5,806	5,343	6,819	11,768
None (jobs) On-Site or In-Plant Training - Total jobs -	250	) 267	299	286	369	666
Over 10 years (jobs)						
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	17,869	19,847	21,430	19,763	25,192	43,444
On-the-Job Training - All sectors - 1 to 4	6,254	6,701	7,390	6,938	8,892	15,718
years (jobs)						
On-the-Job Training - All sectors - 4 to 10 years (jobs)	1,90	7 1,814	2,079	2,043	2,663	5,106
On-the-Job Training - All sectors - None	1,634	1,749	1,880	1,734	2,213	3,862
(jobs) On-the-Job Training - All sectors - Over 10	316	366	389	346	430	681
years (jobs)						
On-the-Job Training - All sectors - Up to 1 year (jobs)	19,71	1 22,000	23,702	21,811	27,792	47,778
Related work experience - All sectors - 1	10,646	5 11,563	12,549	11,667	14,937	26,208
to 4 years (jobs)						
Related work experience - All sectors - 4 to 10 years (jobs)	6,894	7,454	8,119	7,559	9,697	17,070
Related work experience - All sectors -	4,279	9 4,641	5,082	4,756	6,065	10,645
None (jobs)  Related work experience - All sectors -	1,876	5 2,138	2,297	2,094	2,666	4,500
Over 10 years (jobs)						
Related work experience - All sectors - Up	6,12	7 6,835	7,394	6,797	8,625	14,720
to 1 year (jobs) Wage income - All (million \$2019)	1,876	5 2,056	2,262	2,136	2,788	5,027
	,,,,,	1 1 1 1 1 1				· · · · · · · · · · · · · · · · · · ·

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		21,752	24,163				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	36.2	40.9	53.4	71	81.7	85.5
Resistance (%)							
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric	2.22	20.1	24.9	38.9	61	76.7	82.8
Heat Pump (%)							
Sales of space heating units - Electric	2.54	8.05	8.31	9.13	10.6	12	12.8
Resistance (%)							
Sales of space heating units - Fossil (%)	11	4.85	4.51	3.43	1.69	0.531	0.139
Sales of space heating units - Gas Furnace	84.3	67	62.3	48.5	26.7	10.8	4.34
(%)							
Sales of water heating units - Electric	0.097	2.03	7.02	21.4	43.5	57.9	63
Heat Pump (%)							
Sales of water heating units - Electric	2.5	7.39	9.34	15.1	24	29.8	31.8
Resistance (%)							
Sales of water heating units - Gas Furnace	93	86.1	79.2	59.6	29.2	9.38	2.45
(%)							
Sales of water heating units - Other (%)	4.44	4.46	4.4	3.91	3.31	2.91	2.76

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.54	2.53	3.68	3.81	5.55	5.88
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	189	189	186	183	177	171	167
Final energy use - Industry (PJ)	130	132	133	143	154	162	170
Final energy use - Residential (PJ)	241	229	222	214	200	183	167
Final energy use - Transportation (PJ)	449	421	386	356	331	302	268

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		4.8	4.72				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	59	60.1	63.8	73.7	87.5	96	98.9
Resistance (%)							
Sales of cooking units - Gas (%)	41	39.9	36.2	26.3	12.5	4.04	1.09
Sales of space heating units - Electric	17.4	27.2	32.2	46.7	68.8	83.3	88.3
Heat Pump (%)							
Sales of space heating units - Electric	13.2	15.3	14.3	11.6	7.67	5.11	4.2
Resistance (%)							
Sales of space heating units - Fossil (%)	14.3	21.5	20.1	15.7	8.92	4.46	2.92
Sales of space heating units - Gas (%)	55.1	36	33.4	26	14.6	7.13	4.52
Sales of water heating units - Electric	0	1.58	6.08	19	38.9	51.9	56.4
Heat Pump (%)							
Sales of water heating units - Electric	35.7	52.7	51.6	48.7	44.3	41.5	40.5
Resistance (%)							
Sales of water heating units - Gas Furnace	59.5	42.2	38.9	29.2	14.4	4.62	1.21
(%)							
Sales of water heating units - Other (%)	4.77	3.53	3.4	3	2.4	2.02	1.89

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		0	133	271	925	2,883	4,210
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.402		0.44		2.06		5.66
units)							
Public EV charging plugs - L2 (1000 units)	1.67		10.6		49.6		136
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 (%)	1.3	1.76	2.01	1.59	0.995	0.506	0.218
Vehicle sales - Light-duty - EV (%)	2.19	5.36	13.2	28	50.7	73.5	88.2
Vehicle sales - Light-duty - gasoline (%)	90.8	86.2	77.5	63.9	43.6	23.3	10.3
Vehicle sales - Light-duty - hybrid (%)	5.48	6.24	6.9	6.15	4.48	2.57	1.22
Vehicle sales - Light-duty - hydrogen FC	0.112	0.373	0.311	0.232	0.161	0.088	0.041
(%)							
Vehicle sales - Light-duty - other (%)	0.092	0.095	0.085	0.073	0.052	0.028	0.013
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-595
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-29
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-624
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-313
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-14.5
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-327
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							525
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							52.7
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							578
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							276
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							26.4
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							302
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate	2020	2023	2030	2033	2040	2045	-37.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-5,324
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,101
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-1,332
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-140
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-864
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-356
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-62.1
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-886
pasture (1000 tC02e/y)							
Carbon sink potential - High - Restore							-546
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-18.8
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-1,480
counting overlap) (1000 tCO2e/y)							•
Carbon sink potential - Low - Avoid							-183
deforestation (1000 tC02e/y)							
Carbon sink potential - Low - Extend							-511
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-71.1
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-288
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-125
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-31.1
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-67.1
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-184
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-28.2
regeneration (1000 tCO2e/y)							

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

Carbon sink potential - Mid - All (not	2020	2025	2030	2035	2040	2045	2050 -3,401
counting overlap) (1000 tC02e/y)							-3,401
Carbon sink potential - Mid - Avoid							-642
deforestation (1000 tC02e/y)							-042
Carbon sink potential - Mid - Extend							-922
rotation length (1000 tCO2e/y)							,,,
Carbon sink potential - Mid - Improve							-104
plantations (1000 tCO2e/y)							10-1
Carbon sink potential - Mid - Increase							-576
retention of HWP (1000 tCO2e/y)							0.0
Carbon sink potential - Mid - Increase							-240
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest						+	-46.6
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-477
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-365
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							6.15
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							149
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							679
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							51.5
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							33.8
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							4.11
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							25.2
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							181
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,130
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3.08
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							140
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							260
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							25.8
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -	2020	2023	2030	2000	2040	2043	17.8
Low - Increase trees outside forests							11.0
(1000 hectares)							
Land impacted for carbon sink potential -							2.05
Low - Reforest cropland (1000 hectares)							2.05
							/ 0/
Land impacted for carbon sink potential -							4.36
Low - Reforest pasture (1000 hectares)							440
Land impacted for carbon sink potential -							110
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							563
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.61
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							144
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							470
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							38.8
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							25.8
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							3.08
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							31.5
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							221
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							938
Mid - Total impacted (over 30 years) (1000							,50
hectares)							

Table 24: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		743	0.504	0.499	0.457	0.318	0.027
Coal (million 2019\$)							
Monetary damages from air pollution -		248	162	73.2	34.7	11.7	7.64
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		2,231	2,262	2,199	1,975	1,567	1,069
Transportation (million 2019\$)							
Premature deaths from air pollution -		83.9	0.057	0.056	0.052	0.036	0.003
Coal (deaths)							
Premature deaths from air pollution -		28	18.3	8.27	3.91	1.32	0.863
Natural Gas (deaths)							
Premature deaths from air pollution -		251	254	247	222	176	120
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		21,776	24,347				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric	2.22	28.1	70.4	83.7	85	85.1	85.1
Heat Pump (%)							
Sales of space heating units - Electric	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Resistance (%)							
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of space heating units - Gas Furnace	84.3	59.3	18.3	3.58	1.9	1.86	1.85
(%)							
Sales of water heating units - Electric	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Heat Pump (%)							
Sales of water heating units - Electric	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Resistance (%)							
Sales of water heating units - Gas Furnace	93	74.5	14.3	0.646	0.003	0	0
(%)							
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.99	3.04	6	6.39	5.4	5.63
Cumulative 5-yr (billion \$2018)							

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

	,, =						
Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		4.8	4.71				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	59.2	67.9	94.5	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Sales of space heating units - Electric	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Heat Pump (%)							
Sales of space heating units - Electric	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Resistance (%)							
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of water heating units - Electric	0	9.19	48.7	57.6	58	58	58
Heat Pump (%)							
Sales of water heating units - Electric	35.7	51	42.2	40.3	40.2	40.2	40.2
Resistance (%)							
Sales of water heating units - Gas Furnace	59.5	36.5	7.04	0.317	0.002	0	0
(%)							
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		800	2,073	3,321	5,046	5,475	5,229
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.402		1.31		5.5		8.84
units)							
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212
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 (%)	1.29	1.58	1.16	0.367	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.79	17.9	50.4	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.5	75	44.7	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.27	5.16	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC	0.109	0.325	0.182	0.055	0.011	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.019	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base		0	0	0	1.71	17.2	3.59
(billion \$2018)							
Capital invested - Solar PV - Base (billion		4.53	0.414	2.16	2.49	3.65	14.9
\$2018)							
Capital invested - Wind - Base (billion		0	0	0	0	2.43	6.5
\$2018)							
Installed renewables - OffshoreWind -	0	0	0	0	987	12,663	15,370
Base land use assumptions (MW)							
Installed renewables - OffshoreWind -	0	0	0	0	1,978	1,978	30,744
Constrained land use assumptions (MW)							
Installed renewables - Solar - Base land	1,090	5,050	5,455	7,750	10,551	14,905	33,771
use assumptions (MW)							
Installed renewables - Solar -	2,967	6,995	10,842	16,782	20,630	21,260	67,160
Constrained land use assumptions (MW)							
Installed renewables - Wind - Base land	191	191	191	191	191	1,394	4,802
use assumptions (MW)							
Installed renewables - Wind - Constrained	382	382	382	3,606	7,024	7,024	7,024
land use assumptions (MW)							

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	0	0	0	4,268	58,926	72,114
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	8,552	8,552	144,242
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	1,833	8,064	8,720	12,261	16,434	22,811	52,725
Solar - Constrained land use assumptions	4,898	11,221	17,264	26,520	32,278	33,228	105,973
(GWh)							
Wind - Base land use assumptions (GWh)	786	786	786	786	786	4,950	14,593

## Table 31: E+RE+ scenario - PILLAR 2: Clean Electricity - Generation (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Constrained land use assumptions	1,572	1,572	1,572	12,555	21,470	21,470	21,470
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-595
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-29
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-624
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-313
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-14.5
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-327
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							525
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							52.7
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							578
Aggressive deployment - Total (1000							0.0
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							·
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate	+						276
deployment - Cropland measures (1000							210
hectares)							
Land impacted for carbon sink - Moderate	+		+				26.4
deployment - Permanent conservation							20.4
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							302
deployment - Total (1000 hectares)							302
uepioyment - rotar (1000 nectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-37.6
Carbon sink potential - High - All (not counting overlap) (1000 tC02e/y)							-5,324
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,101

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend							-1,332
rotation length (1000 tC02e/y)							
Carbon sink potential - High - Improve							-140
plantations (1000 tC02e/y)							
Carbon sink potential - High - Increase							-864
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-356
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-62.1
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-886
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-546
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-18.8
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-1,480
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-183
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-511
rotation length (1000 tCO2e/y)							• • • • • • • • • • • • • • • • • • • •
Carbon sink potential - Low - Improve							-71.1
plantations (1000 tCO2e/y)							-1 1.1
Carbon sink potential - Low - Increase							-288
retention of HWP (1000 tCO2e/y)							-200
							-125
Carbon sink potential - Low - Increase							-125
trees outside forests (1000 tC02e/y)							011
Carbon sink potential - Low - Reforest							-31.1
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-67.1
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-184
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-28.2
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-3,401
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-642
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-922
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-104
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-576
retention of HWP (1000 tCO2e/y)							0.0
Carbon sink potential - Mid - Increase							-240
trees outside forests (1000 tC02e/y)							-240
Carbon sink potential - Mid - Reforest							-46.6
· ·							-40.0
cropland (1000 tCO2e/y)							-477
Carbon sink potential - Mid - Reforest							-4//
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-365
productivity (1000 tC02e/y)							
Land impacted for carbon sink potential -				T			6.15
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							149
High - Avoid deforestation (over 30 years)							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050 679
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							679
Land impacted for carbon sink potential - High - Improve plantations (1000							51.5
hectares)  Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.8
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.11
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.2
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							181
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							3.08
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							140
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							260
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							25.8
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							17.8
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							2.05
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							4.36
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							110
Land impacted for carbon sink potential - Low - Total impacted (over 30 years)							563
(1000 hectares)  Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000							4.61
hectares) Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							25.8
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							3.08
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							31.5
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							221
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							938
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		743	0.504	0.499	0.457	0.318	0.027
Coal (million 2019\$)							
Monetary damages from air pollution -		228	159	99	69.7	24.4	4.65
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		2,187	2,036	1,542	889	398	147
Transportation (million 2019\$)							
Premature deaths from air pollution -		83.9	0.057	0.056	0.052	0.036	0.003
Coal (deaths)							
Premature deaths from air pollution -		25.7	18	11.2	7.87	2.76	0.525
Natural Gas (deaths)							
Premature deaths from air pollution -		246	229	173	100	44.8	16.5
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		21,776	24,347				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric	2.22	28.1	70.4	83.7	85	85.1	85.1
Heat Pump (%)							
Sales of space heating units - Electric	2.54	8.39	10.6	12.7	13.1	13.1	13.1
Resistance (%)							
Sales of space heating units - Fossil (%)	11	4.19	0.8	0.034	0	0	0
Sales of space heating units - Gas Furnace	84.3	59.3	18.3	3.58	1.9	1.86	1.85
(%)							
Sales of water heating units - Electric	0.097	10.5	54.4	64.3	64.7	64.8	64.7
Heat Pump (%)							
Sales of water heating units - Electric	2.5	10.8	28.3	32.3	32.5	32.5	32.5
Resistance (%)							
Sales of water heating units - Gas Furnace	93	74.5	14.3	0.646	0.003	0	0
(%)							
Sales of water heating units - Other (%)	4.44	4.22	3.02	2.72	2.72	2.72	2.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.99	3.04	6	6.39	5.4	5.63
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	189	188	180	167	157	154	156
Final energy use - Industry (PJ)	130	132	132	141	151	159	167
Final energy use - Residential (PJ)	241	228	209	183	162	149	144
Final energy use - Transportation (PJ)	448	417	367	305	249	213	197

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		4.8	4.71				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	59.2	67.9	94.5	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	40.8	32.1	5.5	0.277	0	0	0
Sales of space heating units - Electric	17.4	35.6	79.7	89.7	90.1	90.1	90.1
Heat Pump (%)							
Sales of space heating units - Electric	13.2	13.8	5.81	3.98	3.89	3.95	3.95
Resistance (%)							
Sales of space heating units - Fossil (%)	14.3	18.9	5.51	2.51	2.38	2.35	2.35
Sales of space heating units - Gas (%)	55.1	31.6	8.99	3.84	3.61	3.62	3.62
Sales of water heating units - Electric	0	9.19	48.7	57.6	58	58	58
Heat Pump (%)							
Sales of water heating units - Electric	35.7	51	42.2	40.3	40.2	40.2	40.2
Resistance (%)							
Sales of water heating units - Gas Furnace	59.5	36.5	7.04	0.317	0.002	0	0
(%)							
Sales of water heating units - Other (%)	4.77	3.29	2.07	1.81	1.81	1.83	1.84

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		800	2,073	3,321	5,046	5,475	5,229
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.402		1.31		5.5		8.84
units)							
Public EV charging plugs - L2 (1000 units)	1.67		31.5		132		212
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 (%)	1.29	1.58	1.16	0.367	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.79	17.9	50.4	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.5	75	44.7	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.27	5.16	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC	0.109	0.325	0.182	0.055	0.011	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.019	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

## Table 39: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)

Item	2020	2025	2030	2035	2040	2045	2050
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 40: E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Constrained (billion \$2018)		0	0	0	0	0.383	0.427
Capital invested - Solar PV - Base (billion \$2018)		1.12	0.84	0.53	0.29	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		1.2	1.38	0.17	0.879	0.198	0
Capital invested - Wind - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Wind - Constrained (billion \$2018)		0	0	0	0	0	0
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	260	582
Installed renewables - Solar - Base land use assumptions (MW)	617	1,596	2,417	2,980	3,306	3,306	3,306
Installed renewables - Solar - Constrained land use assumptions (MW)	786	1,832	3,182	3,362	4,352	4,589	4,589
Installed renewables - Wind - Base land use assumptions (MW)	191	191	191	191	191	191	191
Installed renewables - Wind - Constrained land use assumptions (MW)	191	191	191	191	191	191	191

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	1,098	2,486
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	1,078	2,619	3,931	4,822	5,347	5,347	5,347
Solar - Constrained land use assumptions	1,345	3,008	5,115	5,408	6,969	7,338	7,338
(GWh)							
Wind - Base land use assumptions (GWh)	786	786	786	786	786	786	786
Wind - Constrained land use assumptions	786	786	786	786	786	786	786
(GWh)							

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

		0
	I	
		-595
		-29
		-624
		0
_		

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-313
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-14.5
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-327
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							525
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							52.7
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							578
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							276
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							26.4
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							302
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-37.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-5,324
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,101
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-1,332
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-140
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-864
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-356
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-62.1
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-886
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-546
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-18.8
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-1,480
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-183
deforestation (1000 tCO2e/y)							

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

Item Contantial Law Extend	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Extend							-51
rotation length (1000 tC02e/y)							71
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-71.
Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)							-288
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)							-12
Carbon sink potential - Low - Reforest							-31.
cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest							-67.
pasture (1000 tCO2e/y) Carbon sink potential - Low - Restore							-18
productivity (1000 tCO2e/y) Carbon sink potential - Mid - Accelerate							-28.
regeneration (1000 tCO2e/y) Carbon sink potential - Mid - All (not							-3,40
counting overlap) (1000 tCO2e/y) Carbon sink potential - Mid - Avoid							-64
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-92
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-10
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-57
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-24
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-46.
Carbon sink potential - Mid - Reforest							-47
pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore							-36
productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							6.1
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							14
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							67
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							51.
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 nectares)							
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							33.
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							4.
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							25.
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							18

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

Table 43: E+RE- scenario - PILLAR 6: Land s		•					
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,130
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3.08
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							140
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							260
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							25.8
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							_
hectares)							
Land impacted for carbon sink potential -							17.8
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							2.05
Low - Reforest cropland (1000 hectares)							2.00
Land impacted for carbon sink potential -							4.36
Low - Reforest pasture (1000 hectares)							4.30
Land impacted for carbon sink potential -							110
· · · · · · · · · · · · · · · · · · ·							110
Low - Restore productivity (1000							
hectares)							F/0
Land impacted for carbon sink potential -							563
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.61
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							144
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							470
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							38.8
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							25.8
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							3.08
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							31.5
Mid - Reforest pasture (1000 hectares)							00
Land impacted for carbon sink potential -							221
Mid - Restore productivity (1000							441
hectares)							
Land impacted for carbon sink potential -							938
							730
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table /./	E, DE	aganania	IMPACTS -	Hoalth
Ianie 77.	F+KF-	srennrin -	IMPALIS -	непітп

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		743	0.504	0.499	0.457	0.318	0.027
Coal (million 2019\$)							
Monetary damages from air pollution -		202	159	206	157	54.8	16.7
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		2,187	2,036	1,542	889	398	147
Transportation (million 2019\$)							
Premature deaths from air pollution -		83.9	0.057	0.056	0.052	0.036	0.003
Coal (deaths)							
Premature deaths from air pollution -		22.9	18	23.2	17.7	6.19	1.89
Natural Gas (deaths)							
Premature deaths from air pollution -		246	229	173	100	44.8	16.5
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		21,752	24,163				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	36.2	40.9	53.4	71	81.7	85.5
Resistance (%)							
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric	2.22	20.1	24.9	38.9	61	76.7	82.8
Heat Pump (%)							
Sales of space heating units - Electric	2.54	8.05	8.31	9.13	10.6	12	12.8
Resistance (%)							
Sales of space heating units - Fossil (%)	11	4.85	4.51	3.43	1.69	0.531	0.139
Sales of space heating units - Gas Furnace	84.3	67	62.3	48.5	26.7	10.8	4.34
(%)							
Sales of water heating units - Electric	0.097	2.03	7.02	21.4	43.5	57.9	63
Heat Pump (%)							
Sales of water heating units - Electric	2.5	7.39	9.34	15.1	24	29.8	31.8
Resistance (%)							
Sales of water heating units - Gas Furnace	93	86.1	79.2	59.6	29.2	9.38	2.45
(%)							
Sales of water heating units - Other (%)	4.44	4.46	4.4	3.91	3.31	2.91	2.76

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.54	2.53	3.68	3.81	5.55	5.88
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	189	189	186	183	177	171	167
Final energy use - Industry (PJ)	130	132	133	143	154	162	170
Final energy use - Residential (PJ)	241	229	222	214	200	183	167
Final energy use - Transportation (PJ)	449	421	386	356	331	302	268

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		4.8	4.72				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	59	60.1	63.8	73.7	87.5	96	98.9
Resistance (%)							
Sales of cooking units - Gas (%)	41	39.9	36.2	26.3	12.5	4.04	1.09
Sales of space heating units - Electric	17.4	27.2	32.2	46.7	68.8	83.3	88.3
Heat Pump (%)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	13.2	15.3	14.3	11.6	7.67	5.11	4.2
Resistance (%)							
Sales of space heating units - Fossil (%)	14.3	21.5	20.1	15.7	8.92	4.46	2.92
Sales of space heating units - Gas (%)	55.1	36	33.4	26	14.6	7.13	4.52
Sales of water heating units - Electric	0	1.58	6.08	19	38.9	51.9	56.4
Heat Pump (%)							
Sales of water heating units - Electric	35.7	52.7	51.6	48.7	44.3	41.5	40.5
Resistance (%)							
Sales of water heating units - Gas Furnace	59.5	42.2	38.9	29.2	14.4	4.62	1.21
(%)							
Sales of water heating units - Other (%)	4.77	3.53	3.4	3	2.4	2.02	1.89

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		0	133	271	925	2,883	4,210
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.402		0.44		2.06		5.66
units)							
Public EV charging plugs - L2 (1000 units)	1.67		10.6		49.6		136
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 (%)	1.3	1.76	2.01	1.59	0.995	0.506	0.218
Vehicle sales - Light-duty - EV (%)	2.19	5.36	13.2	28	50.7	73.5	88.2
Vehicle sales - Light-duty - gasoline (%)	90.8	86.2	77.5	63.9	43.6	23.3	10.3
Vehicle sales - Light-duty - hybrid (%)	5.48	6.24	6.9	6.15	4.48	2.57	1.22
Vehicle sales - Light-duty - hydrogen FC	0.112	0.373	0.311	0.232	0.161	0.088	0.041
(%)							
Vehicle sales - Light-duty - other (%)	0.092	0.095	0.085	0.073	0.052	0.028	0.013
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam 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	476
Conversion capital investment -		0	0	0	0	0	5,252
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	6
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	3.32	3.42	3.53
Annual - BECCS (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	0	112	197	197	257
Cumulative investment - All (million \$2018)		0	0	667	748	749	820
Cumulative investment - Spur (million \$2018)		0	0	0	81.3	82.7	153
Cumulative investment - Trunk (million \$2018)		0	0	667	667	667	667
Spur (km)		0	0	0	85.1	85.1	145
Trunk (km)		0	0	112	112	112	112

#### Table 55: 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
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million \$2020)		0	0	0	0	0	0
Wells and facilities construction costs (million \$2020)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-140

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

Item Carbon sink potential - Aggressive	2020	2025	2030	2035	2040	2045	2050 -526
deployment - Cropland measures (1000 tCO2e/y)							-526
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy crops (1000 tC02e/y)							Ü
Carbon sink potential - Aggressive deployment - Pasture to energy crops							0
(1000 tCO2e/y)							
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-25.2
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-691
Carbon sink potential - Moderate							-140
deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-276
deployment - Cropland measures (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy crops (1000 tCO2e/y)							
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y)							-12.6
Carbon sink potential - Moderate							-429
deployment - Total (1000 tCO2e/y)							// -
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							66.5
Land impacted for carbon sink - Aggressive deployment - Cropland							1,142
measures (1000 hectares)							
Land impacted for carbon sink - Aggressive deployment - Cropland to							24.8
woody energy crops (1000 hectares) Land impacted for carbon sink -							15.5
Aggressive deployment - Pasture to energy crops (1000 hectares)							15.5
Land impacted for carbon sink -							45.8
Aggressive deployment - Permanent conservation cover (1000 hectares)							
Land impacted for carbon sink -							1,295
Aggressive deployment - Total (1000 hectares)							
Land impacted for carbon sink - Moderate							66.5
deployment - Corn-ethanol to energy grasses (1000 hectares)							
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000							243
hectares)							
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy							24.8
crops (1000 hectares)  Land impacted for carbon sink - Moderate							15.5
deployment - Pasture to energy crops (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							22.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							372

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

Table 57: E-B+ scenario - PILLAR 6: Land	sinks - Fores	sts					
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-37.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-5,324
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,101
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-1,332
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-140
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-864
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-356
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-62.1
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-886
pasture (1000 tC02e/y)							
Carbon sink potential - High - Restore							-546
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-18.8
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-1,480
counting overlap) (1000 tCO2e/y)							,
Carbon sink potential - Low - Avoid							-183
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-511
rotation length (1000 tCO2e/y)							-
Carbon sink potential - Low - Improve							-71.1
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-288
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-125
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-31.1
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-67.1
pasture (1000 tCO2e/y)							• • • • • • • • • • • • • • • • • • • •
Carbon sink potential - Low - Restore							-184
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-28.2
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-3,401
counting overlap) (1000 tCO2e/y)							-,
Carbon sink potential - Mid - Avoid							-642
deforestation (1000 tCO2e/y)							J
Carbon sink potential - Mid - Extend							-922
rotation length (1000 tC02e/y)							- <b></b>
Carbon sink potential - Mid - Improve							-104
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-576
retention of HWP (1000 tCO2e/y)							5.0
(1000 10020/7)							

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

Item  Carbon sink potential - Mid - Increase	2020	2025	2030	2035	2040	2045	2050 -240
trees outside forests (1000 tC02e/y)							-240
Carbon sink potential - Mid - Reforest							-46.6
cropland (1000 tCO2e/y)							-40.0
Carbon sink potential - Mid - Reforest							-477
pasture (1000 tC02e/y)							-477
Carbon sink potential - Mid - Restore							-365
productivity (1000 tC02e/y)							-303
Land impacted for carbon sink potential -							6.15
High - Accelerate regeneration (1000							0.10
hectares)							
Land impacted for carbon sink potential -							149
High - Avoid deforestation (over 30 years)							149
(1000 hectares)							
Land impacted for carbon sink potential -							679
High - Extend rotation length (1000							019
hectares) Land impacted for carbon sink potential -							51.5
							51.5
High - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
							U
High - Increase retention of HWP (1000							
hectares)							33.8
Land impacted for carbon sink potential -							33.8
High - Increase trees outside forests (1000 hectares)							
-							/ 11
Land impacted for carbon sink potential -							4.11
High - Reforest cropland (1000 hectares)							25.2
Land impacted for carbon sink potential -							25.2
High - Reforest pasture (1000 hectares)							181
Land impacted for carbon sink potential -							181
High - Restore productivity (1000							
hectares)  Land impacted for carbon sink potential -							1,130
							1,130
High - Total impacted (over 30 years) (1000 hectares)							
`							2.00
Land impacted for carbon sink potential -							3.08
Low - Accelerate regeneration (1000							
hectares)							1/ 0
Land impacted for carbon sink potential -							140
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							0/0
Land impacted for carbon sink potential -							260
Low - Extend rotation length (1000							
hectares)							05.0
Land impacted for carbon sink potential -							25.8
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							47.0
Land impacted for carbon sink potential -							17.8
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							2.05
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							4.36
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							110
Low - Restore productivity (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							563
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.61
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							144
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							470
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							38.8
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							3.08
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							31.5
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							938

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		743	0.504	0.499	0.457	0.318	0.027
Monetary damages from air pollution - Natural Gas (million 2019\$)		241	149	85.6	67.2	39.7	11.7
Monetary damages from air pollution - Transportation (million 2019\$)		2,231	2,262	2,199	1,975	1,567	1,069
Premature deaths from air pollution - Coal (deaths)		83.9	0.057	0.056	0.052	0.036	0.003
Premature deaths from air pollution - Natural Gas (deaths)		27.2	16.8	9.67	7.59	4.48	1.32
Premature deaths from air pollution - Transportation (deaths)		251	254	247	222	176	120

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		21,455	22,311				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	34.3	34.3	34.3	34.4	34.3	34.3
Resistance (%)							
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Sales of space heating units - Electric	2.22	24.1	48.5	68.5	71.8	72.2	72.1
Heat Pump (%)							
Sales of space heating units - Electric	2.54	8.78	12.8	20.1	25.2	25.9	26
Resistance (%)							
Sales of space heating units - Fossil (%)	11	4.72	3.48	1.49	0.219	0.018	0

Table 59: RFF scenario -	DTILADA EEGalaman	/Flactuifiantian	0	(h
Tanie 59' REE Scenncin -	- PILLAR I' EMICIPOCV	/FIPCTCITICATION -	Linmmerrini i	rnntiniieni

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	84.3	62.4	35.2	9.92	2.85	1.92	1.85
Sales of water heating units - Electric Heat Pump (%)	0.097	0.269	0.266	0.268	0.269	0.268	0.269
Sales of water heating units - Electric Resistance (%)	2.5	6.69	6.63	6.64	6.67	6.65	6.66
Sales of water heating units - Gas Furnace (%)	93	88.5	88.5	88.6	88.5	88.5	88.6
Sales of water heating units - Other (%)	4.44	4.5	4.6	4.5	4.54	4.55	4.51

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.72	2.74	4.82	5.09	5.1	5.33
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	189	191	193	193	194	199	210
Final energy use - Industry (PJ)	130	136	143	150	159	169	180
Final energy use - Residential (PJ)	241	228	225	225	227	233	239
Final energy use - Transportation (PJ)	449	422	391	372	373	384	398

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		4.7	4.34				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	58.7	58.7	58.7	58.7	58.7	58.7	58.7
Resistance (%)							
Sales of cooking units - Gas (%)	41.3	41.3	41.3	41.3	41.3	41.3	41.3
Sales of space heating units - Electric	15	40.3	41.5	42.8	43.7	44.6	45.9
Heat Pump (%)							
Sales of space heating units - Electric	13.7	12.7	12.4	12	11.7	10.8	9.45
Resistance (%)							
Sales of space heating units - Fossil (%)	14.7	16.1	7.71	4.03	3.79	3.76	3.81
Sales of space heating units - Gas (%)	56.6	31	38.4	41.1	40.8	40.8	40.9
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	35.7	53	53	52.9	52.9	52.8	52.8
Resistance (%)							
Sales of water heating units - Gas Furnace	59.5	43.4	43.4	43.5	43.5	43.6	43.6
(%)							
Sales of water heating units - Other (%)	4.77	3.57	3.58	3.59	3.6	3.6	3.61

### Table 63: 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 (%)	1.29	1.75	2.14	2	1.79	1.66	1.58
Vehicle sales - Light-duty - EV (%)	4.42	6.72	7.55	9.34	11.3	12.8	14.1
Vehicle sales - Light-duty - gasoline (%)	88.8	85	82.5	80.4	78.1	76.3	74.8
Vehicle sales - Light-duty - hybrid (%)	5.29	6.1	7.38	7.93	8.43	8.88	9.17

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC	0.109	0.367	0.331	0.29	0.286	0.285	0.294
(%)							
Vehicle sales - Light-duty - other (%)	0.09	0.094	0.09	0.091	0.09	0.088	0.091
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	0.175	0.208	0.242	0.285	0.339	0.409	0.487
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-37.6
regeneration (1000 tCO2e/y)							F 20/
Carbon sink potential - High - All (not							-5,324
counting overlap) (1000 tC02e/y)							110
Carbon sink potential - High - Avoid							-1,10
deforestation (1000 tC02e/y)							1.00
Carbon sink potential - High - Extend							-1,33
rotation length (1000 tC02e/y)							4.1
Carbon sink potential - High - Improve							-14
plantations (1000 tC02e/y)							0.4
Carbon sink potential - High - Increase							-86
retention of HWP (1000 tCO2e/y)							0.5
Carbon sink potential - High - Increase							-35
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-62
cropland (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-88
pasture (1000 tC02e/y)							
Carbon sink potential - High - Restore							-54
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-18.
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-1,48
counting overlap) (1000 tCO2e/y)							10
Carbon sink potential - Low - Avoid							-18
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-5
rotation length (1000 tCO2e/y)							71
Carbon sink potential - Low - Improve							-71
plantations (1000 tCO2e/y)							00
Carbon sink potential - Low - Increase							-28
retention of HWP (1000 tCO2e/y)							10
Carbon sink potential - Low - Increase							-12
trees outside forests (1000 tC02e/y)							01
Carbon sink potential - Low - Reforest							-31
cropland (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-67
pasture (1000 tCO2e/y)							- 10
Carbon sink potential - Low - Restore							-18
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-28.
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-3,40
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-64
deforestation (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Extend							-922
rotation length (1000 tC02e/y)							10/
Carbon sink potential - Mid - Improve							-104
plantations (1000 tCO2e/y)							F7/
Carbon sink potential - Mid - Increase							-576
retention of HWP (1000 tC02e/y)							0/.0
Carbon sink potential - Mid - Increase							-240
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-46.6
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-477
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-365
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							6.15
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							149
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							679
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							51.5
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							33.8
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							4.11
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							25.2
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							181
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,130
High - Total impacted (over 30 years)							,
(1000 hectares)							
Land impacted for carbon sink potential -							3.08
Low - Accelerate regeneration (1000							-
hectares)							
Land impacted for carbon sink potential -							140
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							260
Low - Extend rotation length (1000							200
hectares)							
Land impacted for carbon sink potential -							25.8
Low - Improve plantations (1000							23.0
hectares)							
-							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							17.0
Land impacted for carbon sink potential -							17.8
Low - Increase trees outside forests							
(1000 hectares)							

Table 6/1	RFFSCP	nario -	DTII AR 6	: Land sinks	- Forests	(continued)
Table 04.	KEF SUE	Huriu -	· PILLAK O	. LUHU SIHKS	- FULESIS I	COMUNICEUM

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							2.05
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							4.36
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							110
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							563
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.61
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							144
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							470
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							38.8
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							25.8
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							3.08
Mid - Reforest cropland (1000 hectares)							04.5
Land impacted for carbon sink potential -							31.5
Mid - Reforest pasture (1000 hectares)							004
Land impacted for carbon sink potential -							221
Mid - Restore productivity (1000							
hectares)							000
Land impacted for carbon sink potential -							938
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural	-4.41		-2.14				-1.92
uptake (Mt CO2e/y)							
Business-as-usual carbon sink - Retained	-0.235		-0.423				-0.44
in Hardwood Products (Mt CO2e/y)							
Business-as-usual carbon sink - Total (Mt	-4.65		-2.57				-2.36
CO2e/y)							

#### Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		1,938	1,218	1,140	1,108	1,087	997
Monetary damages from air pollution - Natural Gas (million 2019\$)		199	221	263	277	254	246
Monetary damages from air pollution - Transportation (million 2019\$)		2,223	2,284	2,337	2,400	2,459	2,517
Premature deaths from air pollution - Coal (deaths)		219	138	129	125	123	113
Premature deaths from air pollution - Natural Gas (deaths)		22.4	24.9	29.7	31.3	28.6	27.7

## Table 66: REF scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		250	257	263	270	277	283
Transportation (deaths)							