

# Net-Zero America - kentucky state report

2021-03-05

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 1: Efficiency/Electrification - Commercial	1
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	2
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	3
12	E+ scenario - PILLAR 6: Land sinks - Agriculture	3
13	E+ scenario - PILLAR 6: Land sinks - Forests	4
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	8
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	9
22	E- scenario - PILLAR 6: Land sinks - Agriculture	10
23	E- scenario - PILLAR 6: Land sinks - Forests	11
24	E- scenario - IMPACTS - Health	13
25	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	13
26	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand .	14
27	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview	14
28	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential	14
29	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	14
30	E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity	15
31	E+RE+ scenario - PILLAR 2: Clean Electricity - Generation	15
32	E+RE+ scenario - PILLAR 6: Land sinks - Agriculture	15
33	E+RE+ scenario - PILLAR 6: Land sinks - Forests	16
34	E+RE+ scenario - IMPACTS - Health	18
35	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial	19
36	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	19
37	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview	19
38	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential	19
39	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation	20
40	E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity	20
41	E+RE- scenario - PILLAR 2: Clean Electricity - Generation	20
42	E+RE- scenario - PILLAR 6: Land sinks - Agriculture	20
43	E+RE- scenario - PILLAR 6: Land sinks - Forests	21

44	E+RE- scenario - IMPACTS - Health	24
45	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	24
46	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	24
47	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview	24
48	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential	25
49	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	25
50	E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity	25
51	E-B+ scenario - PILLAR 2: Clean Electricity - Generation	26
52	E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy	26
53	E-B+ scenario - PILLAR 4: CCUS - CO2 capture	26
54	E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines	26
55	E-B+ scenario - PILLAR 4: CCUS - CO2 storage	26
56	E-B+ scenario - PILLAR 6: Land sinks - Agriculture	27
57	E-B+ scenario - PILLAR 6: Land sinks - Forests	28
58	E-B+ scenario - IMPACTS - Health	30
59	REF scenario - PILLAR 1: Efficiency/Electrification - Commercial	30
60	REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	31
61	REF scenario - PILLAR 1: Efficiency/Electrification - Overview	31
62	REF scenario - PILLAR 1: Efficiency/Electrification - Residential	31
63	REF scenario - PILLAR 1: Efficiency/Electrification - Transportation	31
64	REF scenario - PILLAR 6: Land sinks - Forests	32
65	REF scenario - PILLAR 6: Land sinks - Forests - REF only	34
66	REF scenario - IMPACTS - Health	34

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

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

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

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

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant	0	0	0	0	0	0	0
(billion \$2018)							
Capital invested - Biomass w/ccu allam	0	0	0	0	0	0	0
power plant (billion \$2018)							
Capital invested - Biomass w/ccu power	0	0	5.14	0	0	5.51	0
plant (billion \$2018)							
Capital invested - Solar PV - Base (billion	0	0	0	0	0	0	0.071
\$2018)							
Capital invested - Solar PV - Constrained	0	0.091	0	0	0	0.132	0.08
(billion \$2018)							
Capital invested - Wind - Constrained	0	0	0.098	0.431	0.052	0	0
(billion \$2018)							
Installed (cumulative) - OffshoreWind -	0	0	0	0	0	0	0
Base land use assumptions (MW)							
Installed (cumulative) - Rooftop PV (MW)	45.2	72.8	103	147	208	288	390
Installed (cumulative) - Solar - Base land	68.3	68.3	68.3	68.3	68.3	68.3	145
use assumptions (MW)							
Installed (cumulative) - Wind - Base land	0	0	0	0	0	0	91.4
use assumptions (MW)							

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	5,771	5,771	5,771	11,950	11,950
Solar - Base land use assumptions (GWh)	145	0	0	0	0	0	139
Solar - Constrained land use assumptions (GWh)	145	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	217	838	91	0	0

Table O. C.		DILLAD O.	Ologo	fuele	Diagnanau
Table 8: <i>E+</i>	SCEHUITO -	PILLAK 5.	GIEUH	TUEIS -	BIUEIIEI'UV

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

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432

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

Item IZ: E+ Scenario - PILLAR 6: Land Sini	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive	2020	2020	2000	2000	2070	2070	-4,963
deployment - Cropland measures (1000 tC02e/y)							.,,,,,
Carbon sink potential - Aggressive							-136
deployment - Permanent conservation							-130
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-5,532
deployment - Total (1000 tCO2e/y)							-0,002
Carbon sink potential - Moderate							-432
deployment - Corn-ethanol to energy							702
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,618
deployment - Cropland measures (1000							_,0.0
tCO2e/y)							
Carbon sink potential - Moderate							-67.9
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-3,118
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							188
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,250
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							247
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,685
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							188
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							1107
Land impacted for carbon sink - Moderate							1,187
deployment - Cropland measures (1000							
hectares)							124
Land impacted for carbon sink - Moderate							124
deployment - Permanent conservation cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,498
deployment - Total (1000 hectares)							1,490
achiganient - iotai (1000 nectai es)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-96.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest		-					-1,409
cropland (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-3,200
productivity (1000 tCO2e/y)							-,
Carbon sink potential - Low - Accelerate							-48.5
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tCO2e/y)							0,700
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tC02e/y)							200
Carbon sink potential - Low - Extend						+	-2,177
rotation length (1000 tCO2e/y)							-2,111
Carbon sink potential - Low - Improve							-24.5
							-24.5
plantations (1000 tCO2e/y)							1 5 5 5
Carbon sink potential - Low - Increase							-1,555
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-704
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-773
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,079
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-72.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-17,376
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-897
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,923
rotation length (1000 tCO2e/y)							•
Carbon sink potential - Mid - Improve						+	-35.9
plantations (1000 tCO2e/y)							00.7
Carbon sink potential - Mid - Increase						+	-3,110
retention of HWP (1000 tCO2e/y)							0,110
Carbon sink potential - Mid - Increase							-651
trees outside forests (1000 tC02e/y)							001
Carbon sink potential - Mid - Reforest						+	-1,057
cropland (1000 tCO2e/y)							-1,051
							F / 00
Carbon sink potential - Mid - Reforest							-5,490
pasture (1000 tC02e/y)							0.100
Carbon sink potential - Mid - Restore							-2,139
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							15.8
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							208
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,891
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							17.7
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -			+				0
High - Increase retention of HWP (1000							Ū
	ı İ	1	1		1		

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

Them	2020			2025	2040	2045	2050
Item Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050 91.7
High - Increase trees outside forests							71.1
(1000 hectares)							
Land impacted for carbon sink potential -		<del></del>				+	93.2
High - Reforest cropland (1000 hectares)							70.2
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							,
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							7.91
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							F0.0
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							( ( 0
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000 hectares)							
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							2,107
(1000 hectares)							
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							11.7
hectares)							
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							202
(1000 hectares)							
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							.,,,,,
hectares)							
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							_
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							. 3
hectares)							
Land impacted for carbon sink potential -							69.9
Land impacted for carbon sink potential -	1	I	1			1	07.7

Tahla 12. Fx	econario -	DILLAD 6.	Land sinks -	Enrecte	(continued)
Table 15. Et	SCEIIUI 10 -	PILLAK O.	LUIIU SIIIKS -	. คบา ยอเอา	COHUHUEUT

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		263	222	178	134	84.2	58.4
Natural gas consumption - Cumulative (tcf)		0	0	0	0	0	5,358
Natural gas production - Annual (tcf)		96.2	91	79.2	67	53.1	41.3
Oil consumption - Annual (million bbls)		88.2	77.2	61.2	46.1	34.1	24.3
Oil consumption - Cumulative (million bbls)		0	0	0	0	0	1,887
Oil production - Annual (million bbls)		2.93	2.94	2.94	2.33	1.89	1.26

# Table 15: E+ scenario - IMPACTS - Health

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

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

14516 161 2 1 666747 16 17 17 167 6 6656							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		96.7	299	1,155	982	1,266	1,043
By economic sector - Construction (jobs)		3,515	4,016	4,488	3,984	3,689	3,953
By economic sector - Manufacturing		6,895	8,210	10,972	10,457	8,644	10,810
(jobs)							
By economic sector - Mining (jobs)		3,343	2,045	1,485	1,026	741	535
By economic sector - Other (jobs)		192	198	249	252	245	305
By economic sector - Pipeline (jobs)		384	485	428	317	312	353
By economic sector - Professional (jobs)		2,162	1,906	2,831	2,559	2,950	2,893
By economic sector - Trade (jobs)		2,011	1,576	1,563	1,364	1,319	1,276
By economic sector - Utilities (jobs)		5,255	5,483	6,059	5,536	4,636	4,648
By education level - All sectors -		7,408	7,599	9,006	8,212	7,226	7,950
Associates degree or some college (jobs)							
By education level - All sectors -		4,990	4,941	5,868	5,290	4,789	5,164
Bachelors degree (jobs)							
By education level - All sectors - Doctoral		139	128	162	144	149	151
degree (jobs)							
By education level - All sectors - High		10,191	10,458	12,880	11,654	10,535	11,394
school diploma or less (jobs)							
By education level - All sectors - Masters		1,128	1,092	1,314	1,177	1,102	1,156
or professional degree (jobs)							

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Biomass (jobs)		295	796	3,253	2,933	4,620	4,463
By resource sector - CO2 (jobs)		24.2	1,338	1,452	1,106	1,664	2,392
By resource sector - Coal (jobs)		3,153	589	505	432	384	339
By resource sector - Grid (jobs)		5,665	6,646	8,440	7,292	6,211	6,045
By resource sector - Natural Gas (jobs)		4,926	4,400	3,428	3,561	2,066	1,464
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		4,580	3,754	2,855	2,011	1,414	933
By resource sector - Solar (jobs)		2,727	3,196	4,630	4,869	4,415	6,347
By resource sector - Wind (jobs)		2,484	3,499	4,667	4,273	3,026	3,833
Median wages - Annual - All (\$2019 per		54,997	55,154	55,014	55,539	56,203	56,450
job)							
On-Site or In-Plant Training - Total jobs - 1		3,827	3,908	4,608	4,177	3,679	4,012
to 4 years (jobs)							
On-Site or In-Plant Training - Total jobs - 4		1,415	1,435	1,626	1,462	1,306	1,382
to 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		3,777	3,876	4,748	4,311	3,904	4,248
None (jobs)							
On-Site or In-Plant Training - Total jobs -		191	200	236	216	191	209
Over 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		14,645	14,798	18,012	16,312	14,721	15,965
Up to 1 year (jobs)							
On-the-Job Training - All sectors - 1 to 4		4,882	4,989	5,848	5,304	4,658	5,080
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,345	1,370	1,552	1,397	1,246	1,317
years (jobs)							
On-the-Job Training - All sectors - None		1,241	1,246	1,496	1,352	1,237	1,345
(jobs)							
On-the-Job Training - All sectors - Over 10		233	247	296	271	236	270
years (jobs)							
On-the-Job Training - All sectors - Up to 1		16,154	16,366	20,038	18,153	16,423	17,804
year (jobs)							
Related work experience - All sectors - 1		8,676	8,710	10,438	9,429	8,449	9,108
to 4 years (jobs)							
Related work experience - All sectors - 4		5,489	5,568	6,575	5,960	5,299	5,768
to 10 years (jobs)							
Related work experience - All sectors -		3,382	3,477	4,217	3,821	3,452	3,720
None (jobs)							
Related work experience - All sectors -		1,540	1,575	1,873	1,704	1,497	1,660
Over 10 years (jobs)		, = : =					
Related work experience - All sectors - Up		4,768	4,887	6,126	5,562	5,103	5,559
to 1 year (jobs)		4.010	1.007	1 ( ) )	4 174	1.000	4 / ==
Wage income - All (million \$2019)		1,312	1,336	1,608	1,471	1,338	1,457

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	12,642	14,325	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	43.5	47.1	51.3	61.6	76.1	85	88
Resistance (%)							
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric	5.4	22.1	27.3	42.8	66.9	83.6	89.9
Heat Pump (%)							
Sales of space heating units - Electric	3.11	4.17	4.24	4.4	4.84	5.52	5.99
Resistance (%)							
Sales of space heating units - Fossil (%)	15.1	5.03	4.61	3.36	1.65	0.539	0.139
Sales of space heating units - Gas Furnace	76.4	68.7	63.8	49.5	26.6	10.3	3.94
(%)							
Sales of water heating units - Electric	0.117	1.95	7.08	21.8	44.5	59.3	64.4
Heat Pump (%)							

Table 17: E- scenario -	DILLAR 1. Efficience	//Electrification -	Commercial	continued
Table II. E- Scellul IO -	PILLAK I. EIIILIEIIL	// EIECH 111CUHUH -	CUITITIETCIULT	Continueur

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric	4.29	6.36	8.3	14.3	23.5	29.4	31.5
Resistance (%)							
Sales of water heating units - Gas Furnace	94.4	90.1	83.1	62.2	30.5	9.74	2.54
(%)							
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	0	135	286	962	3,037	4,422
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06	0	0.518	0	2.83	0	7.94
units)							
Public EV charging plugs - L2 (1000 units)	0.251	0	12.5	0	68	0	191
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC	0.332	0.969	2.74	7.17	15.7	26.3	34
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.57	1.98	2.06	1.64	1.05	0.538	0.231
Vehicle sales - Light-duty - EV (%)	1.88	4.66	11.8	25.8	48.3	72	87.5
Vehicle sales - Light-duty - gasoline (%)	91.8	87.5	79.7	66.7	46.3	24.9	11

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hybrid (%)	4.56	5.37	6.03	5.49	4.12	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC	0.113	0.38	0.326	0.249	0.177	0.098	0.046
(%)							
Vehicle sales - Light-duty - other (%)	0.103	0.107	0.097	0.085	0.061	0.034	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-96.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-1,409
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tC02e/y)							
Carbon sink potential - High - Restore							-3,200
productivity (1000 tC02e/y)							
Carbon sink potential - Low - Accelerate							-48.5
regeneration (1000 tC02e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tC02e/y)							057
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tC02e/y)							0.177
Carbon sink potential - Low - Extend							-2,177
rotation length (1000 tC02e/y)							0/ 5
Carbon sink potential - Low - Improve							-24.5
plantations (1000 tC02e/y)  Carbon sink potential - Low - Increase							1 ГГГ
·							-1,555
retention of HWP (1000 tC02e/y)  Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tCO2e/y)							-330
Carbon sink potential - Low - Reforest							-704
cropland (1000 tC02e/y)							-704
Carbon sink potential - Low - Reforest							-773
pasture (1000 tCO2e/y)							-113
							-1,079
carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,017
Carbon sink potential - Mid - Accelerate							-72.6
regeneration (1000 tCO2e/y)							-12.0
Carbon sink potential - Mid - All (not							-17,376
counting overlap) (1000 tC02e/y)							-11,010
Carbon sink potential - Mid - Avoid							-897
deforestation (1000 tC02e/y)							071
Carbon sink potential - Mid - Extend							-3,923
rotation length (1000 tCO2e/y)							0,720
Carbon sink potential - Mid - Improve							-35.9
plantations (1000 tCO2e/y)							00.7
Carbon sink potential - Mid - Increase							-3,110
retention of HWP (1000 tCO2e/y)							0,110
Carbon sink potential - Mid - Increase							-651
trees outside forests (1000 tCO2e/y)							501
Carbon sink potential - Mid - Reforest							-1,057
cropland (1000 tCO2e/y)							.,501
Carbon sink potential - Mid - Reforest							-5,490
pasture (1000 tC02e/y)							5,175
Carbon sink potential - Mid - Restore							-2,139
Carbon sink potential - Mio - Resione	l l						

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

Table 23: E- scenario - PILLAR 6: Land sink				0005	00/0	00/5	0050
Item Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050 15.8
The state of the s							15.8
High - Accelerate regeneration (1000							
hectares)  Land impacted for carbon sink potential -							208
High - Avoid deforestation (over 30 years)							200
(1000 hectares)							
							0.001
Land impacted for carbon sink potential - High - Extend rotation length (1000							2,891
• • • • • • • • • • • • • • • • • • • •							
hectares)  Land impacted for carbon sink potential -							17.7
							17.7
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							017
Land impacted for carbon sink potential -							91.7
High - Increase trees outside forests							
(1000 hectares)							00.0
Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							000
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							7.91
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -	Ţ	T	T	T			2,107
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)			1		1	1	

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

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

Table 24: E- scenario - IMPACTS - Health

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	840	2,147	3,490	5,282	5,754	5,483
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06	0	1.72	0	7.66	0	12.4
units)							
Public EV charging plugs - L2 (1000 units)	0.251	0	41.4	0	184	0	298
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.56	1.82	1.26	0.403	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.9	15.1	46.4	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78.1	48.9	16.6	3.3	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.4	4.53	3.21	1.19	0.29	0.063	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC	0.11	0.34	0.203	0.063	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)	0	0	0	0	0	0.519	5.27
Capital invested - Wind - Base (billion \$2018)	0	0	0	0	0.302	0.116	0.175
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Solar - Base land use assumptions (MW)	68.3	68.3	68.3	68.3	68.3	597	6,284
Installed (cumulative) - Wind - Base land use assumptions (MW)	0	0	0	0	256	359	524

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	145		0	0	0	930	10,365
Solar - Constrained land use assumptions (GWh)	145		0	0	0	1,294	10,440
Wind - Base land use assumptions (GWh)	0		0	0	623	237	450
Wind - Constrained land use assumptions (GWh)	0		217	929	0	0	0

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest							-704
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-773
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,079
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-72.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-17,376
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-897
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,923
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-35.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-3,110
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-651
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,057
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-5,490
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-2,139
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							15.8
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							208
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,891
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							17.7
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							91.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							•
(1000 hectares)							
Land impacted for carbon sink potential -							7.91
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -	+				+		195
Low - Avoid deforestation (over 30 years)							
LOW - Avoid actor catation tover an vearar							

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

a on mo	COLO (CONTEN	racaj				
2020	2025	2030	2035	2040	2045	2050
						1,107
						8.86
						0
						48.3
						46.6
						50.3
						642
						2,107
						11.9
						202
						1,999
						13.3
						0
						70
						69.9
						363
						1,293
						4,022
	I	l l				.,
						1,022
				, , , , , , , , , , , , , , , , , , , ,	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·

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

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

## Table 34: E+RE+ scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		15.6	11.1	6.16	3.78	1.16	0.366
Natural Gas (deaths)							
Premature deaths from air pollution -		138	128	96.5	55.5	25.3	10.1
Transportation (deaths)							

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

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

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	34.2	19.2	3.59	0.151	0	0	0
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-432
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-4,963
deployment - Cropland measures (1000							
tCO2e/y)							

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-96.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,409
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Restore							-3,200
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-48.5
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,17
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-24.5
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,55
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-704
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-773
pasture (1000 tC02e/y)							
Carbon sink potential - Low - Restore							-1,079
productivity (1000 tCO2e/y)							1,01
Carbon sink potential - Mid - Accelerate							-72.0
regeneration (1000 tCO2e/y)							-12.0
Carbon sink potential - Mid - All (not							-17,37
•							-11,511
counting overlap) (1000 tC02e/y)							00
Carbon sink potential - Mid - Avoid							-89
deforestation (1000 tC02e/y)							0.00
Carbon sink potential - Mid - Extend							-3,92
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-35.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-3,110
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-65
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,05
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-5,490
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-2,13
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							15.
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							20
High - Avoid deforestation (over 30 years)							20.
(1000 hectares)							
Land impacted for carbon sink potential -							2,89
High - Extend rotation length (1000							2,07
hectares)							
							17
Land impacted for carbon sink potential -							17.
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							91.
High - Increase trees outside forests							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							
(1000 hectares)							704
Land impacted for carbon sink potential -							7.91
Low - Accelerate regeneration (1000							
hectares)							105
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							1107
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							
hectares)							0.07
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							/ 0 0
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							
(1000 hectares)							46.6
Land impacted for carbon sink potential -							40.0
Low - Reforest cropland (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							042
hectares)							
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							2,101
(1000 hectares)							
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							11.7
hectares)							
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							202
(1000 hectares)							
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							1,777
hectares)							
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares)							10.0
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							·
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							.0
hectares)							
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							07.7
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							500
That included pastar a (1000 flootal co)							

Table 43: E+RE-	cconario	DTIIAD	6. Land sinks	Enrocte	(continued)
1401E 45. E+KE-	SCEHUITO -	PILLAR	o: Luiiu Siiiks -	· FUI ESIS I	COMUNICEUR

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)	0	12,642	14,325	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric Heat Pump (%)	5.4	22.1	27.3	42.8	66.9	83.6	89.9
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.24	4.4	4.84	5.52	5.99
Sales of space heating units - Fossil (%)	15.1	5.03	4.61	3.36	1.65	0.539	0.139
Sales of space heating units - Gas Furnace (%)	76.4	68.7	63.8	49.5	26.6	10.3	3.94
Sales of water heating units - Electric Heat Pump (%)	0.117	1.95	7.08	21.8	44.5	59.3	64.4
Sales of water heating units - Electric Resistance (%)	4.29	6.36	8.3	14.3	23.5	29.4	31.5
Sales of water heating units - Gas Furnace (%)	94.4	90.1	83.1	62.2	30.5	9.74	2.54
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-971
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							/ 50/
Carbon sink potential - Aggressive							-4,584
deployment - Cropland measures (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							U
crops (1000 tC02e/y)							
Carbon sink potential - Aggressive							0
deployment - Pasture to energy crops							O
(1000 tC02e/y)							
Carbon sink potential - Aggressive							-124
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-5,680
deployment - Total (1000 tCO2e/y)							•
Carbon sink potential - Moderate							-971
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,418
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Moderate							-62.1
deployment - Permanent conservation							
cover (1000 tC02e/y)							0 / 51
Carbon sink potential - Moderate							-3,451
deployment - Total (1000 tC02e/y) Land impacted for carbon sink -							395
Aggressive deployment - Corn-ethanol to							395
energy grasses (1000 hectares)							
Land impacted for carbon sink -							5,086
Aggressive deployment - Cropland							3,000
measures (1000 hectares)							
Land impacted for carbon sink -							92.2
Aggressive deployment - Cropland to							, 2.2
woody energy crops (1000 hectares)							
Land impacted for carbon sink -		+					432
Aggressive deployment - Pasture to							
energy crops (1000 hectares)							
Land impacted for carbon sink -							226
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							6,231
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							395
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,086
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							92.2
deployment - Cropland to woody energy							
crops (1000 hectares)							

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							432
deployment - Pasture to energy crops (1000 hectares)							
Land impacted for carbon sink - Moderate							113
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							2,118
deployment - Total (1000 hectares)							

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-96.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.1
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,409
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-3,200
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-48.5
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tC02e/y)							0.177
Carbon sink potential - Low - Extend							-2,177
rotation length (1000 tC02e/y)							-24.5
Carbon sink potential - Low - Improve							-24.5
plantations (1000 tCO2e/y)							1 555
Carbon sink potential - Low - Increase							-1,555
retention of HWP (1000 tCO2e/y)  Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tC02e/y)							-330
Carbon sink potential - Low - Reforest							-704
cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest							-773
pasture (1000 tC02e/y)							-113
Carbon sink potential - Low - Restore							-1,079
productivity (1000 tC02e/y)							-1,019
Carbon sink potential - Mid - Accelerate					+		-72.6
regeneration (1000 tC02e/y)							-12.0
Carbon sink potential - Mid - All (not							-17,376
counting overlap) (1000 tC02e/y)							11,010
Carbon sink potential - Mid - Avoid							-897
deforestation (1000 tC02e/y)							-071
Carbon sink potential - Mid - Extend					+		-3,923
rotation length (1000 tC02e/y)							0,720

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve							-35.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-3,110
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-651
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-1,057
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-5,490
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-2,139
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							15.8
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							208
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,891
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							17.7
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							91.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							70.2
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							270
Land impacted for carbon sink potential -		+		+			1,061
High - Restore productivity (1000							1,001
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							4,000
(1000 hectares)							
`							7.91
Land impacted for carbon sink potential -							1.91
Low - Accelerate regeneration (1000							
hectares)							105
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							

Table 57: E-B+	connario	DTII AD 6.	Land cinke	Enracte	Continued
1aule 57. <i>E-</i> D+	· SCEHUITO -	· PILLAR O:	LUHU SIHKS	- FULESIS I	COMUNICEUR

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							
hectares)							40.0
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							70
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000 hectares)							
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							09.9
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							303
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							1,273
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							4,022
hectares)							
noctal 63)							

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	12,419	12,935	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	43.5	45.6	45.9	45.7	46	45.9	45.7
Resistance (%)							
Sales of cooking units - Gas (%)	56.5	54.4	54.1	54.3	54	54.1	54.3

Table 50: DEE	cconario -	DTIIAD 1.	Efficiency/Electrification -	Commercial (continued	1
Table 39. KEF	SCEIIUI 10 -	PILLAK I.	EIIICIEIICV/EIECUTIICUUUT -	GUITHITEL CIULTCUTTITIUEU	1

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	5.4	26.5	53.4	75.5	79.2	79.6	79.6
Heat Pump (%)							
Sales of space heating units - Electric	3.11	5.03	9.13	15	18.3	18.8	18.9
Resistance (%)							
Sales of space heating units - Fossil (%)	15.1	4.63	2.27	0.341	0.034	0	0
Sales of space heating units - Gas Furnace	76.4	63.9	35.2	9.15	2.46	1.58	1.52
(%)							
Sales of water heating units - Electric	0.117	0.149	0.144	0.146	0.145	0.143	0.145
Heat Pump (%)							
Sales of water heating units - Electric	4.29	5.63	5.49	5.57	5.54	5.49	5.54
Resistance (%)							
Sales of water heating units - Gas Furnace	94.4	92.6	92.8	92.7	92.7	92.8	92.8
(%)							
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

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

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.56	1.97	2.19	2.03	1.83	1.71	1.62
Vehicle sales - Light-duty - EV (%)	3.54	5.57	6.35	7.81	9.51	11	12.2
Vehicle sales - Light-duty - gasoline (%)	90.3	86.7	84.6	82.7	80.7	78.7	77.2
Vehicle sales - Light-duty - hybrid (%)	4.42	5.26	6.45	7.01	7.58	8.17	8.62
Vehicle sales - Light-duty - hydrogen FC	0.111	0.377	0.346	0.308	0.305	0.305	0.316
(%)							
Vehicle sales - Light-duty - other (%)	0.102	0.106	0.103	0.103	0.103	0.101	0.104
Vehicle sales - Medium-duty - diesel (%)	65.2	63.5	61.6	59.6	58	56.5	55.2
Vehicle sales - Medium-duty - EV (%)	0.027	0.105	0.329	0.671	0.895	0.973	0.993
Vehicle sales - Medium-duty - gasoline (%)	34	35.5	37	38.5	39.7	40.8	41.7
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen	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							-96.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-27,796
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,537
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,669
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-48.
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,665
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-965
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,409
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-10,207
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-3,200
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-48.5
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,956
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-256
deforestation (1000 tC02e/y)							
Carbon sink potential - Low - Extend							-2,177
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-24.5
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,555
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-338
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-704
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-773
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,079
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-72.6
regeneration (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 - All (not counting overlap) (1000 tC02e/y)							-17,376
Carbon sink potential - Mid - Avoid							-897
deforestation (1000 tC02e/y)							071
Carbon sink potential - Mid - Extend							-3,923
rotation length (1000 tCO2e/y)							•
Carbon sink potential - Mid - Improve							-35.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-3,110
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-651
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-1,057
cropland (1000 tC02e/y)							F / 00
Carbon sink potential - Mid - Reforest							-5,490
pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore							-2,139
productivity (1000 tCO2e/y)							-2,139
Land impacted for carbon sink potential -							15.8
High - Accelerate regeneration (1000							13.0
hectares)							
Land impacted for carbon sink potential -							208
High - Avoid deforestation (over 30 years)							200
(1000 hectares)							
Land impacted for carbon sink potential -							2,891
High - Extend rotation length (1000							·
hectares)							
Land impacted for carbon sink potential -							17.7
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							91.7
High - Increase trees outside forests							
(1000 hectares)  Land impacted for carbon sink potential -							93.2
High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential -							290
High - Reforest pasture (1000 hectares)							270
Land impacted for carbon sink potential -							1,061
High - Restore productivity (1000							1,001
hectares)							
Land impacted for carbon sink potential -							4,668
High - Total impacted (over 30 years)							,
(1000 hectares)							
Land impacted for carbon sink potential -							7.91
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							195
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,107
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							8.86
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							

		DT1 1 4 D 1			
Table 64'	RFF scenario	- PILLAR 6: I	' and sinks -	Forests I	continuedi

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							48.3
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							46.6
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							50.3
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							642
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,107
Low - Total impacted (over 30 years)							·
(1000 hectares)							
Land impacted for carbon sink potential -							11.9
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							202
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,999
Mid - Extend rotation length (1000							,
hectares)							
Land impacted for carbon sink potential -							13.3
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							70
Mid - Increase trees outside forests (1000							
hectares							
Land impacted for carbon sink potential -							69.9
Mid - Reforest cropland (1000 hectares)							07.7
Land impacted for carbon sink potential -							363
Mid - Reforest pasture (1000 hectares)							000
Land impacted for carbon sink potential -							1,293
Mid - Restore productivity (1000							1,270
hectares)							
Land impacted for carbon sink potential -							4,022
Mid - Total impacted (over 30 years) (1000							.,022
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 uptake (Mt CO2e/y)	-13.6		-9.57				-7.76
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.27		-2.12				-2.23
Business-as-usual carbon sink - Total (Mt CO2e/y)	-14.9		-11.7				-9.99

# Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		1,969	1,409	1,188	1,068	1,025	1,005
Monetary damages from air pollution - Natural Gas (million 2019\$)		134	177	193	250	199	173
Monetary damages from air pollution - Transportation (million 2019\$)		1,243	1,267	1,291	1,321	1,351	1,382

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

rabio con nei cochano in minoro modici	11 (00111111111111111111111111111111111	۵)					
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Coal (deaths)		222	159	134	121	116	113
Premature deaths from air pollution - Natural Gas (deaths)		15.2	19.9	21.8	28.2	22.5	19.5
Premature deaths from air pollution - Transportation (deaths)		140	142	145	149	152	155