

Net-Zero America - tennessee 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 https://netzeroamerica.princeton.edu.

Notes

- These data are all data from the study available at https://netzeroamerica.prince-ton.edu.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one "no new policies" reference scenario. In this document, state-level results are grouped by scenario. For some scenarios, the study generated national, but not 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

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	19,412	22,037	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	9.56	30.6	77.3	90.8	91.9	92	92
Heat Pump (%)							
Sales of space heating units - Electric	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Resistance (%)							
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0
Sales of space heating units - Gas Furnace	85.6	62	17.3	2.94	1.48	1.43	1.43
(%)							
Sales of water heating units - Electric	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Heat Pump (%)							
Sales of water heating units - Electric	5.74	9.97	28	32.1	32.3	32.3	32.3
Resistance (%)							
Sales of water heating units - Gas Furnace	92.5	77.8	14.7	0.62	0	0	0
(%)							
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		4.81	4.94	6.83	7.17	5.85	5.99
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)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	5.23	5.68	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	83.2	86.7	97.7	99.9	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Sales of space heating units - Electric	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Heat Pump (%)							
Sales of space heating units - Electric	31.3	29.8	12.5	8.63	8.46	8.57	8.59
Resistance (%)							
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of water heating units - Electric	0	9.08	48.1	56.8	57.1	57.2	57.2
Heat Pump (%)							
Sales of water heating units - Electric	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Resistance (%)							
Sales of water heating units - Gas Furnace	27.4	14.7	2.75	0.116	0	0	0
(%)							
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,105	2,839	4,591	6,958	7,569	7,219
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.165	0	2.15	0	9.36	0	15.1
units)							
Public EV charging plugs - L2 (1000 units)	0.888	0	51.7	0	225	0	363
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.55	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.92	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.8	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.42	4.54	3.21	1.19	0.291	0.064	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	0	0	0	3.78	0
plant (billion \$2018)							
Capital invested - Solar PV - Base (billion	0	0.364	0.667	1.41	2.88	6.84	11
\$2018)							
Capital invested - Solar PV - Constrained	0	0.173	0	1.86	2.57	9.47	7
(billion \$2018)							
Capital invested - Wind - Base (billion	0	0.069	0.052	0	0	0	0
\$2018)							
Installed (cumulative) - OffshoreWind -	0	0	0	0	0	0	0
Base land use assumptions (MW)							
Installed (cumulative) - Rooftop PV (MW)	127	205	290	412	585	809	1,096
Installed (cumulative) - Solar - Base land	260	532	1,089	2,367	5,134	12,099	23,955
use assumptions (MW)							
Installed (cumulative) - Wind - Base land	29	75.6	115	115	115	115	115
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	0	0	0	4,245	4,245
Solar - Base land use assumptions (GWh)	538	517	1,060	2,417	5,226	12,990	22,023
Solar - Constrained land use assumptions (GWh)	282	0	293	4,856	5,444	10,756	13,520
Wind - Base land use assumptions (GWh)	106	139	116	0	0	0	0

Table 7: E+ scenario	DILLAD O. Cloan Fla	atriaity Cananatio	n (continued)
Table C. E+ Scenurio	- PILLAR Z. GIBUII EIB	CHICHV - GEHEFULIC	III I CUIILIIIUEU I

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Constrained land use assumptions	106	0	0	0	0	0	255
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	170	170	506	506
Conversion capital investment -	0	0	0	3,213	0	6,799	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	3	3	7	7
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	0	0	2	2
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	5.99	5.7	17.2	16.5
Annual - BECCS (MMT)		0	0	4.13	4.13	12.5	12.5
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	1.86	1.57	4.69	4.06
Cumulative - All (MMT)		0	0	5.99	11.7	28.9	45.4
Cumulative - BECCS (MMT)		0	0	4.13	8.26	20.7	33.2
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	1.86	3.43	8.12	12.2

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	181	832	1,089	1,872	1,662
Cumulative investment - All (million \$2018)		0	1,110	2,685	2,984	3,656	3,492
Cumulative investment - Spur (million \$2018)		0	0	464	763	1,435	1,271
Cumulative investment - Trunk (million \$2018)		0	1,110	2,221	2,221	2,221	2,221
Spur (km)		0	0	470	727	1,511	1,301
Trunk (km)		0	181	362	362	362	362

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0.88	1.81	2.58	3.73
Injection wells (wells)		0	1	2	4	7	8
Resource characterization, appraisal, permitting costs (million \$2020)		25.4	71.2	91.5	91.5	91.5	91.5
Wells and facilities construction costs (million \$2020)		0	16.9	66	118	197	244

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-274
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,357
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-108
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,739
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-274
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,769
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-54
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,097
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink -							112
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,832
Aggressive deployment - Cropland							,
measures (1000 hectares)							
Land impacted for carbon sink -							197
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,141
Aggressive deployment - Total (1000							_,
hectares)							
Land impacted for carbon sink - Moderate							112
deployment - Corn-ethanol to energy							112
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							965
deployment - Cropland measures (1000							700
hectares)							
Land impacted for carbon sink - Moderate							98.3
deployment - Permanent conservation							70.0
cover (1000 hectares)							
Land impacted for carbon sink - Moderate		+		-			1,176
deployment - Total (1000 hectares)							1,170
deployment - rotal (1000 nectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-116
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-31,364
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,178
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,783
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-591
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,834
retention of HWP (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 - Increase							-928
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tC02e/y)							-3,823
Carbon sink potential - Low - Accelerate							-57.9
regeneration (1000 tCO2e/y) Carbon sink potential - Low - All (not							-8,323
counting overlap) (1000 tCO2e/y) Carbon sink potential - Low - Avoid							-363
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase							-2,278
retention of HWP (1000 tCO2e/y)							, -
Carbon sink potential - Low - Increase							-325
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-763
cropland (1000 tC02e/y) Carbon sink potential - Low - Reforest							-726
pasture (1000 tC02e/y)							-120
Carbon sink potential - Low - Restore							-1,289
productivity (1000 tC02e/y)							1,207
Carbon sink potential - Mid - Accelerate							-86.8
regeneration (1000 tCO2e/y) Carbon sink potential - Mid - All (not							-19,839
counting overlap) (1000 tCO2e/y)							.,,00,
Carbon sink potential - Mid - Avoid							-1,271
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve							-441
plantations (1000 tC02e/y)							-441
Carbon sink potential - Mid - Increase							-4,556
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-626
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-1,144
cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest							-5,156
pasture (1000 tC02e/y)							-5,156
Carbon sink potential - Mid - Restore							-2,556
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							18.9
High - Accelerate regeneration (1000							
hectares)							005
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years)							295
(1000 hectares)							
Land impacted for carbon sink potential -							2,949
High - Extend rotation length (1000							2,, 4,
hectares)							
Land impacted for carbon sink potential -							218
High - Improve plantations (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase retention of HWP (1000							0
hectares)							
Land impacted for carbon sink potential -							88.2
High - Increase trees outside forests							
(1000 hectares)							101
Land impacted for carbon sink potential -							101
High - Reforest cropland (1000 hectares)							272
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							212
Land impacted for carbon sink potential -							1,267
High - Restore productivity (1000							1,201
hectares)							
Land impacted for carbon sink potential -							5,209
High - Total impacted (over 30 years)							0,207
(1000 hectares)							
Land impacted for carbon sink potential -							9.46
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							277
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,130
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							109
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 -							46.4
Low - Increase trees outside forests (1000 hectares)							
Land impacted for carbon sink potential -							50.4
Low - Reforest cropland (1000 hectares)							30.4
Land impacted for carbon sink potential -							47.2
Low - Reforest pasture (1000 hectares)							71.2
Land impacted for carbon sink potential -							767
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,436
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							14.2
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							286
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,039
Mid - Extend rotation length (1000							
hectares)							164
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							104
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							67.3
Mid - Increase trees outside forests (1000							01.3
					1	1	

Table 13: E+	ccanario -	DTII AD 6.	Land cinke	Enracte	(continued)
Table 15. E+	scenurio -	PILLAR D.	LUIIU SIIIKS ·	- Furests i	COHUHUEUT

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							75.6
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							341
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,544
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,532
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		303	256	205	154	97.1	67.4
Natural gas consumption - Cumulative (tcf)		0	0	0	0	0	6,175
Natural gas production - Annual (tcf)		4.04	3.82	3.33	2.81	2.23	1.73
Oil consumption - Annual (million bbls)		123	105	78.9	54.7	35.5	20.6
Oil consumption - Cumulative (million bbls)		0	0	0	0	0	2,449
Oil production - Annual (million bbls)		0.272	0.273	0.273	0.216	0.176	0.117

Table 15: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		678	0.89	0.865	0.635	0.43	0.035
Coal (million 2019\$)							
Monetary damages from air pollution -		231	165	93.7	75.4	30.8	12.1
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,540	1,435	1,091	632	291	118
Transportation (million 2019\$)							
Premature deaths from air pollution -		76.6	0.101	0.098	0.072	0.049	0.004
Coal (deaths)							
Premature deaths from air pollution -		26.1	18.6	10.6	8.51	3.48	1.37
Natural Gas (deaths)							
Premature deaths from air pollution -		173	161	123	71.1	32.7	13.3
Transportation (deaths)							

Table 16: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		446	511	765	539	791	630
By economic sector - Construction (jobs)		4,928	5,282	6,728	7,188	9,183	13,635
By economic sector - Manufacturing		8,493	10,165	13,466	12,832	10,500	13,560
(jobs)							
By economic sector - Mining (jobs)		2,237	1,603	1,043	637	388	238
By economic sector - Other (jobs)		336	393	622	971	1,757	3,311
By economic sector - Pipeline (jobs)		452	517	487	296	258	237
By economic sector - Professional (jobs)		2,680	2,460	3,173	3,387	4,784	6,907
By economic sector - Trade (jobs)		2,315	2,009	2,093	2,174	2,915	4,617
By economic sector - Utilities (jobs)		7,809	7,736	9,463	8,714	7,834	9,365
By education level - All sectors -		9,090	9,483	11,834	11,609	12,123	16,800
Associates degree or some college (jobs)							
By education level - All sectors -		6,373	6,380	7,650	7,345	7,571	10,227
Bachelors degree (jobs)							
By education level - All sectors - Doctoral		185	175	206	205	247	344
degree (jobs)							
By education level - All sectors - High		12,589	13,206	16,436	15,922	16,684	22,696
school diploma or less (jobs)							

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

14510 101 27 000114110 11 11 11010 0050 (00111							
Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Masters		1,460	1,431	1,713	1,658	1,786	2,433
or professional degree (jobs)							
By resource sector - Biomass (jobs)		1,166	1,223	1,948	1,486	2,903	2,752
By resource sector - CO2 (jobs)		13.5	1,134	1,618	735	1,111	1,373
By resource sector - Coal (jobs)		519	20.5	17.8	15.6	14.1	12.5
By resource sector - Grid (jobs)		8,096	8,072	11,427	11,624	12,058	15,882
By resource sector - Natural Gas (jobs)		4,373	3,586	3,247	2,992	1,666	1,554
By resource sector - Nuclear (jobs)		2,514	2,474	2,435	1,914	956	349
By resource sector - Oil (jobs)		5,546	4,342	3,023	1,949	1,189	650
By resource sector - Solar (jobs)		4,257	5,307	8,129	10,534	14,614	25,062
By resource sector - Wind (jobs)		3,212	4,519	5,995	5,488	3,900	4,864
Median wages - Annual - All (\$2019 per		55,958	55,914	55,961	56,362	56,704	56,970
job)		ŕ	,	,	•		•
On-Site or In-Plant Training - Total jobs - 1		4,704	4,882	6,048	5,908	6,169	8,492
to 4 years (jobs)			.	,	•		•
On-Site or In-Plant Training - Total jobs - 4		1,750	1,779	2,182	2,152	2,370	3,310
to 10 years (jobs)		·					
On-Site or In-Plant Training - Total jobs -		4,817	4,982	6,159	6,000	6,318	8,666
None (jobs)		,	.		•	,	•
On-Site or In-Plant Training - Total jobs -		237	247	311	305	323	448
Over 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		18,189	18,786	23,139	22,373	23,231	31,585
Up to 1 year (jobs)					-		
On-the-Job Training - All sectors - 1 to 4		6,004	6,226	7,715	7,545	7,885	10,868
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,653	1,689	2,093	2,083	2,328	3,281
years (jobs)							
On-the-Job Training - All sectors - None		1,614	1,643	1,994	1,944	2,077	2,876
(jobs)							
On-the-Job Training - All sectors - Over 10		301	321	399	389	394	542
years (jobs)							
On-the-Job Training - All sectors - Up to 1		20,125	20,797	25,639	24,778	25,726	34,932
year (jobs)							
Related work experience - All sectors - 1		10,664	10,940	13,433	13,036	13,630	18,607
to 4 years (jobs)							
Related work experience - All sectors - 4		6,833	7,017	8,616	8,377	8,719	11,940
to 10 years (jobs)							
Related work experience - All sectors -		4,244	4,394	5,438	5,279	5,574	7,638
None (jobs)							
Related work experience - All sectors -		1,936	2,007	2,467	2,384	2,396	3,245
Over 10 years (jobs)							
Related work experience - All sectors - Up		6,019	6,318	7,885	7,662	8,093	11,071
to 1 year (jobs)							
Wage income - All (million \$2019)		1,662	1,715	2,118	2,071	2,178	2,991

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	19,401	22,003	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	9.56	21.7	26.9	42.4	66.6	83.3	89.7
Heat Pump (%)							
Sales of space heating units - Electric	4.81	4.61	4.65	4.78	5.23	5.91	6.33
Resistance (%)							
Sales of space heating units - Fossil (%)	0	3.27	3.09	2.34	1.17	0.379	0.099
Sales of space heating units - Gas Furnace	85.6	70.4	65.3	50.5	27	10.4	3.89
(%)							

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	0.155	1.96	7.08	21.8	44.4	59.2	64.3
Heat Pump (%)							
Sales of water heating units - Electric	5.74	6.48	8.39	14.4	23.5	29.5	31.6
Resistance (%)							
Sales of water heating units - Gas Furnace	92.5	90	83	62.2	30.4	9.74	2.53
(%)							
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		4.14	4.18	4.77	4.88	5.83	6.04
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)	171	171	169	166	161	156	153
Final energy use - Industry (PJ)	755	838	889	910	921	912	909
Final energy use - Residential (PJ)	260	244	232	219	204	187	173
Final energy use - Transportation (PJ)	680	628	570	525	490	449	400

Table 20: E- 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	5.17	5.41	0	0	0	0
Sales of cooking units - Electric Resistance (%)	83.1	83.5	85.1	89.2	94.8	98.3	99.6
Sales of cooking units - Gas (%)	16.9	16.5	14.9	10.8	5.17	1.67	0.449
Sales of space heating units - Electric Heat Pump (%)	32.2	41.6	45.3	56	72.3	82.8	86.5
Sales of space heating units - Electric Resistance (%)	31.3	33.1	31	25.2	16.6	11.1	9.21
Sales of space heating units - Fossil (%)	4.13	5	4.74	3.81	2.44	1.57	1.28
Sales of space heating units - Gas (%)	32.4	20.3	18.9	14.9	8.67	4.49	3.04
Sales of water heating units - Electric Heat Pump (%)	0	1.56	6	18.8	38.4	51.1	55.6
Sales of water heating units - Electric Resistance (%)	68.9	78.9	75.9	67	53.3	44.5	41.4
Sales of water heating units - Gas Furnace (%)	27.4	17	15.5	11.7	5.76	1.83	0.477
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.56	2.54	2.54

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	0	180	376	1,271	3,991	5,817
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.165	0	0.677	0	3.48	0	9.69
units)							
Public EV charging plugs - L2 (1000 units)	0.888	0	16.3	0	83.7	0	233
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 (%)	1.56	1.97	2.06	1.64	1.05	0.537	0.23

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - EV (%)	1.89	4.68	11.9	25.9	48.4	72	87.6
Vehicle sales - Light-duty - gasoline (%)	91.7	87.5	79.6	66.7	46.2	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.59	5.39	6.05	5.51	4.13	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC	0.113	0.38	0.326	0.249	0.177	0.098	0.046
(%)							
Vehicle sales - Light-duty - other (%)	0.103	0.106	0.097	0.084	0.061	0.033	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	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

2020	2025	2030	2035	2040	2045	2050
						-274
						-3,357
						-108
						-3,739
						-274
						-1,769
						-54
						-2,097
						•
						112
						1,832
						,
					+	197
						2,14
						_,
						112
						965
						/00
		-		+		98.3
						70.0
		2020 2025	2020 2025 2030	2020 2025 2030 2035	2020 2025 2030 2035 2040	2020 2025 2030 2035 2040 2045

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

	-	•	-				
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate							1,176
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							-116
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-31,364
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,178
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,783
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-591
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,834
retention of HWP (1000 tCO2e/y)							-,
Carbon sink potential - High - Increase							-928
trees outside forests (1000 tCO2e/y)							720
Carbon sink potential - High - Reforest							-1,525
cropland (1000 tCO2e/y)							1,020
Carbon sink potential - High - Reforest							-9,586
•							-9,566
pasture (1000 tC02e/y)							0.000
Carbon sink potential - High - Restore							-3,823
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-57.9
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-8,323
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-363
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,221
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-301
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-2,278
retention of HWP (1000 tCO2e/y)							2,2.0
Carbon sink potential - Low - Increase							-325
trees outside forests (1000 tC02e/y)							020
Carbon sink potential - Low - Reforest							-763
•							-103
cropland (1000 tC02e/y)							70/
Carbon sink potential - Low - Reforest							-726
pasture (1000 tC02e/y)							
Carbon sink potential - Low - Restore							-1,289
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-86.8
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-19,839
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,271
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-4,002
rotation length (1000 tCO2e/y)							•
Carbon sink potential - Mid - Improve							-441
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-4,556
retention of HWP (1000 tCO2e/y)							-4,000
Carbon sink potential - Mid - Increase							-626
trees outside forests (1000 tCO2e/y)							-020
ti 553 00t3i05 i0i 53t3 (1000 t6025/y)							

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

Item Personal Persona	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest							-1,144
cropland (1000 tCO2e/y)							F 1F/
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore							-2,556
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							18.9
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							295
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,949
High - Extend rotation length (1000							
hectares)							010
Land impacted for carbon sink potential -							218
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 -							88.2
High - Increase trees outside forests							00.2
(1000 hectares)							
Land impacted for carbon sink potential -		+					101
High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential -							272
High - Reforest pasture (1000 hectares)							212
Land impacted for carbon sink potential -							1,267
High - Restore productivity (1000							, -
hectares)							
Land impacted for carbon sink potential -							5,209
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							9.46
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							277
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,130
Low - Extend rotation length (1000							
hectares)							100
Land impacted for carbon sink potential -							109
Low - Improve plantations (1000							
hectares)							0
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000							0
hectares)							
Land impacted for carbon sink potential -							46.4
Low - Increase trees outside forests							40.4
(1000 hectares)							
Land impacted for carbon sink potential -							50.4
Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential -							47.2
Low - Reforest pasture (1000 hectares)							71.2
Land impacted for carbon sink potential -							767
Low - Restore productivity (1000							.51
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							2,436
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							14.2
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							286
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,039
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							164
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 -							67.3
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							75.6
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							341
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,544
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,532
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 -		678	0.89	0.865	0.635	0.43	0.035
Coal (million 2019\$)		475	100	, -	40.5	, 50	
Monetary damages from air pollution - Natural Gas (million 2019\$)		175	109	45	18.5	6.58	4.21
Monetary damages from air pollution - Transportation (million 2019\$)		1,565	1,579	1,538	1,387	1,106	761
Premature deaths from air pollution - Coal (deaths)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Natural Gas (deaths)		19.8	12.3	5.08	2.09	0.743	0.475
Premature deaths from air pollution - Transportation (deaths)		176	178	173	156	124	85.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	19,412	22,037	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	9.56	30.6	77.3	90.8	91.9	92	92
Heat Pump (%)							
Sales of space heating units - Electric	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Resistance (%)							
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0

Table 25: <i>E+RE+</i>	scenario -	PTIIAR 1.	Efficiency/	Flectrification -	Commercial	(continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	85.6	62	17.3	2.94	1.48	1.43	1.43
Sales of water heating units - Electric Heat Pump (%)	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Sales of water heating units - Electric Resistance (%)	5.74	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	92.5	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		4.81	4.94	6.83	7.17	5.85	5.99
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)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293

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	5.23	5.68	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	83.2	86.7	97.7	99.9	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Sales of space heating units - Electric	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Heat Pump (%)							
Sales of space heating units - Electric	31.3	29.8	12.5	8.63	8.46	8.57	8.59
Resistance (%)							
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of water heating units - Electric	0	9.08	48.1	56.8	57.1	57.2	57.2
Heat Pump (%)							
Sales of water heating units - Electric	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Resistance (%)							
Sales of water heating units - Gas Furnace	27.4	14.7	2.75	0.116	0	0	0
(%)							
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,105	2,839	4,591	6,958	7,569	7,219
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000 units)	0.165	0	2.15	0	9.36	0	15.1
Public EV charging plugs - L2 (1000 units)	0.888	0	51.7	0	225	0	363
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.55	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.92	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.8	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.42	4.54	3.21	1.19	0.291	0.064	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 30: E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity

14510 001 2 112 1 000114110 1 1227 11 21 010	a =	c, aomona	ing capaci	-,			
Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)	0	0	1.82	5.34	15	16.4	37.2
Capital invested - Wind - Base (billion \$2018)	0	0.069	0.052	0	0	0	0
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Solar - Base land use assumptions (MW)	163	163	1,681	6,524	20,916	37,604	77,802
Installed (cumulative) - Wind - Base land use assumptions (MW)	29	75.6	115	115	115	115	115

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	355	0	2,871	9,024	26,849	31,008	74,393
Solar - Constrained land use assumptions (GWh)	501	0	1,591	8,838	22,244	30,754	59,291
Wind - Base land use assumptions (GWh)	106	139	116	0	0	0	0
Wind - Constrained land use assumptions (GWh)	106	0	0	0	0	0	255

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-274
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,357
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-108
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,739
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-274
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-1,769
deployment - Cropland measures (1000							
tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-54
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,097
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							112
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,832
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							197
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,141
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							112
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							965
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							98.3
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,176
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 regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - All (not counting overlap) (1000 tC02e/y)							-31,364
Carbon sink potential - High - Avoid deforestation (1000 tC02e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)							-57.9
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-8,323
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221

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

Item Conhon sink notantial Law Improve	2020	2025	2030	2035	2040	2045	205
Carbon sink potential - Low - Improve							-30
plantations (1000 tCO2e/y)							0.07
Carbon sink potential - Low - Increase							-2,27
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-32
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-76
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-72
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,28
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-86.
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-19,83
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,27
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-4,00
rotation length (1000 tCO2e/y)							,
Carbon sink potential - Mid - Improve							-44
plantations (1000 tC02e/y)							
Carbon sink potential - Mid - Increase							-4,55
retention of HWP (1000 tCO2e/y)							4,00
Carbon sink potential - Mid - Increase							-62
trees outside forests (1000 tCO2e/y)							02
Carbon sink potential - Mid - Reforest							-1,14
cropland (1000 tCO2e/y)							-1,14
Carbon sink potential - Mid - Reforest							-5,15
pasture (1000 tCO2e/y)							-5,15
Carbon sink potential - Mid - Restore							-2,55
productivity (1000 tCO2e/y)							-2,55
Land impacted for carbon sink potential -							18.
							10.
High - Accelerate regeneration (1000							
hectares)							00
Land impacted for carbon sink potential -							29
High - Avoid deforestation (over 30 years)							
(1000 hectares)							0.07
Land impacted for carbon sink potential -							2,94
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							21
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							88.
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							10
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							27
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,26
High - Restore productivity (1000							.,_0
hectares)							
Land impacted for carbon sink potential -							5,20
High - Total impacted (over 30 years)							5,20
(1000 hectares)							

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

Item 2020 2025 2030 2035 2040 20 Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	045 2050 9.46 277
Low - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - Low - Extend rotation length (1000	277
hectares) Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - Low - Extend rotation length (1000	
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - Low - Extend rotation length (1000	
Low - Avoid deforestation (over 30 years) [1000 hectares] Land impacted for carbon sink potential - Low - Extend rotation length (1000	
(1000 hectares) Land impacted for carbon sink potential - Low - Extend rotation length (1000	1120
Land impacted for carbon sink potential - Low - Extend rotation length (1000	1120
Low - Extend rotation length (1000	1120
= ',	1,130
hectares)	
Land impacted for carbon sink potential -	109
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 -	46.4
Low - Increase trees outside forests	
(1000 hectares)	
Land impacted for carbon sink potential -	50.4
Low - Reforest cropland (1000 hectares)	
Land impacted for carbon sink potential -	47.2
Low - Reforest pasture (1000 hectares)	12
Land impacted for carbon sink potential -	767
Low - Restore productivity (1000	101
hectares)	
Land impacted for carbon sink potential -	2,436
Low - Total impacted (over 30 years)	2,400
(1000 hectares)	
Land impacted for carbon sink potential -	14.2
Mid - Accelerate regeneration (1000	14.2
hectares)	
Land impacted for carbon sink potential -	286
Mid - Avoid deforestation (over 30 years)	200
(1000 hectares)	
	0.000
Land impacted for carbon sink potential -	2,039
Mid - Extend rotation length (1000	
hectares)	1//
Land impacted for carbon sink potential -	164
Mid - Improve plantations (1000 hectares)	
Land impacted for carbon sink potential -	0
Mid - Increase retention of HWP (1000	
hectares)	(7.0
Land impacted for carbon sink potential -	67.3
Mid - Increase trees outside forests (1000	
hectares)	
Land impacted for carbon sink potential -	75.6
Mid - Reforest cropland (1000 hectares)	
Land impacted for carbon sink potential -	341
Mid - Reforest pasture (1000 hectares)	
Land impacted for carbon sink potential -	1,544
Mid - Restore productivity (1000	
hectares)	
Land impacted for carbon sink potential -	4,532
Mid - Total impacted (over 30 years) (1000	
hectares)	

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		678	0.89	0.865	0.635	0.43	0.035

Table 34:	E+RE+ scenario -	· IMPACTS -	Health	l continued l

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Natural Gas (million 2019\$)		188	134	70	43.8	12.3	4.63
Monetary damages from air pollution - Transportation (million 2019\$)		1,540	1,435	1,091	632	291	118
Premature deaths from air pollution - Coal (deaths)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Natural Gas (deaths)		21.2	15.1	7.9	4.95	1.39	0.523
Premature deaths from air pollution - Transportation (deaths)		173	161	123	71.1	32.7	13.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	19,412	22,037	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	9.56	30.6	77.3	90.8	91.9	92	92
Heat Pump (%)							
Sales of space heating units - Electric	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Resistance (%)							
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0
Sales of space heating units - Gas Furnace	85.6	62	17.3	2.94	1.48	1.43	1.43
(%)							
Sales of water heating units - Electric	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Heat Pump (%)							
Sales of water heating units - Electric	5.74	9.97	28	32.1	32.3	32.3	32.3
Resistance (%)							
Sales of water heating units - Gas Furnace	92.5	77.8	14.7	0.62	0	0	0
(%)							
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		4.81	4.94	6.83	7.17	5.85	5.99
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)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293

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	5.23	5.68	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	83.2	86.7	97.7	99.9	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Sales of space heating units - Electric	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Heat Pump (%)							
Sales of space heating units - Electric	31.3	29.8	12.5	8.63	8.46	8.57	8.59
Resistance (%)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of water heating units - Electric	0	9.08	48.1	56.8	57.1	57.2	57.2
Heat Pump (%)							
Sales of water heating units - Electric	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Resistance (%)							
Sales of water heating units - Gas Furnace	27.4	14.7	2.75	0.116	0	0	0
(%)							
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54

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

Table 39: E+RE-Scendrio - PILLAR I: Effici		•	•				
Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,105	2,839	4,591	6,958	7,569	7,219
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.165	0	2.15	0	9.36	0	15.1
units)							
Public EV charging plugs - L2 (1000 units)	0.888	0	51.7	0	225	0	363
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.55	1.81	1.26	0.402	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	3.92	15.2	46.5	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78	48.8	16.5	3.29	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.42	4.54	3.21	1.19	0.291	0.064	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	1.03	1.06	0.107
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	0.233	0.639	1.71	0
Capital invested - Wind - Base (billion \$2018)		0.069	0	0	0.046	0	0
Capital invested - Wind - 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)	1,029	0		0	1,871	2,014	219
Solar - Constrained land use assumptions (GWh)	501	0		401	1,150	3,257	0
Wind - Base land use assumptions (GWh)	106	139		0	116	0	0
Wind - Constrained land use assumptions (GWh)	106	0		0	0	0	0

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

Table 42: E+RE- scenario - PILLAR 6: Land							
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-274
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,357
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-108
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,739
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-274
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-1,769
deployment - Cropland measures (1000							, -
tCO2e/v)							
Carbon sink potential - Moderate							-54
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,097
deployment - Total (1000 tC02e/y)							_, _ , .
Land impacted for carbon sink -							112
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,832
Aggressive deployment - Cropland							.,002
measures (1000 hectares)							
Land impacted for carbon sink -							197
Aggressive deployment - Permanent							171
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,141
Aggressive deployment - Total (1000							2,171
hectares)							
Land impacted for carbon sink - Moderate							112
deployment - Corn-ethanol to energy							112
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							965
deployment - Cropland measures (1000							703
hectares)							
,							98.3
Land impacted for carbon sink - Moderate							98.3
deployment - Permanent conservation							
cover (1000 hectares)							4 47 /
Land impacted for carbon sink - Moderate							1,176
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							-116
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-31,364
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,178
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,783
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-591
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,834
retention of HWP (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 - Increase trees outside forests (1000 tC02e/y)							-928
,							1 505
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)							-57.9
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-8,323
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,22
Carbon sink potential - Low - Improve plantations (1000 tC02e/y)							-30
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest							-726
pasture (1000 tCO2e/y) Carbon sink potential - Low - Restore							-1,28
productivity (1000 tCO2e/y) Carbon sink potential - Mid - Accelerate							-86.
regeneration (1000 tCO2e/y) Carbon sink potential - Mid - All (not							-19,83
counting overlap) (1000 tCO2e/y) Carbon sink potential - Mid - Avoid							-1,27
deforestation (1000 tCO2e/y) Carbon sink potential - Mid - Extend							-4,00
rotation length (1000 tCO2e/y) Carbon sink potential - Mid - Improve							-44
plantations (1000 tCO2e/y) Carbon sink potential - Mid - Increase							-4,55
retention of HWP (1000 tCO2e/y) Carbon sink potential - Mid - Increase							-62
trees outside forests (1000 tCO2e/y) Carbon sink potential - Mid - Reforest							-1,14
cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest							-5,15
pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore							-2,55
productivity (1000 tCO2e/y) Land impacted for carbon sink potential -							18.
High - Accelerate regeneration (1000 nectares)							10.
Land impacted for carbon sink potential -							29
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential - High - Extend rotation length (1000							2,94
hectares) Land impacted for carbon sink potential -							21
High - Improve plantations (1000 hectares)							

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

Item Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050
High - Increase retention of HWP (1000							·
hectares)							
Land impacted for carbon sink potential -							88.2
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							101
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							272
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,267
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,209
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							9.46
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							277
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,130
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							109
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							C
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							46.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							50.4
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							47.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							767
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,436
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							14.2
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							286
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,039
Mid - Extend rotation length (1000							•
hectares)							
Land impacted for carbon sink potential -		 					164
Mid - Improve plantations (1000 hectares)							.5-
Land impacted for carbon sink potential -		-					(
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							67.3
Mid - Increase trees outside forests (1000							01.3
The Thoreago troop outside for esta (1000)							

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 -							75.6
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							341
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,544
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,532
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 -		678	0.89	0.865	0.635	0.43	0.035
Coal (million 2019\$)							
Monetary damages from air pollution -		214	151	156	120	41.1	13.4
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,540	1,435	1,091	632	291	118
Transportation (million 2019\$)							
Premature deaths from air pollution -		76.6	0.101	0.098	0.072	0.049	0.004
Coal (deaths)							
Premature deaths from air pollution -		24.1	17	17.6	13.5	4.64	1.51
Natural Gas (deaths)							
Premature deaths from air pollution -		173	161	123	71.1	32.7	13.3
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 -	0	19,401	22,003	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	9.56	21.7	26.9	42.4	66.6	83.3	89.7
Heat Pump (%)							
Sales of space heating units - Electric	4.81	4.61	4.65	4.78	5.23	5.91	6.33
Resistance (%)							
Sales of space heating units - Fossil (%)	0	3.27	3.09	2.34	1.17	0.379	0.099
Sales of space heating units - Gas Furnace	85.6	70.4	65.3	50.5	27	10.4	3.89
(%)							
Sales of water heating units - Electric	0.155	1.96	7.08	21.8	44.4	59.2	64.3
Heat Pump (%)							
Sales of water heating units - Electric	5.74	6.48	8.39	14.4	23.5	29.5	31.6
Resistance (%)							
Sales of water heating units - Gas Furnace	92.5	90	83	62.2	30.4	9.74	2.53
(%)							
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		4.14	4.18	4.77	4.88	5.83	6.04
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	171	171	169	166	161	156	153

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	755	838	889	910	921	912	909
Final energy use - Residential (PJ)	260	244	232	219	204	187	173
Final energy use - Transportation (PJ)	680	628	570	525	490	449	400

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	5.17	5.41	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	83.1	83.5	85.1	89.2	94.8	98.3	99.6
Resistance (%)							
Sales of cooking units - Gas (%)	16.9	16.5	14.9	10.8	5.17	1.67	0.449
Sales of space heating units - Electric	32.2	41.6	45.3	56	72.3	82.8	86.5
Heat Pump (%)							
Sales of space heating units - Electric	31.3	33.1	31	25.2	16.6	11.1	9.21
Resistance (%)							
Sales of space heating units - Fossil (%)	4.13	5	4.74	3.81	2.44	1.57	1.28
Sales of space heating units - Gas (%)	32.4	20.3	18.9	14.9	8.67	4.49	3.04
Sales of water heating units - Electric	0	1.56	6	18.8	38.4	51.1	55.6
Heat Pump (%)							
Sales of water heating units - Electric	68.9	78.9	75.9	67	53.3	44.5	41.4
Resistance (%)							
Sales of water heating units - Gas Furnace	27.4	17	15.5	11.7	5.76	1.83	0.477
(%)							
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.56	2.54	2.54

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	180	376	1,271	3,991	5,817
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.165	0	0.677	0	3.48	0	9.69
units)							
Public EV charging plugs - L2 (1000 units)	0.888	0	16.3	0	83.7	0	233
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 (%)	1.56	1.97	2.06	1.64	1.05	0.537	0.23
Vehicle sales - Light-duty - EV (%)	1.89	4.68	11.9	25.9	48.4	72	87.6
Vehicle sales - Light-duty - gasoline (%)	91.7	87.5	79.6	66.7	46.2	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.59	5.39	6.05	5.51	4.13	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC	0.113	0.38	0.326	0.249	0.177	0.098	0.046
(%)							
Vehicle sales - Light-duty - other (%)	0.103	0.106	0.097	0.084	0.061	0.033	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0.046	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	2.97	0.004	6.62	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	45.5	45.5	45.5	45.5
Biomass w/ccu power plant (GWh)	0	0	3,332	3,337	10,762	10,762	10,762

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	214	575	1,886	2,174	2,174
Conversion capital investment -	0	0	2,724	4,018	15,288	3,181	0
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	1	1	1	1
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	4	15	18	18
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	2	3	9	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	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.3	8.41	27.6	31.7	31.7
Annual - BECCS (MMT)		0	3.3	8.41	27.6	31.7	31.7
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0.01
Cumulative - All (MMT)		0	3.3	11.7	39.3	71	103
Cumulative - BECCS (MMT)		0	3.3	11.7	39.3	71	103
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0.01

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	499	1,390	2,745	2,186	2,944
Cumulative investment - All (million \$2018)		0	1,603	3,872	6,641	6,309	6,854
Cumulative investment - Spur (million \$2018)		0	310	1,287	2,763	2,431	2,976
Cumulative investment - Trunk (million \$2018)		0	1,293	2,585	3,878	3,878	3,878
Spur (km)		0	318	1,029	2,203	1,644	2,401
Trunk (km)		0	181	362	543	543	543

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

		•					
Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0.92	3.21	7.13	9.85	10
Injection wells (wells)		0	2	7	12	20	24
Resource characterization, appraisal, permitting costs (million \$2020)		25.4	112	173	173	173	173
Wells and facilities construction costs (million \$2020)		0	50.8	198	353	590	732

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

Item	2020	2025	2030	2035	2040	2045	205
Carbon sink potential - Aggressive							-65
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,10
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Aggressive							
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Aggressive							-97.
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,85
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-65
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-1,63
deployment - Cropland measures (1000							•
tCO2e/y)							
Carbon sink potential - Moderate							
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Moderate							
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Moderate							-48
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,33
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink -							29
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							4,11
Aggressive deployment - Cropland							•
measures (1000 hectares)							
Land impacted for carbon sink -							11
Aggressive deployment - Cropland to							
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							44
Aggressive deployment - Pasture to							
energy crops (1000 hectares)							
Land impacted for carbon sink -		+					17
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -		+					5,13
Aggressive deployment - Total (1000							0,10
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							292
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							877
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							110
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							442
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							89
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,810
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-116
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-31,364
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,178
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,783
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-591
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,834
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-928
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,525
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-9,586
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-3,823
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-57.9
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-8,323
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-363
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,221
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-301
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-2,278
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-325
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-763
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-726
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,289
productivity (1000 tCO2e/y)							

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

Item On the state of the state	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate							-86.8
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-19,839
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,271
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-4,002
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-441
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-4,556
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-626
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,144
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-5,156
pasture (1000 tCO2e/y)							•
Carbon sink potential - Mid - Restore							-2,556
productivity (1000 tCO2e/y)							,
Land impacted for carbon sink potential -							18.9
High - Accelerate regeneration (1000							.0.,
hectares)							
Land impacted for carbon sink potential -							295
High - Avoid deforestation (over 30 years)							270
(1000 hectares)							
Land impacted for carbon sink potential -							2,949
High - Extend rotation length (1000							2,949
hectares)							010
Land impacted for carbon sink potential -							218
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 -							88.2
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							101
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							272
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,267
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,209
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							9.46
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							277
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,130
Low - Extend rotation length (1000							1,130
hectares)							
							109
Land impacted for carbon sink potential -							109
Low - Improve plantations (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							46.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							50.4
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							47.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							767
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,436
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							14.2
Mid - Accelerate regeneration (1000							
hectares							
Land impacted for carbon sink potential -							286
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,039
Mid - Extend rotation length (1000							_,00,
hectares)							
Land impacted for carbon sink potential -							164
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 -							67.3
Mid - Increase trees outside forests (1000							01.0
hectares)							
Land impacted for carbon sink potential -							75.6
Mid - Reforest cropland (1000 hectares)							10.0
Land impacted for carbon sink potential -							341
Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential -							1,544
Mid - Restore productivity (1000							1,044
hectares)							
Land impacted for carbon sink potential -							4,532
Mid - Total impacted (over 30 years) (1000							4,002
hectares)							
Herral col							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		678	0.89	0.865	0.635	0.43	0.035
Coal (million 2019\$)							
Monetary damages from air pollution -		200	118	59.1	37.9	19.1	8.1
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,565	1,579	1,538	1,387	1,106	761
Transportation (million 2019\$)							
Premature deaths from air pollution -		76.6	0.101	0.098	0.072	0.049	0.004
Coal (deaths)							
Premature deaths from air pollution -		22.6	13.3	6.67	4.27	2.16	0.915
Natural Gas (deaths)							
Premature deaths from air pollution -		176	178	173	156	124	85.5
Transportation (deaths)							

Table 59: REF 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	19,056	19,846	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	45.6	45.9	45.7	46	45.9	45.7
Sales of cooking units - Gas (%)	56.5	54.4	54.1	54.3	54	54.1	54.3
Sales of space heating units - Electric Heat Pump (%)	9.56	27.5	56.9	76.1	79	79.4	79.4
Sales of space heating units - Electric Resistance (%)	4.81	5.67	10	15.4	18.7	19.2	19.2
Sales of space heating units - Fossil (%)	0	2.93	1.3	0.192	0.019	0	0
Sales of space heating units - Gas Furnace (%)	85.6	63.9	31.8	8.33	2.28	1.48	1.43
Sales of water heating units - Electric Heat Pump (%)	0.155	0.153	0.147	0.149	0.149	0.146	0.148
Sales of water heating units - Electric Resistance (%)	5.74	5.75	5.58	5.66	5.62	5.56	5.61
Sales of water heating units - Gas Furnace (%)	92.5	92.5	92.7	92.6	92.7	92.7	92.7
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		4.86	5	5.95	6.18	5.74	5.89
Odmalativo o yi (billion 42010)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	171	174	176	176	177	181	190
Final energy use - Industry (PJ)	755	847	903	938	959	961	976
Final energy use - Residential (PJ)	260	244	236	230	227	228	229
Final energy use - Transportation (PJ)	680	628	576	545	545	562	584

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	5.15	4.97	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	82.9	82.9	82.9	82.9	82.9	82.9	82.9
Resistance (%)							
Sales of cooking units - Gas (%)	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Sales of space heating units - Electric	30.6	53.8	54.6	55.9	57.2	58.9	61.6
Heat Pump (%)							
Sales of space heating units - Electric	32	27.2	26.7	25.9	24.9	23.3	20.6
Resistance (%)							
Sales of space heating units - Fossil (%)	4.21	3.29	3.32	3.27	3.22	3.18	3.2
Sales of space heating units - Gas (%)	33.2	15.8	15.4	14.9	14.7	14.6	14.6
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	68.9	80	80.1	80	79.9	79.9	79.9
Resistance (%)							
Sales of water heating units - Gas Furnace	27.4	17.5	17.3	17.5	17.6	17.5	17.6
(%)							
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.57	2.56	2.57

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC	0.119	0.138	0.16	0.186	0.216	0.25	0.29
(%)							
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.55	1.97	2.18	2.03	1.83	1.71	1.62
Vehicle sales - Light-duty - EV (%)	3.56	5.6	6.38	7.84	9.55	11.1	12.2
Vehicle sales - Light-duty - gasoline (%)	90.2	86.7	84.5	82.7	80.6	78.7	77.1
Vehicle sales - Light-duty - hybrid (%)	4.44	5.28	6.47	7.04	7.6	8.18	8.63
Vehicle sales - Light-duty - hydrogen FC	0.111	0.377	0.346	0.307	0.304	0.305	0.315
(%)							
Vehicle sales - Light-duty - other (%)	0.102	0.106	0.102	0.103	0.102	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							-116
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-31,364
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,178
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-5,783
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-591
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,834
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-928
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,525
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-9,586
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-3,823
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-57.9
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-8,323
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-363
deforestation (1000 tC02e/y)							
Carbon sink potential - Low - Extend							-2,221
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-301
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-2,278
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-325
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-763
cropland (1000 tCO2e/y)							

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

Item Corporation Low Referent	2020	2025	2030	2035	2040	2045	205
Carbon sink potential - Low - Reforest							-72
pasture (1000 tC02e/y)							100
Carbon sink potential - Low - Restore							-1,28
productivity (1000 tC02e/y)							
Carbon sink potential - Mid - Accelerate							-86.
regeneration (1000 tC02e/y)							10.00
Carbon sink potential - Mid - All (not							-19,83
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,27
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-4,00
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-44
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-4,55
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-62
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,14
cropland (1000 tCO2e/y)							,
Carbon sink potential - Mid - Reforest							-5,15
pasture (1000 tC02e/y)							-,
Carbon sink potential - Mid - Restore						+	-2,55
productivity (1000 tC02e/y)							2,00
Land impacted for carbon sink potential -						+	18.
High - Accelerate regeneration (1000							10.
hectares)							
Land impacted for carbon sink potential -							29
							29
High - Avoid deforestation (over 30 years)							
(1000 hectares)						+	0.07
Land impacted for carbon sink potential -							2,94
High - Extend rotation length (1000							
hectares)							01
Land impacted for carbon sink potential -							21
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							88.
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							10
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							27
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,26
High - Restore productivity (1000							•
hectares)							
Land impacted for carbon sink potential -							5,20
High - Total impacted (over 30 years)							-,
(1000 hectares)							
Land impacted for carbon sink potential -							9.4
Low - Accelerate regeneration (1000							7.4
hectares)							
Land impacted for carbon sink potential -					+		27
							21
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,13
Low - Extend rotation length (1000							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							109
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 -							46.4
Low - Increase trees outside forests							
(1000 hectares)							FO /
Land impacted for carbon sink potential -							50.4
Low - Reforest cropland (1000 hectares)							/70
Land impacted for carbon sink potential -							47.2
Low - Reforest pasture (1000 hectares) Land impacted for carbon sink potential -							767
Low - Restore productivity (1000							101
hectares)							
Land impacted for carbon sink potential -							2,436
Low - Total impacted (over 30 years)							2,430
(1000 hectares)							
Land impacted for carbon sink potential -							14.2
Mid - Accelerate regeneration (1000							14.2
hectares)							
Land impacted for carbon sink potential -							286
Mid - Avoid deforestation (over 30 years)							200
(1000 hectares)							
Land impacted for carbon sink potential -							2,039
Mid - Extend rotation length (1000							,
hectares)							
Land impacted for carbon sink potential -							164
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 -							67.3
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							75.6
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							341
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,544
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,532
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-8.29		-10.7				-8.71
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.86		-3.1				-3.26
Business-as-usual carbon sink - Total (Mt CO2e/y)	-10.1		-13.8				-12

Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		2,413	1,652	1,307	1,127	1,062	1,052
Monetary damages from air pollution - Natural Gas (million 2019\$)		191	205	222	261	220	209
Monetary damages from air pollution - Transportation (million 2019\$)		1,564	1,601	1,639	1,685	1,732	1,780
Premature deaths from air pollution - Coal (deaths)		273	187	148	127	120	119
Premature deaths from air pollution - Natural Gas (deaths)		21.5	23.2	25.1	29.4	24.8	23.6
Premature deaths from air pollution - Transportation (deaths)		176	180	184	190	195	200