

Net-Zero America - georgia state report

2021-03-05

These data underlie graphs and tables presented in the Princeton Net-Zero America study:

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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 - Cumulative 5-yr (million \$2018)	0	34,949	38,935	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	7.3	27.4	70.6	84	85.3	85.4	85.4
Sales of space heating units - Electric Resistance (%)	6.68	8.23	10.2	12.3	12.7	12.7	12.7
Sales of space heating units - Fossil (%)	0	3.85	0.732	0.031	0	0	0
Sales of space heating units - Gas Furnace (%)	86	60.5	18.4	3.67	2	1.95	1.94
Sales of water heating units - Electric Heat Pump (%)	0.221	10.5	54.6	64.4	64.8	64.8	64.8
Sales of water heating units - Electric Resistance (%)	5.5	10.9	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	92.1	74.6	14.1	0.594	0	0	0
Sales of water heating units - Other (%)	2.13	3.93	2.95	2.7	2.71	2.7	2.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		7.03	7.31	10.9	11.6	9.14	9.44
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)	252	253	245	233	223	221	224
Final energy use - Industry (PJ)	420	427	428	425	426	427	431
Final energy use - Residential (PJ)	362	344	319	286	259	244	240
Final energy use - Transportation (PJ)	1,057	990	878	740	614	535	499

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	8.06	8.87	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	66.9	74	95.5	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	33.1	26	4.45	0.224	0	0	0
Sales of space heating units - Electric	25.4	45	81.3	89.4	89.8	89.7	89.7
Heat Pump (%)							
Sales of space heating units - Electric	18.4	19.7	8.27	5.67	5.52	5.61	5.63
Resistance (%)							
Sales of space heating units - Fossil (%)	4.42	5.56	2.13	1.36	1.33	1.31	1.31
Sales of space heating units - Gas (%)	51.8	29.7	8.3	3.54	3.35	3.36	3.35
Sales of water heating units - Electric	0	11.6	61.4	72.5	73	72.9	72.9
Heat Pump (%)							
Sales of water heating units - Electric	47.2	57.2	31	25.2	24.9	24.9	24.9
Resistance (%)							
Sales of water heating units - Gas Furnace	50	29.1	5.49	0.232	0	0	0
(%)							
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.11	2.12	2.14	2.15

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,609	4,204	6,681	10,172	11,015	10,532
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.376	0	3.15	0	12.8	0	20.6
units)							
Public EV charging plugs - L2 (1000 units)	2.43	0	75.7	0	308	0	494
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 (%)	1.47	1.74	1.22	0.391	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.2	16.1	47.7	82.3	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.4	77	47.5	16	3.22	0.588	0
Vehicle sales - Light-duty - hybrid (%)	4.69	4.74	3.31	1.22	0.298	0.066	0
Vehicle sales - Light-duty - hydrogen FC	0.11	0.335	0.196	0.061	0.012	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.098	0.094	0.06	0.021	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	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	0.034	0	0	0.013
power plant (billion \$2018)							
Capital invested - Biomass w/ccu power	0	0	0	0.007	6.93	0.666	0.001
plant (billion \$2018)							
Capital invested - Solar PV - Base (billion	0	0	6.5	23.3	14.7	31.2	25.3
\$2018)							
Capital invested - Solar PV - Constrained	0	1.41	10.8	26.5	21	26.4	28.1
(billion \$2018)							
Installed (cumulative) - OffshoreWind -	0	0	0	0	0	0	0
Base land use assumptions (MW)							
Installed (cumulative) - Rooftop PV (MW)	381	614	869	1,237	1,756	2,428	3,288
Installed (cumulative) - Solar - Base land	1,091	1,091	6,520	27,608	41,703	73,542	100,827
use assumptions (MW)							
Installed (cumulative) - Wind - Base land	0	0	0	0	0	0	5,361
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	33.7	33.7	33.7	47
Biomass w/ccu power plant (GWh)	0	0	0	8.06	7,781	8,528	8,529
Solar - Base land use assumptions (GWh)	2,538	0	10,709	41,457	27,660	62,310	53,596
Solar - Constrained land use assumptions (GWh)	2,371	0	10,193	27,292	42,821	55,930	49,132

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Table 8: <i>E+</i>	SCEHUITO -	PILLAK 5.	GIEUH	TUEIS -	BIUEIIEI'UV

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	18.6	628	1,015	1,134
Conversion capital investment -	0	0	0	408	13,059	7,815	2,416
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	1	1	1	2
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	1	6	14	16
(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	0	1	6	7	8
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	1	1	1	2
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0.55	18.4	25.9	31.9
Annual - BECCS (MMT)		0	0	0.47	16.5	25.8	28.8
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0.08	1.93	0.05	3.05
Cumulative - All (MMT)		0	0	0.55	19	44.8	76.7
Cumulative - BECCS (MMT)		0	0	0.47	17	42.8	71.6
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0.08	2.01	2.06	5.11

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	570	1,282	2,064	3,105	3,550
Cumulative investment - All (million \$2018)		0	2,891	5,025	5,797	6,725	7,046
Cumulative investment - Spur (million \$2018)		0	0	206	978	1,906	2,226
Cumulative investment - Trunk (million \$2018)		0	2,891	4,819	4,819	4,819	4,819
Spur (km)		0	0	376	1,159	2,199	2,645
Trunk (km)		0	570	906	906	906	906

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	5.28	7.23	12.1	16.8
Injection wells (wells)		0	4	18	30	52	66
Resource characterization, appraisal,		101	277	379	379	379	379
permitting costs (million \$2020)							
Wells and facilities construction costs		0	135	528	941	1,573	1,953
(million \$2020)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-66
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-3,806
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-67.7
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,940
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-66
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,975
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-33.9
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,075
deployment - Total (1000 tC02e/y)							•
Land impacted for carbon sink -							38.6
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,609
Aggressive deployment - Cropland							,
measures (1000 hectares)							
Land impacted for carbon sink -							123
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							1,771
Aggressive deployment - Total (1000							.,
hectares)							
Land impacted for carbon sink - Moderate							38.6
deployment - Corn-ethanol to energy							00.0
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							835
deployment - Cropland measures (1000							000
hectares)							
Land impacted for carbon sink - Moderate							61.6
deployment - Permanent conservation							01.0
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							935
deployment - Total (1000 hectares)							/50

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-781
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-61,940
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,764
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-12,001
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6,449
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-25,469
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,000
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,887
cropland (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest							-5,666
pasture (1000 tC02e/y)							
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,922
Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)							-391
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-20,952
Carbon sink potential - Low - Avoid							-461
deforestation (1000 tCO2e/y) Carbon sink potential - Low - Extend							-4,610
rotation length (1000 tCO2e/y) Carbon sink potential - Low - Improve							-3,281
plantations (1000 tCO2e/y) Carbon sink potential - Low - Increase							-8,490
retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Increase							-350
trees outside forests (1000 tC02e/y) Carbon sink potential - Low - Reforest							-944
cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest							-429
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,996
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-586
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-41,389
Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y)							-1,612
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,306
Carbon sink potential - Mid - Improve							-4,808
plantations (1000 tCO2e/y) Carbon sink potential - Mid - Increase							-16,980
retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase							-675
trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest							-1,415
cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest							-3,047
pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore							-3,959
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential - High - Accelerate regeneration (1000							128
hectares) Land impacted for carbon sink potential -							374
High - Avoid deforestation (over 30 years) (1000 hectares)							
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,120
Land impacted for carbon sink potential - High - Improve plantations (1000							2,376
hectares) Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000 hectares)							

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

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Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							95
High - Increase trees outside forests							
(1000 hectares)							405
Land impacted for carbon sink potential -							125
High - Reforest cropland (1000 hectares)							4.4
Land impacted for carbon sink potential -							161
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,963
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							11,342
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							63.9
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							351
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,345
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,188
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 -							50
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							62.4
Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential -							27.9
Low - Reforest pasture (1000 hectares)							2117
Land impacted for carbon sink potential -							1,188
Low - Restore productivity (1000							1,100
hectares)							
Land impacted for carbon sink potential -							5,276
Low - Total impacted (over 30 years)							3,210
(1000 hectares)							
Land impacted for carbon sink potential -							95.8
							90.0
Mid - Accelerate regeneration (1000							
hectares)							0/0
Land impacted for carbon sink potential -							363
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							/ 000
Land impacted for carbon sink potential -							4,232
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,788
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 -							72.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							93.6
Mid - Reforest cropland (1000 hectares)	I						93.0

Table 13: F+ scenario	- PTI LAR 6: Land sink	s - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,392
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,239

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		572	482	387	291	183	127
Natural gas consumption - Cumulative		0	0	0	0	0	11,650
(tcf)							
Natural gas production - Annual (tcf)		0	0	0	0	0	0
Oil consumption - Annual (million bbls)		162	137	101	67.5	41.5	21.7
Oil consumption - Cumulative (million		0	0	0	0	0	3,127
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0

Table 15: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		458	0.839	0.761	0.535	0.353	0.029
Coal (million 2019\$)							
Monetary damages from air pollution -		310	291	175	133	67.2	25.4
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		3,449	3,336	2,621	1,565	731	289
Transportation (million 2019\$)							
Premature deaths from air pollution -		51.7	0.095	0.086	0.06	0.04	0.003
Coal (deaths)							
Premature deaths from air pollution -		35	32.8	19.8	15	7.59	2.87
Natural Gas (deaths)							
Premature deaths from air pollution -		388	375	295	176	82.2	32.5
Transportation (deaths)							

Table 16: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		518	841	481	1,473	1,714	1,546
By economic sector - Construction (jobs)		8,017	13,649	25,968	24,743	36,486	43,167
By economic sector - Manufacturing		13,877	25,461	25,847	21,005	24,522	20,768
(jobs)							
By economic sector - Mining (jobs)		3,112	2,251	1,494	912	602	360
By economic sector - Other (jobs)		579	1,616	4,570	4,627	8,156	10,212
By economic sector - Pipeline (jobs)		733	929	757	444	412	396
By economic sector - Professional (jobs)		4,605	6,026	10,432	11,691	17,726	21,767
By economic sector - Trade (jobs)		3,315	4,064	7,122	7,274	11,466	14,462
By economic sector - Utilities (jobs)		12,277	14,692	19,695	20,934	26,102	31,429
By education level - All sectors -		14,596	21,930	30,902	29,700	40,706	46,413
Associates degree or some college (jobs)							
By education level - All sectors -		10,049	14,015	18,743	18,146	24,630	27,889
Bachelors degree (jobs)							
By education level - All sectors - Doctoral		295	385	582	602	869	1,026
degree (jobs)							
By education level - All sectors - High		19,782	30,088	41,798	40,316	54,974	61,812
school diploma or less (jobs)							
By education level - All sectors - Masters		2,309	3,112	4,341	4,339	6,007	6,967
or professional degree (jobs)							

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

14210 101 = 1000114110 21 11 11010 0020 (00							
Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Biomass (jobs)		1,824	2,220	1,246	4,360	6,262	6,637
By resource sector - CO2 (jobs)		54.7	2,697	2,528	1,044	1,978	2,463
By resource sector - Coal (jobs)		1,328	0	0	0	0	0
By resource sector - Grid (jobs)		13,098	16,979	28,948	32,373	45,105	57,917
By resource sector - Natural Gas (jobs)		7,360	6,976	5,694	6,745	4,317	3,553
By resource sector - Nuclear (jobs)		3,150	3,100	2,705	2,175	1,690	605
By resource sector - Oil (jobs)		7,190	5,570	3,788	2,362	1,358	666
By resource sector - Solar (jobs)		12,993	31,052	50,735	41,815	60,787	64,464
By resource sector - Wind (jobs)		33.8	933	720	2,229	5,690	7,803
Median wages - Annual - All (\$2019 per		56,677	55,664	55,966	57,160	57,723	58,897
job)							
On-Site or In-Plant Training - Total jobs - 1		7,516	11,176	15,784	15,180	20,750	23,661
to 4 years (jobs)							
On-Site or In-Plant Training - Total jobs - 4		2,807	4,041	6,176	6,059	8,443	9,921
to 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		7,660	11,410	15,790	15,238	20,886	23,555
None (jobs)							
On-Site or In-Plant Training - Total jobs -		381	570	824	802	1,102	1,275
Over 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		28,669	42,332	57,791	55,824	76,006	85,696
Up to 1 year (jobs)							
On-the-Job Training - All sectors - 1 to 4		9,621	14,270	20,250	19,483	26,638	30,450
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		2,670	3,893	6,097	6,004	8,423	9,951
years (jobs)							
On-the-Job Training - All sectors - None		2,524	3,690	5,212	5,023	6,978	7,930
(jobs)							
On-the-Job Training - All sectors - Over 10		478	755	1,028	943	1,275	1,393
years (jobs)							
On-the-Job Training - All sectors - Up to 1		31,738	46,921	63,779	61,649	83,873	94,384
year (jobs)							
Related work experience - All sectors - 1		16,928	24,699	34,161	33,101	45,188	51,334
to 4 years (jobs)							
Related work experience - All sectors - 4		10,896	15,900	22,109	21,297	29,042	33,061
to 10 years (jobs)							
Related work experience - All sectors -		6,707	9,946	13,923	13,558	18,587	21,169
None (jobs)							
Related work experience - All sectors -		3,075	4,541	6,069	5,750	7,728	8,636
Over 10 years (jobs)			4,	00.10.	10.55=		
Related work experience - All sectors - Up		9,425	14,443	20,104	19,397	26,641	29,908
to 1 year (jobs)			0.000			72.2	
Wage income - All (million \$2019)		2,666	3,870	5,394	5,322	7,343	8,489

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	34,927	38,922	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	36.2	40.9	53.4	71	81.7	85.5
Resistance (%)							
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric	7.3	19.2	24.1	38.5	61	76.9	83
Heat Pump (%)							
Sales of space heating units - Electric	6.68	7.92	8.16	8.87	10.2	11.6	12.4
Resistance (%)							
Sales of space heating units - Fossil (%)	0	4.46	4.13	3.1	1.52	0.487	0.128
Sales of space heating units - Gas Furnace	86	68.4	63.6	49.6	27.2	11	4.45
(%)							
Sales of water heating units - Electric	0.221	2.04	7.05	21.5	43.6	58	63
Heat Pump (%)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric	5.5	7.53	9.45	15.2	24	29.8	31.8
Resistance (%)							
Sales of water heating units - Gas Furnace	92.1	86.3	79.4	59.6	29.1	9.31	2.42
(%)							
Sales of water heating units - Other (%)	2.13	4.12	4.13	3.73	3.23	2.87	2.75

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		5.72	5.83	7.6	7.92	9.61	10.1
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)	252	254	251	248	242	237	235
Final energy use - Industry (PJ)	420	427	430	431	435	436	439
Final energy use - Residential (PJ)	362	345	337	326	309	288	268
Final energy use - Transportation (PJ)	1,059	999	916	848	794	730	654

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	7.98	8.75	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	66.8	67.7	70.7	78.7	89.9	96.7	99.1
Resistance (%)							
Sales of cooking units - Gas (%)	33.2	32.3	29.3	21.3	10.1	3.27	0.881
Sales of space heating units - Electric	25.4	38	42.2	54.2	72.4	84.2	88.3
Heat Pump (%)							
Sales of space heating units - Electric	18.4	21.9	20.5	16.6	10.8	7.24	5.98
Resistance (%)							
Sales of space heating units - Fossil (%)	4.42	6.22	5.88	4.75	3	1.86	1.47
Sales of space heating units - Gas (%)	51.8	33.9	31.4	24.5	13.8	6.68	4.21
Sales of water heating units - Electric	0	1.99	7.66	24	49	65.3	70.9
Heat Pump (%)							
Sales of water heating units - Electric	47.2	62.3	59.3	50.6	37.5	28.9	26
Resistance (%)							
Sales of water heating units - Gas Furnace	50	33.6	30.9	23.3	11.4	3.65	0.952
(%)							
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.12	2.13	2.14	2.15

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	0	274	545	1,871	5,792	8,472
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.376	0	1.11	0	4.86	0	13.2
units)							
Public EV charging plugs - L2 (1000 units)	2.43	0	26.7	0	117	0	316
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 (%)	1.48	1.9	2.04	1.62	1.03	0.527	0.226
Vehicle sales - Light-duty - EV (%)	1.99	4.9	12.3	26.6	49.1	72.5	87.8
Vehicle sales - Light-duty - gasoline (%)	91.5	87.1	78.9	65.8	45.4	24.3	10.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hybrid (%)	4.87	5.66	6.33	5.72	4.25	2.48	1.2
Vehicle sales - Light-duty - hydrogen FC	0.112	0.378	0.321	0.243	0.172	0.095	0.044
(%)							
Vehicle sales - Light-duty - other (%)	0.099	0.103	0.093	0.081	0.058	0.032	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-66
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,806
deployment - Cropland measures (1000							
tC02e/y)							
Carbon sink potential - Aggressive							-67.7
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,940
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-66
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,975
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-33.9
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,075
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink -							38.6
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,609
Aggressive deployment - Cropland							,
measures (1000 hectares)							
Land impacted for carbon sink -						+	123
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							1,771
Aggressive deployment - Total (1000							.,
hectares)							
Land impacted for carbon sink - Moderate							38.6
deployment - Corn-ethanol to energy							00.0
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							835
deployment - Cropland measures (1000							000
hectares)							
Land impacted for carbon sink - Moderate							61.6
deployment - Permanent conservation							01.0
cover (1000 hectares)							
							005
Land impacted for carbon sink - Moderate							935
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							-781
regeneration (1000 tC02e/y)							
Carbon sink potential - High - All (not							-61,940
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,764
deforestation (1000 tCO2e/y)							10.001
Carbon sink potential - High - Extend							-12,001
rotation length (1000 tC02e/y) Carbon sink potential - High - Improve							/ / / 0
plantations (1000 tCO2e/y)							-6,449
Carbon sink potential - High - Increase							-25,469
retention of HWP (1000 tCO2e/y)							-23,469
Carbon sink potential - High - Increase							-1,000
trees outside forests (1000 tC02e/y)							-1,000
Carbon sink potential - High - Reforest							-1,887
cropland (1000 tCO2e/y)							-1,001
Carbon sink potential - High - Reforest							-5,666
pasture (1000 tCO2e/y)							0,000
Carbon sink potential - High - Restore							-5,922
productivity (1000 tCO2e/y)							-7
Carbon sink potential - Low - Accelerate							-391
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-20,952
counting overlap) (1000 tCO2e/y)							•
Carbon sink potential - Low - Avoid							-461
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-4,610
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3,281
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-8,490
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-350
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-944
cropland (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-429
pasture (1000 tC02e/y)							1.007
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,996
Carbon sink potential - Mid - Accelerate							-586
regeneration (1000 tCO2e/y)							-300
Carbon sink potential - Mid - All (not							-41,389
counting overlap) (1000 tC02e/y)							-41,507
Carbon sink potential - Mid - Avoid							-1,612
deforestation (1000 tC02e/y)							1,012
Carbon sink potential - Mid - Extend							-8,306
rotation length (1000 tCO2e/y)							0,000
Carbon sink potential - Mid - Improve							-4,808
plantations (1000 tC02e/y)							•
Carbon sink potential - Mid - Increase							-16,980
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-675
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,415
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-3,047
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-3,959
productivity (1000 tCO2e/y)							

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

Table 23: E- scenario - PILLAR 6: Land sink		·		000=	00/0	001-	00
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							128
High - Accelerate regeneration (1000							
hectares) Land impacted for carbon sink potential -							374
High - Avoid deforestation (over 30 years)							314
(1000 hectares)							
Land impacted for carbon sink potential -						+	6,120
High - Extend rotation length (1000							0,120
hectares)							
Land impacted for carbon sink potential -							2,376
High - Improve plantations (1000							2,010
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							95
High - Increase trees outside forests							70
(1000 hectares)							
Land impacted for carbon sink potential -							125
High - Reforest cropland (1000 hectares)							120
Land impacted for carbon sink potential -							161
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,963
High - Restore productivity (1000							1,700
hectares)							
Land impacted for carbon sink potential -							11,342
High - Total impacted (over 30 years)							,-
(1000 hectares)							
Land impacted for carbon sink potential -							63.9
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							351
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,345
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,188
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 -							50
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							62.4
Low - Reforest cropland (1000 hectares)							070
Land impacted for carbon sink potential -							27.9
Low - Reforest pasture (1000 hectares)							1100
Land impacted for carbon sink potential -							1,188
Low - Restore productivity (1000							
hectares)						+	E 07/
Land impacted for carbon sink potential -							5,276
Low - Total impacted (over 30 years)							
(1000 hectares)							05.0
Land impacted for carbon sink potential -							95.8
Mid - Accelerate regeneration (1000							
hectares)							

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

363
4,232
1,788
0
72.5
93.6
202
2,392
9,239
2

Table 24: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		458	0.839	0.761	0.535	0.353	0.029
Coal (million 2019\$)							
Monetary damages from air pollution -		308	210	87.8	29.9	9.22	5.25
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		3,513	3,692	3,720	3,460	2,838	1,999
Transportation (million 2019\$)							
Premature deaths from air pollution -		51.7	0.095	0.086	0.06	0.04	0.003
Coal (deaths)							
Premature deaths from air pollution -		34.8	23.7	9.91	3.38	1.04	0.593
Natural Gas (deaths)							
Premature deaths from air pollution -		395	415	418	389	319	225
Transportation (deaths)							

 ${\it Table 25: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial}$

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	34,949	38,935	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric	7.3	27.4	70.6	84	85.3	85.4	85.4
Heat Pump (%)							
Sales of space heating units - Electric	6.68	8.23	10.2	12.3	12.7	12.7	12.7
Resistance (%)							
Sales of space heating units - Fossil (%)	0	3.85	0.732	0.031	0	0	0
Sales of space heating units - Gas Furnace	86	60.5	18.4	3.67	2	1.95	1.94
(%)							
Sales of water heating units - Electric	0.221	10.5	54.6	64.4	64.8	64.8	64.8
Heat Pump (%)							
Sales of water heating units - Electric	5.5	10.9	28.4	32.3	32.5	32.5	32.5
Resistance (%)							

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

·	•	•		•	•		
Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	92.1	74.6	14.1	0.594	0	0	0
Sales of water heating units - Other (%)	2.13	3.93	2.95	2.7	2.71	2.7	2.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		7.03	7.31	10.9	11.6	9.14	9.44
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)	252	253	245	233	223	221	224
Final energy use - Industry (PJ)	420	427	428	425	426	427	431
Final energy use - Residential (PJ)	362	344	319	286	259	244	240
Final energy use - Transportation (PJ)	1,057	990	878	740	614	535	499

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	8.06	8.87	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	66.9	74	95.5	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	33.1	26	4.45	0.224	0	0	0
Sales of space heating units - Electric	25.4	45	81.3	89.4	89.8	89.7	89.7
Heat Pump (%)							
Sales of space heating units - Electric	18.4	19.7	8.27	5.67	5.52	5.61	5.63
Resistance (%)							
Sales of space heating units - Fossil (%)	4.42	5.56	2.13	1.36	1.33	1.31	1.31
Sales of space heating units - Gas (%)	51.8	29.7	8.3	3.54	3.35	3.36	3.35
Sales of water heating units - Electric	0	11.6	61.4	72.5	73	72.9	72.9
Heat Pump (%)							
Sales of water heating units - Electric	47.2	57.2	31	25.2	24.9	24.9	24.9
Resistance (%)							
Sales of water heating units - Gas Furnace	50	29.1	5.49	0.232	0	0	0
(%)							
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.11	2.12	2.14	2.15

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,609	4,204	6,681	10,172	11,015	10,532
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.376	0	3.15	0	12.8	0	20.6
units)							
Public EV charging plugs - L2 (1000 units)	2.43	0	75.7	0	308	0	494
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 (%)	1.47	1.74	1.22	0.391	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.2	16.1	47.7	82.3	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.4	77	47.5	16	3.22	0.588	0
Vehicle sales - Light-duty - hybrid (%)	4.69	4.74	3.31	1.22	0.298	0.066	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC	0.11	0.335	0.196	0.061	0.012	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.098	0.094	0.06	0.021	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion \$2018)	0	0	0	0	0	0.214	18.5
Capital invested - Solar PV - Base (billion \$2018)	0	0.849	8.24	44	39.1	25.6	31.1
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	145	14,875
Installed (cumulative) - Solar - Base land use assumptions (MW)	1,091	1,725	8,604	48,495	86,109	112,241	145,859
Installed (cumulative) - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	0	0	0	0	514	52,411
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	51,557
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	2,538	1,249	13,510	78,330	73,909	51,434	66,150
Solar - Constrained land use assumptions (GWh)	2,538	3,247	29,534	65,148	69,596	69,056	66,359

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

Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to denergy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Total (1000 tC02e/y)	Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y)	deployment - Corn-ethanol to energy							-66
deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y)	· · · · · · · · · · · · · · · · · ·							-3 806
tCO2e/y) Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)								-3,000
deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate -2,075								
cover (1000 tC02e/y) Carbon sink potential - Aggressive deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y)	Carbon sink potential - Aggressive							-67.7
Carbon sink potential - Aggressive deployment - Total (1000 tC02e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y)	deployment - Permanent conservation							
deployment - Total (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate	cover (1000 tCO2e/y)							
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate -2,075								-3,940
deployment - Corn-ethanol to energy grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate -2,075	deployment - Total (1000 tCO2e/y)							
grasses (1000 tC02e/y) Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate -2,075	Carbon sink potential - Moderate							-66
Carbon sink potential - Moderate deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate -2,075	deployment - Corn-ethanol to energy							
deployment - Cropland measures (1000 tC02e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate -2,075								
tCO2e/y) Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y) Carbon sink potential - Moderate -2,075	Carbon sink potential - Moderate							-1,975
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate -2,075	deployment - Cropland measures (1000							
deployment - Permanent conservation cover (1000 tC02e/y) Carbon sink potential - Moderate -2,075	tCO2e/y)							
cover (1000 tC02e/y) Carbon sink potential - Moderate -2,075								-33.9
Carbon sink potential - Moderate -2,075	• •							
	cover (1000 tCO2e/y)							
deployment - Total (1000 tCO2e/y)	·							-2,075
	deployment - Total (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							38.6
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,609
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							123
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							1,771
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							38.6
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							835
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							61.6
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							935
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							-781
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-61,940
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,764
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-12,001
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6,449
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-25,469
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,000
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,887
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-5,666
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-5,922
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-391
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-20,952
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-461
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-4,610
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3,281
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-8,490
retention of HWP (1000 tCO2e/y)							•
Carbon sink potential - Low - Increase							-350
trees outside forests (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	205
Carbon sink potential - Low - Reforest							-94
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-42
pasture (1000 tC02e/y)							100
Carbon sink potential - Low - Restore							-1,99
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-58
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-41,38
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,61
deforestation (1000 tC02e/y)							
Carbon sink potential - Mid - Extend							-8,30
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-4,80
plantations (1000 tCO2e/y)							1/ 00
Carbon sink potential - Mid - Increase							-16,98
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-67
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,41
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-3,04
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-3,95
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							12
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							37
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							6,12
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2,37
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
nectares)							
Land impacted for carbon sink potential -							9
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							12
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							16
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,96
High - Restore productivity (1000							
nectares)							
Land impacted for carbon sink potential -							11,34
High - Total impacted (over 30 years)							•
(1000 hectares)							
and impacted for carbon sink potential -							63
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							35
Low - Avoid deforestation (over 30 years)							30
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -	2020	2023	2000	2000	2040	2043	2,345
Low - Extend rotation length (1000							2,040
hectares)							
Land impacted for carbon sink potential -						+	1,188
Low - Improve plantations (1000							1,100
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							50
Low - Increase trees outside forests							00
(1000 hectares)							
Land impacted for carbon sink potential -							62.4
Low - Reforest cropland (1000 hectares)							02
Land impacted for carbon sink potential -							27.9
Low - Reforest pasture (1000 hectares)							2,
Land impacted for carbon sink potential -							1,188
Low - Restore productivity (1000							1,100
hectares)							
Land impacted for carbon sink potential -							5,276
Low - Total impacted (over 30 years)							0,2.10
(1000 hectares)							
Land impacted for carbon sink potential -							95.8
Mid - Accelerate regeneration (1000							70.0
hectares)							
Land impacted for carbon sink potential -							363
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,232
Mid - Extend rotation length (1000							, -
hectares)							
Land impacted for carbon sink potential -							1,788
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 -							72.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							93.6
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							202
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,392
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,239
Mid - Total impacted (over 30 years) (1000							
hectares)							
Mid - Restore productivity (1000 hectares) Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		458	0.839	0.761	0.535	0.353	0.029
Coal (million 2019\$)							
Monetary damages from air pollution -		329	278	138	81.3	18.7	6.69
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		3,449	3,336	2,621	1,565	731	289
Transportation (million 2019\$)							
Premature deaths from air pollution -		51.7	0.095	0.086	0.06	0.04	0.003
Coal (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		37.1	31.4	15.5	9.18	2.11	0.755
Natural Gas (deaths)							
Premature deaths from air pollution -		388	375	295	176	82.2	32.5
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	34,949	38,935	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric	7.3	27.4	70.6	84	85.3	85.4	85.4
Heat Pump (%)							
Sales of space heating units - Electric	6.68	8.23	10.2	12.3	12.7	12.7	12.7
Resistance (%)							
Sales of space heating units - Fossil (%)	0	3.85	0.732	0.031	0	0	0
Sales of space heating units - Gas Furnace	86	60.5	18.4	3.67	2	1.95	1.94
_ (%)							
Sales of water heating units - Electric	0.221	10.5	54.6	64.4	64.8	64.8	64.8
Heat Pump (%)							
Sales of water heating units - Electric	5.5	10.9	28.4	32.3	32.5	32.5	32.5
Resistance (%)							
Sales of water heating units - Gas Furnace	92.1	74.6	14.1	0.594	0	0	0
Sales of water heating units - Other (%)	2.13	3.93	2.95	2.7	2.71	2.7	2.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		7.03	7.31	10.9	11.6	9.14	9.44
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)	252	253	245	233	223	221	224
Final energy use - Industry (PJ)	420	427	428	425	426	427	431
Final energy use - Residential (PJ)	362	344	319	286	259	244	240
Final energy use - Transportation (PJ)	1,057	990	878	740	614	535	499

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	8.06	8.87	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	66.9	74	95.5	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	33.1	26	4.45	0.224	0	0	0
Sales of space heating units - Electric	25.4	45	81.3	89.4	89.8	89.7	89.7
Heat Pump (%)							
Sales of space heating units - Electric	18.4	19.7	8.27	5.67	5.52	5.61	5.63
Resistance (%)							
Sales of space heating units - Fossil (%)	4.42	5.56	2.13	1.36	1.33	1.31	1.31
Sales of space heating units - Gas (%)	51.8	29.7	8.3	3.54	3.35	3.36	3.35
Sales of water heating units - Electric	0	11.6	61.4	72.5	73	72.9	72.9
Heat Pump (%)							
Sales of water heating units - Electric	47.2	57.2	31	25.2	24.9	24.9	24.9
Resistance (%)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	50	29.1	5.49	0.232	0	0	0
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.11	2.12	2.14	2.15

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,609	4,204	6,681	10,172	11,015	10,532
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.376	0	3.15	0	12.8	0	20.6
units)							
Public EV charging plugs - L2 (1000 units)	2.43	0	75.7	0	308	0	494
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 (%)	1.47	1.74	1.22	0.391	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.2	16.1	47.7	82.3	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.4	77	47.5	16	3.22	0.588	0
Vehicle sales - Light-duty - hybrid (%)	4.69	4.74	3.31	1.22	0.298	0.066	0
Vehicle sales - Light-duty - hydrogen FC	0.11	0.335	0.196	0.061	0.012	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.098	0.094	0.06	0.021	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	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)		0.592	1.02	4.63	8.35	15	1.17
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	7.72	9.68	11.9	0.605

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,538	872	1,690	8,238	15,763	30,094	2,482
Solar - Constrained land use assumptions	2,538	0	0	13,732	18,280	23,667	1,279
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-66
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,806
deployment - Cropland measures (1000							
tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-67.7
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,940
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Moderate							-66
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,975
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-33.9
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,075
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							38.6
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,609
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							123
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							1,771
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							38.6
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							835
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							61.6
deployment - Permanent conservation							2
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							935
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							-781
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-61,940
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,764
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-12,001
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6,449
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-25,469
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,000
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,887
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-5,666
pasture (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Restore							-5,922
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-39
regeneration (1000 tCO2e/y)							00.05
Carbon sink potential - Low - All (not							-20,952
counting overlap) (1000 tC02e/y)							
Carbon sink potential - Low - Avoid							-46
deforestation (1000 tC02e/y)							
Carbon sink potential - Low - Extend							-4,610
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3,28
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-8,490
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-350
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-944
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-429
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,996
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-586
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-41,389
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,61
deforestation (1000 tC02e/y)							
Carbon sink potential - Mid - Extend							-8,306
rotation length (1000 tCO2e/y)							·
Carbon sink potential - Mid - Improve							-4,808
plantations (1000 tCO2e/y)							,
Carbon sink potential - Mid - Increase							-16,980
retention of HWP (1000 tCO2e/y)							,.
Carbon sink potential - Mid - Increase							-675
trees outside forests (1000 tC02e/y)							0.1
Carbon sink potential - Mid - Reforest							-1,415
cropland (1000 tCO2e/y)							1,-110
Carbon sink potential - Mid - Reforest							-3,04
pasture (1000 tC02e/y)							-3,04
Carbon sink potential - Mid - Restore							-3,95
productivity (1000 tCO2e/y)							-3,73
Land impacted for carbon sink potential -							128
High - Accelerate regeneration (1000							120
hectares)							07
Land impacted for carbon sink potential -							37
High - Avoid deforestation (over 30 years)							
(1000 hectares)							(10
Land impacted for carbon sink potential -							6,12
High - Extend rotation length (1000							
hectares)							0.07
Land impacted for carbon sink potential -							2,37
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							9
High - Increase trees outside forests							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							125
High - Reforest cropland (1000 hectares)							1/1
Land impacted for carbon sink potential -							161
High - Reforest pasture (1000 hectares)							10/3
Land impacted for carbon sink potential - High - Restore productivity (1000							1,963
hectares) Land impacted for carbon sink potential -							11,342
,							11,342
High - Total impacted (over 30 years) (1000 hectares)							
,							63.9
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000							03.9
hectares)							
Land impacted for carbon sink potential -							351
Low - Avoid deforestation (over 30 years)							331
(1000 hectares)							
Land impacted for carbon sink potential -							2,345
Low - Extend rotation length (1000							2,343
hectares)							
Land impacted for carbon sink potential -							1,188
Low - Improve plantations (1000							1,100
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							50
Low - Increase trees outside forests							30
(1000 hectares)							
Land impacted for carbon sink potential -							62.4
Low - Reforest cropland (1000 hectares)							02.4
Land impacted for carbon sink potential -							27.9
Low - Reforest pasture (1000 hectares)							21.7
Land impacted for carbon sink potential -							1,188
Low - Restore productivity (1000							1,100
hectares)							
Land impacted for carbon sink potential -							5,276
Low - Total impacted (over 30 years)							0,210
(1000 hectares)							
Land impacted for carbon sink potential -		+					95.8
Mid - Accelerate regeneration (1000							70.0
hectares)							
Land impacted for carbon sink potential -							363
Mid - Avoid deforestation (over 30 years)							000
(1000 hectares)							
Land impacted for carbon sink potential -							4,232
Mid - Extend rotation length (1000							.,
hectares)							
Land impacted for carbon sink potential -							1,788
Mid - Improve plantations (1000 hectares)							.,. 0 0
Land impacted for carbon sink potential -							С
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							72.5
Mid - Increase trees outside forests (1000							12.0
hectares)							
Land impacted for carbon sink potential -		-					93.6
Mid - Reforest cropland (1000 hectares)							75.0
Land impacted for carbon sink potential -							202
Mid - Reforest pasture (1000 hectares)							202
MID - RETOREST DASTURE LIUUU hectarest						[

Table 43: E+RE- scenario - PILLAR 6: Land sinks	Forests	(continued)
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		•					
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							2,392
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,239
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 -		458	0.839	0.761	0.535	0.353	0.029
Coal (million 2019\$)							
Monetary damages from air pollution -		315	293	303	240	81.5	25.1
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		3,449	3,336	2,621	1,565	731	289
Transportation (million 2019\$)							
Premature deaths from air pollution -		51.7	0.095	0.086	0.06	0.04	0.003
Coal (deaths)							
Premature deaths from air pollution -		35.5	33.1	34.3	27	9.2	2.83
Natural Gas (deaths)							
Premature deaths from air pollution -		388	375	295	176	82.2	32.5
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)	0	34,927	38,922	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	7.3	19.2	24.1	38.5	61	76.9	83
Sales of space heating units - Electric Resistance (%)	6.68	7.92	8.16	8.87	10.2	11.6	12.4
Sales of space heating units - Fossil (%)	0	4.46	4.13	3.1	1.52	0.487	0.128
Sales of space heating units - Gas Furnace (%)	86	68.4	63.6	49.6	27.2	11	4.45
Sales of water heating units - Electric Heat Pump (%)	0.221	2.04	7.05	21.5	43.6	58	63
Sales of water heating units - Electric Resistance (%)	5.5	7.53	9.45	15.2	24	29.8	31.8
Sales of water heating units - Gas Furnace (%)	92.1	86.3	79.4	59.6	29.1	9.31	2.42
Sales of water heating units - Other (%)	2.13	4.12	4.13	3.73	3.23	2.87	2.75

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		5.72	5.83	7.6	7.92	9.61	10.1
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)	252	254	251	248	242	237	235
Final energy use - Industry (PJ)	420	427	430	431	435	436	439
Final energy use - Residential (PJ)	362	345	337	326	309	288	268
Final energy use - Transportation (PJ)	1,059	999	916	848	794	730	654

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)	0	7.98	8.75	0	0	0	0
Sales of cooking units - Electric Resistance (%)	66.8	67.7	70.7	78.7	89.9	96.7	99.1
Sales of cooking units - Gas (%)	33.2	32.3	29.3	21.3	10.1	3.27	0.881
Sales of space heating units - Electric Heat Pump (%)	25.4	38	42.2	54.2	72.4	84.2	88.3
Sales of space heating units - Electric Resistance (%)	18.4	21.9	20.5	16.6	10.8	7.24	5.98
Sales of space heating units - Fossil (%)	4.42	6.22	5.88	4.75	3	1.86	1.47
Sales of space heating units - Gas (%)	51.8	33.9	31.4	24.5	13.8	6.68	4.21
Sales of water heating units - Electric Heat Pump (%)	0	1.99	7.66	24	49	65.3	70.9
Sales of water heating units - Electric Resistance (%)	47.2	62.3	59.3	50.6	37.5	28.9	26
Sales of water heating units - Gas Furnace (%)	50	33.6	30.9	23.3	11.4	3.65	0.952
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.12	2.13	2.14	2.15

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	274	545	1,871	5,792	8,472
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.376	0	1.11	0	4.86	0	13.2
units)							
Public EV charging plugs - L2 (1000 units)	2.43	0	26.7	0	117	0	316
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 (%)	1.48	1.9	2.04	1.62	1.03	0.527	0.226
Vehicle sales - Light-duty - EV (%)	1.99	4.9	12.3	26.6	49.1	72.5	87.8
Vehicle sales - Light-duty - gasoline (%)	91.5	87.1	78.9	65.8	45.4	24.3	10.8
Vehicle sales - Light-duty - hybrid (%)	4.87	5.66	6.33	5.72	4.25	2.48	1.2
Vehicle sales - Light-duty - hydrogen FC	0.112	0.378	0.321	0.243	0.172	0.095	0.044
(%)							
Vehicle sales - Light-duty - other (%)	0.099	0.103	0.093	0.081	0.058	0.032	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

	,		0 , ,				
Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant	0	0	0	0	0	0	0
(billion \$2018)							
Capital invested - Biomass w/ccu allam	0	0	0	0	0	0	0
power plant (billion \$2018)							
Capital invested - Biomass w/ccu power	0	0	0	20.6	13.5	0	0
plant (billion \$2018)							

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

	•						
Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	23,083	38,180	38,180	38,180

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	1,341	2,217	2,884	2,939
Conversion capital investment -	0	0	0	18,864	12,338	8,109	678
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	9	10
(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	18	30	30	30
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
		•	•	•			

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	22.9	37.8	48.2	48.1
Annual - BECCS (MMT)		0	0	22.8	37.8	48.2	48.1
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0.07	0.05	0.05	0.04
Cumulative - All (MMT)		0	0	22.9	60.7	109	157
Cumulative - BECCS (MMT)		0	0	22.8	60.6	109	157
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0.07	0.12	0.17	0.21

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	570	2,000	2,851	3,430	4,050
Cumulative investment - All (million \$2018)		0	2,891	6,153	7,284	8,156	8,572
Cumulative investment - Spur (million \$2018)		0	0	1,333	2,272	3,144	3,560
Cumulative investment - Trunk (million \$2018)		0	2,891	4,819	5,012	5,012	5,012
Spur (km)		0	0	1,095	1,945	2,525	3,144
Trunk (km)		0	570	906	906	906	906

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

	0000	2005	0000	0005	00/0	0015	0050
Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	6.42	11.9	15.8	16.7
Injection wells (wells)		0	4	18	32	54	68
Resource characterization, appraisal,		101	292	404	404	404	404
permitting costs (million \$2020)							
Wells and facilities construction costs		0	141	548	976	1,633	2,027
(million \$2020)							

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

Item Conhon sink notantial Aggressive	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy							-306
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,445
deployment - Cropland measures (1000							-5,445
tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							
crops (1000 tC02e/y)							
Carbon sink potential - Aggressive							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Aggressive							-58.6
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,810
deployment - Total (1000 tC02e/y)							007
Carbon sink potential - Moderate							-306
deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,784
deployment - Cropland measures (1000							-1,104
tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy							Ū
crops (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Moderate							-29.3
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,120
deployment - Total (1000 tCO2e/y)							404
Land impacted for carbon sink -							191
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares) Land impacted for carbon sink -							3,605
Aggressive deployment - Cropland							3,003
measures (1000 hectares)							
Land impacted for carbon sink -							85.3
Aggressive deployment - Cropland to							00.0
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							147
Aggressive deployment - Pasture to							
energy crops (1000 hectares)							
Land impacted for carbon sink -							107
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							4,135
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							191
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							7-7
Land impacted for carbon sink - Moderate							757
deployment - Cropland measures (1000 hectares)							
Land impacted for carbon sink - Moderate							85.3
deployment - Cropland to woody energy							00.0
appropriate or opinite to woody click gy							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							147
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							53.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,233

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-78
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-61,940
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,76
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-12,00
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6,44
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-25,46
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,00
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,88
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-5,66
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-5,92
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-39
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-20,95
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-46
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-4,61
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3,28
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-8,49
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-35
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-94
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-42
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,99
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-58
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-41,38
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,61
deforestation (1000 tCO2e/y)							-
Carbon sink potential - Mid - Extend							-8,30
rotation length (1000 tCO2e/y)							•

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

Item Carbon sink potential - Mid - Improve	2020	2025	2030	2035	2040	2045	2050 -4,808
plantations (1000 tCO2e/y)							-4,000
Carbon sink potential - Mid - Increase						+	-16,980
retention of HWP (1000 tCO2e/y)							-10,700
Carbon sink potential - Mid - Increase							-675
trees outside forests (1000 tCO2e/y)							-013
							1 / 1 Γ
Carbon sink potential - Mid - Reforest							-1,415
cropland (1000 tCO2e/y)							0.07
Carbon sink potential - Mid - Reforest							-3,047
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-3,959
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							128
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							374
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							6,120
High - Extend rotation length (1000							0,.20
hectares)							
Land impacted for carbon sink potential -						-	2,376
High - Improve plantations (1000							2,310
= ' ' ' '							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							95
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							125
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							161
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,963
High - Restore productivity (1000							1,700
hectares)							
Land impacted for carbon sink potential -						+	11,342
							11,542
High - Total impacted (over 30 years)							
(1000 hectares)							/00
Land impacted for carbon sink potential -							63.9
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							351
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,345
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,188
Low - Improve plantations (1000							,
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							50
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							62.4
Low - Reforest cropland (1000 hectares)		1	1				

Table 57: E-B+	. cronaria -	DTIIAP 6.	Land einke	- Forests	Continued
1 auit 31. E-D+	· SCEHUITO -	PILLAK O.	LUIIU SIIIKS	- คบายธเธา	CUITLITIUEUT

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							27.9
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,188
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,276
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							95.8
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							363
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,232
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,788
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 -							72.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							93.6
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							202
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,392
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,239
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

The second secon	0000	0005	0000	0005	0010	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		458	0.839	0.761	0.535	0.353	0.029
Coal (million 2019\$)							
Monetary damages from air pollution -		352	215	97.2	59	29.9	12.2
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		3,513	3,692	3,720	3,460	2,838	1,999
Transportation (million 2019\$)							
Premature deaths from air pollution -		51.7	0.095	0.086	0.06	0.04	0.003
Coal (deaths)							
Premature deaths from air pollution -		39.8	24.3	11	6.66	3.37	1.38
Natural Gas (deaths)							
Premature deaths from air pollution -		395	415	418	389	319	225
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	34,430	35,753	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	32	34.3	34.3	34.3	34.4	34.3	34.3
Resistance (%)							
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7

Table CO. DCC assessia	DILLAD 1. Efficiency /Floorwiff continue	0
Table 59: REE Scenorio	- PTLLAR 1 [,] Efficiency/Flectrification -	Commerciai I continuea i

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	7.3	29.1	63.5	71.8	72.4	72.4	72.4
Heat Pump (%)							
Sales of space heating units - Electric	6.68	9.42	14.6	20.2	24.8	25.6	25.6
Resistance (%)							
Sales of space heating units - Fossil (%)	0	4.09	2.54	1.21	0.181	0.016	0
Sales of space heating units - Gas Furnace	86	57.4	19.3	6.83	2.61	2	1.94
(%)							
Sales of water heating units - Electric	0.221	0.279	0.274	0.275	0.276	0.274	0.275
Heat Pump (%)							
Sales of water heating units - Electric	5.5	6.83	6.74	6.75	6.78	6.74	6.75
Resistance (%)							
Sales of water heating units - Gas Furnace	92.1	88.7	88.7	88.7	88.7	88.7	88.7
(%)							
Sales of water heating units - Other (%)	2.13	4.16	4.3	4.23	4.29	4.32	4.3

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)		7.5	7.83	10.5	11.1	9.45	9.79

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	252	257	260	262	266	276	290
Final energy use - Industry (PJ)	420	441	459	477	500	522	549
Final energy use - Residential (PJ)	362	345	342	342	347	357	368
Final energy use - Transportation (PJ)	1,058	1,005	938	900	906	935	973

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	7.85	7.66	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	66.5	66.5	66.5	66.5	66.5	66.5	66.5
Resistance (%)							
Sales of cooking units - Gas (%)	33.5	33.5	33.5	33.5	33.5	33.5	33.5
Sales of space heating units - Electric	23.1	53.2	54.3	56	57.1	58.3	60.1
Heat Pump (%)							
Sales of space heating units - Electric	19	17.4	17.2	16.5	15.9	14.8	12.9
Resistance (%)							
Sales of space heating units - Fossil (%)	4.53	3.7	3.73	3.74	3.7	3.7	3.74
Sales of space heating units - Gas (%)	53.4	25.6	24.8	23.8	23.3	23.2	23.3
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	47.2	63.3	63.3	63.2	63.1	63	63
Resistance (%)							
Sales of water heating units - Gas Furnace	50	34.6	34.6	34.7	34.8	34.8	34.9
(%)							
Sales of water heating units - Other (%)	2.84	2.09	2.1	2.12	2.13	2.15	2.16

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

2020	2025	2030	2035	2040	2045	2050
98.1	98.2	97.9	97	95.6	93.5	91.6
0	0	0	0	0	0	0
0.229	0.242	0.257	0.274	0.294	0.317	0.343
0.083	0.096	0.112	0.13	0.15	0.174	0.202
0.119	0.138	0.16	0.186	0.216	0.25	0.29
	98.1 0 0.229 0.083	98.1 98.2 0 0 0.229 0.242 0.083 0.096	98.1 98.2 97.9 0 0 0 0.229 0.242 0.257 0.083 0.096 0.112	98.1 98.2 97.9 97 0 0 0 0 0.229 0.242 0.257 0.274 0.083 0.096 0.112 0.13	98.1 98.2 97.9 97 95.6 0 0 0 0 0 0.229 0.242 0.257 0.274 0.294 0.083 0.096 0.112 0.13 0.15	98.1 98.2 97.9 97 95.6 93.5 0 0 0 0 0 0 0.229 0.242 0.257 0.274 0.294 0.317 0.083 0.096 0.112 0.13 0.15 0.174

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.47	1.9	2.17	2.02	1.82	1.69	1.61
Vehicle sales - Light-duty - EV (%)	3.84	5.96	6.76	8.33	10.1	11.6	12.8
Vehicle sales - Light-duty - gasoline (%)	89.8	86.1	83.9	81.9	79.8	77.9	76.3
Vehicle sales - Light-duty - hybrid (%)	4.71	5.54	6.77	7.33	7.87	8.41	8.81
Vehicle sales - Light-duty - hydrogen FC	0.11	0.374	0.341	0.302	0.298	0.298	0.308
(%)							
Vehicle sales - Light-duty - other (%)	0.098	0.102	0.098	0.099	0.098	0.097	0.099
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							-78
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-61,94
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,76
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-12,00
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6,44
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-25,46
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,00
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-1,88
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-5,66
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-5,92
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-39
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-20,95
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-46
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-4,61
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3,28
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-8,49
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-35
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-94
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-42
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,99
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-58
regeneration (1000 tCO2e/y)							

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

Item Carbon sink potential - Mid - All (not	2020	2025	2030	2035	2040	2045	2050 -41,389
counting overlap) (1000 tCO2e/y)							-41,385
							1 /10
Carbon sink potential - Mid - Avoid							-1,612
deforestation (1000 tC02e/y)							0.00
Carbon sink potential - Mid - Extend							-8,306
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-4,808
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-16,980
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-675
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-1,415
cropland (1000 tC02e/y)							-
Carbon sink potential - Mid - Reforest							-3,04
pasture (1000 tC02e/y)							0,0 1
Carbon sink potential - Mid - Restore							-3,959
productivity (1000 tC02e/y)							-0,70
Land impacted for carbon sink potential -							128
·							120
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							374
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							6,120
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2,37
High - Improve plantations (1000							, -
hectares)							
Land impacted for carbon sink potential -							(
High - Increase retention of HWP (1000							`
hectares)							
Land impacted for carbon sink potential -						-	95
High - Increase trees outside forests							/(
(1000 hectares)							101
Land impacted for carbon sink potential -							125
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							16
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,96
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							11,342
High - Total impacted (over 30 years)							, -
(1000 hectares)							
Land impacted for carbon sink potential -							63.9
Low - Accelerate regeneration (1000							03.
hectares)							
							0.5
Land impacted for carbon sink potential -							35
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,34
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,18
Low - Improve plantations (1000							, -
hectares)							
Land impacted for carbon sink potential -							
Low - Increase retention of HWP (1000							,
hectares)	[

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Table 64'	RFF scenario	- PILLAR 6: I	' and sinks -	Forests I	continuedi

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							50
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							62.4
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							27.9
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,188
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,276
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							95.8
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							363
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,232
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,788
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 -							72.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							93.6
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							202
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,392
Mid - Restore productivity (1000							,-
hectares)							
Land impacted for carbon sink potential -							9,239
Mid - Total impacted (over 30 years) (1000							,
hectares)							

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

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Item	2020	2025	2030	2035	2040	2045	2050	
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-11.1		-19				-15.4	
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-6.93		-11.6				-12.2	
Business-as-usual carbon sink - Total (Mt CO2e/y)	-18		-30.5				-27.5	

Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		1,958	1,331	1,080	977	935	926
Monetary damages from air pollution - Natural Gas (million 2019\$)		306	381	400	439	483	526
Monetary damages from air pollution - Transportation (million 2019\$)		3,505	3,734	3,959	4,203	4,447	4,695

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Coal (deaths)		221	150	122	110	106	105
Premature deaths from air pollution - Natural Gas (deaths)		34.5	43	45.1	49.6	54.5	59.4
Premature deaths from air pollution - Transportation (deaths)		394	420	445	473	500	528