

Net-Zero America - oregon 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 -	0	13,358	14,518	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Sales of space heating units - Electric	2.5	16.7	41.2	54.8	56.6	56.7	56.7
Heat Pump (%)							
Sales of space heating units - Electric	16.7	17.5	36.3	42	42.6	42.6	42.6
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	80.8	65.8	22.5	3.25	0.79	0.695	0.695
(%)							
Sales of water heating units - Electric	1	10.3	52.2	64.9	66	66	66
Heat Pump (%)							
Sales of water heating units - Electric	3.08	6.46	25	32.5	33.3	33.3	33.3
Resistance (%)							
Sales of water heating units - Gas Furnace	95.1	82.6	22.2	1.99	0.085	0	0
(%)							
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.38	2.48	3.93	4.2	3.62	3.78
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)	93.8	95	93.3	89	85.5	84.8	85.9
Final energy use - Industry (PJ)	209	215	214	219	226	230	236
Final energy use - Residential (PJ)	151	140	123	104	88.4	78.3	72.2
Final energy use - Transportation (PJ)	334	313	278	236	197	173	163

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	2.54	2.66	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	65.6	73	95.4	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	34.4	27	4.63	0.233	0	0	0
Sales of space heating units - Electric	12.4	24.5	48.3	57.6	58.8	58.8	58.7
Heat Pump (%)							
Sales of space heating units - Electric	31	37.4	34.1	31.4	31	31.2	31.3
Resistance (%)							
Sales of space heating units - Fossil (%)	8.35	13.5	10.5	9.63	9.42	9.21	9.21
Sales of space heating units - Gas (%)	48.3	24.7	7.17	1.4	0.846	0.812	0.816
Sales of water heating units - Electric	0	7.68	41.4	51	51.8	51.8	51.8
Heat Pump (%)							
Sales of water heating units - Electric	40.2	54.8	44.8	43.1	43.1	43.1	43.1
Resistance (%)							
Sales of water heating units - Gas Furnace	53.4	32.3	8.69	0.78	0.033	0	0
(%)							
Sales of water heating units - Other (%)	6.41	5.3	5.09	5.09	5.1	5.11	5.12

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	737	1,953	3,062	4,679	5,048	4,837
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.347	0	1.51	0	5.84	0	9.31
units)							
Public EV charging plugs - L2 (1000 units)	1.3	0	36.3	0	141	0	224
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 (%)	1.62	1.88	1.29	0.412	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.67	14.4	45.3	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.3	78.9	50	17	3.35	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.18	4.37	3.13	1.17	0.284	0.062	0
Vehicle sales - Light-duty - hydrogen FC	0.111	0.344	0.209	0.065	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.105	0.101	0.067	0.023	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Offshore Wind - Base (billion \$2018)	0	0.417	0	0	0.179	0	12.3
Capital invested - Offshore Wind - Constrained (billion \$2018)	0	0.46	0	0	0	0.231	14.1
Capital invested - Solar PV - Base (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion \$2018)	0	1.68	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)	0	0	2.51	1.27	1.2	0.855	0.175
Capital invested - Wind - Constrained (billion \$2018)	0	0	2.32	2.86	7.4	6.28	0.499
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	109	109	109	197	197	9,476
Installed (cumulative) - Rooftop PV (MW)	2,443	3,766	5,029	6,555	8,366	10,477	12,977
Installed (cumulative) - Solar - Base land use assumptions (MW)	837	837	837	837	837	837	837
Installed (cumulative) - Wind - Base land use assumptions (MW)	4,154	4,154	5,605	6,394	7,175	7,762	7,889

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use	0	522	0	0	422	0	38,382
assumptions (GWh)							
OffshoreWind - Constrained land use	0	522	0	0	422	0	38,382
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	2,011	0	0	0	0	0	0
Solar - Constrained land use assumptions	1,737	0	0	0	0	0	0
(GWh)							
Wind - Base land use assumptions (GWh)	14,129	0	5,290	2,744	2,613	1,899	381
Wind - Constrained land use assumptions	14,129	0	4,759	4,933	13,384	11,933	882
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	0	0	124	398
Conversion capital investment -	0	0	0	0	0	2,271	5,019
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	4	11
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	2.92	9.37
Annual - BECCS (MMT)		0	0	0	0	2.92	9.37
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	2.92	12.3
Cumulative - BECCS (MMT)		0	0	0	0	2.92	12.3
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	0	497	497	871	1,423
Cumulative investment - All (million \$2018)		0	0	1,561	1,561	1,794	2,143
Cumulative investment - Spur (million \$2018)		0	0	0	0	234	583
Cumulative investment - Trunk (million \$2018)		0	0	1,561	1,561	1,561	1,561
Spur (km)		0	0	0	0	373	926
Trunk (km)		0	0	497	497	497	497

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

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

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

Table 12: E+ scenario - PILLAR 6: Lana sini			0000	0005	0016	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,084
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-74.1
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,158
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-558
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-37
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-595
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,788
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							126
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							1,914
Aggressive deployment - Total (1000							•
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							926
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							62.8
deployment - Permanent conservation							32.3
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							988
deployment - Total (1000 hectares)							700
acproyment - rotar (1000 nectal es)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-3,070
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-60,233
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,267
deforestation (1000 tC02e/y)							44.005
Carbon sink potential - High - Extend							-11,025
rotation length (1000 tCO2e/y)							F 7/ /
Carbon sink potential - High - Improve							-5,746
plantations (1000 tCO2e/y)							00.007
Carbon sink potential - High - Increase							-20,097
retention of HWP (1000 tC02e/y)							//0
Carbon sink potential - High - Increase							-660
trees outside forests (1000 tC02e/y) Carbon sink potential - High - Reforest							-6,564
cropland (1000 tCO2e/y)							-0,564
Carbon sink potential - High - Reforest							-3,779
pasture (1000 tC02e/y)							-3,117
Carbon sink potential - High - Restore							-8,025
productivity (1000 tC02e/y)							-0,023
Carbon sink potential - Low - Accelerate							-1,538
regeneration (1000 tCO2e/y)							-1,550
Carbon sink potential - Low - All (not							-22,111
counting overlap) (1000 tC02e/y)							-22,111
Carbon sink potential - Low - Avoid							-211
deforestation (1000 tC02e/y)							211
Carbon sink potential - Low - Extend							-4,235
rotation length (1000 tC02e/y)							1,200
Carbon sink potential - Low - Improve							-2,923
plantations (1000 tCO2e/y)							_,
Carbon sink potential - Low - Increase							-6,699
retention of HWP (1000 tCO2e/y)							-,-
Carbon sink potential - Low - Increase							-231
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-3,282
cropland (1000 tCO2e/y)							•
Carbon sink potential - Low - Reforest							-286
pasture (1000 tC02e/y)							
Carbon sink potential - Low - Restore							-2,705
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-2,304
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-41,121
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-739
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-7,630
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-4,284
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-13,398
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-446
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-4,923
cropland (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-2,033
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-5,365
productivity (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							502
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							172
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							5,622
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2,117
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							62.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							434
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							107
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,660
High - Restore productivity (1000							_,
hectares)							
Land impacted for carbon sink potential -							11,677
High - Total impacted (over 30 years)							,
(1000 hectares)							
Land impacted for carbon sink potential -							251
Low - Accelerate regeneration (1000							201
hectares)							
Land impacted for carbon sink potential -		+					161
Low - Avoid deforestation (over 30 years)							101
(1000 hectares)							
Land impacted for carbon sink potential -							2,154
Low - Extend rotation length (1000							2,104
hectares)							
Land impacted for carbon sink potential -		+	-				1,058
Low - Improve plantations (1000							1,000
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -		-					33
Low - Increase trees outside forests							33
(1000 hectares)							
Land impacted for carbon sink potential -							217
							217
Low - Reforest cropland (1000 hectares)							10 /
Land impacted for carbon sink potential -							18.6
Low - Reforest pasture (1000 hectares)							1 (00
Land impacted for carbon sink potential -							1,609
Low - Restore productivity (1000							
hectares)							·
Land impacted for carbon sink potential -							5,503
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							377
Mid - Accelerate regeneration (1000							
hectares)							

Table 13: E+	econario -	DTIIAP 6.	I and sinks -	Enrocte	(continued)
Table 15. E+	SCEHUITO -	PILLAR D.	LUHU SHIKS -	FULESTS	COMUNICEUR

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							166
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,888
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,593
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 -							47.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							325
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							135
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							3,241
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,773
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		198	167	134	101	63.4	44
Natural gas consumption - Cumulative		0	0	0	0	0	4,030
(tcf)							
Natural gas production - Annual (tcf)		0.609	0.576	0.502	0.424	0.336	0.261
Oil consumption - Annual (million bbls)		58.9	50.4	38	26.4	17.2	9.78
Oil consumption - Cumulative (million		0	0	0	0	0	1,173
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0

Table 15: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		36.5	0.043	0.043	0.027	0.016	0
Monetary damages from air pollution - Natural Gas (million 2019\$)		38.6	22.4	18.6	17.2	14	10.5
Monetary damages from air pollution - Transportation (million 2019\$)		414	387	294	170	77.9	31.3
Premature deaths from air pollution - Coal (deaths)		4.12	0.005	0.005	0.003	0.002	0
Premature deaths from air pollution - Natural Gas (deaths)		4.36	2.52	2.1	1.94	1.57	1.18
Premature deaths from air pollution - Transportation (deaths)		46.6	43.5	33.1	19.1	8.76	3.52

Table 16: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		183	298	156	105	229	501
By economic sector - Construction (jobs)		9,860	9,552	11,033	10,875	11,128	23,154
By economic sector - Manufacturing		2,689	4,018	4,949	4,552	4,061	5,967
(jobs)							
By economic sector - Mining (jobs)		1,109	788	503	297	160	80.2

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

Table 16: E+ scenario - IMPACTS - Jobs (co	ontinueaj						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		1,508	1,565	1,882	2,198	2,513	5,237
By economic sector - Pipeline (jobs)		259	218	358	124	109	129
By economic sector - Professional (jobs)		4,290	4,527	4,973	5,413	5,976	13,282
By economic sector - Trade (jobs)		2,854	2,896	3,218	3,532	3,890	8,534
By economic sector - Utilities (jobs)		4,145	4,455	6,315	6,083	6,269	15,629
By education level - All sectors -		8,494	8,962	10,765	10,703	11,062	23,425
Associates degree or some college (jobs)							
By education level - All sectors -		5,307	5,592	6,496	6,510	6,766	14,373
Bachelors degree (jobs)							
By education level - All sectors - Doctoral		212	219	242	253	272	589
degree (jobs)							
By education level - All sectors - High		11,566	12,160	14,290	14,083	14,514	30,392
school diploma or less (jobs)							
By education level - All sectors - Masters		1,319	1,383	1,596	1,630	1,721	3,734
or professional degree (jobs)							
By resource sector - Biomass (jobs)		647	788	400	290	840	2,149
By resource sector - CO2 (jobs)		0	0	1,544	0	250	659
By resource sector - Coal (jobs)		86.9	0	0	0	0	0
By resource sector - Grid (jobs)		6,144	7,093	9,281	10,434	10,900	29,558
By resource sector - Natural Gas (jobs)		2,131	1,792	1,840	1,654	1,259	1,035
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		2,619	2,054	1,431	922	562	300
By resource sector - Solar (jobs)		11,450	11,083	13,181	14,424	15,631	27,983
By resource sector - Wind (jobs)		3,820	5,507	5,711	5,457	4,893	10,829
Median wages - Annual - All (\$2019 per		62,291	62,798	63,770	64,648	65,678	67,496
job)							
On-Site or In-Plant Training - Total jobs - 1		4,427	4,632	5,533	5,475	5,642	11,956
to 4 years (jobs)							
On-Site or In-Plant Training - Total jobs - 4		1,945	1,979	2,369	2,341	2,426	5,225
to 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		4,437	4,681	5,482	5,470	5,677	11,904
None (jobs)							
On-Site or In-Plant Training - Total jobs -		233	245	297	294	304	652
Over 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		15,855	16,780	19,707	19,600	20,288	42,777
Up to 1 year (jobs)							
On-the-Job Training - All sectors - 1 to 4		5,712	5,968	7,149	7,070	7,285	15,467
years (jobs)					-		
On-the-Job Training - All sectors - 4 to 10		1,939	1,970	2,369	2,346	2,436	5,258
years (jobs)		-	-		-		
On-the-Job Training - All sectors - None		1,517	1,579	1,833	1,841	1,918	4,026
(jobs)					•		,
On-the-Job Training - All sectors - Over 10		279	292	343	335	339	681
years (jobs)							
On-the-Job Training - All sectors - Up to 1		17,451	18,508	21,696	21,588	22,358	47,081
year (jobs)		, -	-,	,	,	,	,
Related work experience - All sectors - 1		9,580	10,079	11,879	11,825	12,253	25,966
to 4 years (jobs)				,	•		•
Related work experience - All sectors - 4		6,236	6,539	7,757	7,696	7,947	16,851
to 10 years (jobs)		,			•	,	•
Related work experience - All sectors -		3,889	4,093	4,854	4,818	5,004	10,602
None (jobs)		5,551	.,	.,	1,210	5,55	,
Related work experience - All sectors -		1,604	1,705	2,022	2,000	2,049	4,301
Over 10 years (jobs)		.,554	.,. 00	2,022	2,000	2,047	1,001
Related work experience - All sectors - Up		5,587	5,901	6,877	6,840	7,084	14,793
to 1 year (jobs)		5,551	3,, 3,	5,5	5,5 10	.,00.	,. , 0
Wage income - All (million \$2019)		1,676	1,778	2,130	2,145	2,256	4,895
Tago moomo An (minon 42017)		1,010	1,110	2,100	2,140	2,200	4,070

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	13,324	14,288	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	27.5	31	36.1	49.7	68.6	80.2	84.3
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Sales of space heating units - Electric	2.5	12.5	15.3	23.6	37.7	49.3	54.5
Heat Pump (%)							
Sales of space heating units - Electric	16.7	13.9	16.1	22.4	32.2	39	41.6
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	80.8	73.6	68.6	54	30.1	11.7	3.87
(%)							
Sales of water heating units - Electric	1	2.5	7.27	21.1	42.9	58.1	63.8
Heat Pump (%)							
Sales of water heating units - Electric	3.08	3.16	5.27	11.4	21.5	29	32.1
Resistance (%)							
Sales of water heating units - Gas Furnace	95.1	93.7	86.8	66.8	35	12.3	3.44
(%)							
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		1.88	1.92	2.22	2.29	3.56	3.78
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)	93.8	95.2	96.6	96.8	95.9	94.4	93.4
Final energy use - Industry (PJ)	209	215	215	222	230	234	240
Final energy use - Residential (PJ)	151	140	128	117	105	92.8	81.8
Final energy use - Transportation (PJ)	334	315	290	270	254	235	213

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	2.53	2.65	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	65.5	66.4	69.6	77.9	89.5	96.6	99.1
Resistance (%)							
Sales of cooking units - Gas (%)	34.5	33.6	30.4	22.1	10.5	3.4	0.915
Sales of space heating units - Electric	12.4	20.2	22.9	30.9	43.8	53.4	57.2
Heat Pump (%)							
Sales of space heating units - Electric	31	37.9	37.5	36.3	34.2	32.4	31.5
Resistance (%)							
Sales of space heating units - Fossil (%)	8.35	14	13.7	12.7	11	9.88	9.53
Sales of space heating units - Gas (%)	48.3	27.9	25.9	20.1	10.9	4.35	1.81
Sales of water heating units - Electric	0	1.35	5.19	16.3	33.7	45.7	50.1
Heat Pump (%)							
Sales of water heating units - Electric	40.2	56.7	55.5	52.2	47.4	44.4	43.4
Resistance (%)							
Sales of water heating units - Gas Furnace	53.4	36.6	34	26.2	13.7	4.82	1.35
(%)							
Sales of water heating units - Other (%)	6.41	5.35	5.33	5.3	5.21	5.14	5.13

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	0	130	249	865	2,649	3,885
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.347	0	0.57	0	2.25	0	5.96
units)							
Public EV charging plugs - L2 (1000 units)	1.3	0	13.7	0	54.1	0	144
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 (%)	1.63	2.03	2.07	1.65	1.06	0.547	0.234
Vehicle sales - Light-duty - EV (%)	1.8	4.49	11.5	25.2	47.7	71.6	87.4
Vehicle sales - Light-duty - gasoline (%)	92	87.8	80.2	67.5	47	25.3	11.2
Vehicle sales - Light-duty - hybrid (%)	4.33	5.15	5.81	5.32	4.03	2.4	1.17
Vehicle sales - Light-duty - hydrogen FC	0.113	0.382	0.33	0.254	0.181	0.101	0.047
(%)							
Vehicle sales - Light-duty - other (%)	0.106	0.11	0.1	0.087	0.063	0.035	0.016
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,084
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-74.1
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,158
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-558
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-37
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-595
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,788
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							126
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							1,914
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							926
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							62.8
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							988
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate	2020	2025	2030	2035	2040	2045	-3,070
regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - All (not							-60,233
counting overlap) (1000 tCO2e/y)							-00,233
Carbon sink potential - High - Avoid							-1,267
deforestation (1000 tCO2e/y)							-1,201
							-11,025
Carbon sink potential - High - Extend							-11,025
rotation length (1000 tC02e/y)							-5,746
Carbon sink potential - High - Improve							-5,746
plantations (1000 tC02e/y)							00.007
Carbon sink potential - High - Increase							-20,097
retention of HWP (1000 tC02e/y)							
Carbon sink potential - High - Increase							-660
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-6,564
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-3,779
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-8,025
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-1,538
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-22,111
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-211
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-4,235
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-2,923
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-6,699
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-231
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-3,282
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-286
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-2,705
productivity (1000 tCO2e/y)							,
Carbon sink potential - Mid - Accelerate							-2,304
regeneration (1000 tCO2e/y)							-,

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

Item Carbon sink potential - Mid - All (not	2020	2025	2030	2035	2040	2045	2050 -41,121
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y)							-739
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,630
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,284
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)							-13,398
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-446
Carbon sink potential - Mid - Reforest							-4,923
cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest							-2,033
pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore							-5,365
productivity (1000 tCO2e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							502
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							172
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,622
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,117
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							62.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							434
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							107
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,660
Land impacted for carbon sink potential - High - Total impacted (over 30 years)							11,677
(1000 hectares) Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							251
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							161
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,154
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,058
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							33
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							217
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							18.6
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,609
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,503
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							377
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							166
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,888
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,593
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 -							47.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							325
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							135
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							3,241
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,773
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 24: E- scenario - IMPACTS - Health

Table 24. L- Scendi lo - IMPACTO - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		36.5	0.043	0.043	0.027	0.016	0
Coal (million 2019\$)							
Monetary damages from air pollution -		40.6	21	13.7	9.96	7.56	7.55
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		421	425	414	372	296	204
Transportation (million 2019\$)							
Premature deaths from air pollution -		4.12	0.005	0.005	0.003	0.002	0
Coal (deaths)							
Premature deaths from air pollution -		4.58	2.37	1.55	1.12	0.854	0.853
Natural Gas (deaths)							
Premature deaths from air pollution -		47.3	47.8	46.5	41.9	33.3	22.9
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	13,358	14,518	0	0	0	0
Cumulative 5-yr (million \$2018)	•	.5,555	,6.6		•		
Sales of cooking units - Electric	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Sales of space heating units - Electric	2.5	16.7	41.2	54.8	56.6	56.7	56.7
Heat Pump (%)							
Sales of space heating units - Electric	16.7	17.5	36.3	42	42.6	42.6	42.6
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	80.8	65.8	22.5	3.25	0.79	0.695	0.695
(%)							
Sales of water heating units - Electric	1	10.3	52.2	64.9	66	66	66
Heat Pump (%)							
Sales of water heating units - Electric	3.08	6.46	25	32.5	33.3	33.3	33.3
Resistance (%)							
Sales of water heating units - Gas Furnace	95.1	82.6	22.2	1.99	0.085	0	0
(%)							
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.38	2.48	3.93	4.2	3.62	3.78
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)	93.8	95	93.3	89	85.5	84.8	85.9
Final energy use - Industry (PJ)	209	215	214	219	226	230	236
Final energy use - Residential (PJ)	151	140	123	104	88.4	78.3	72.2
Final energy use - Transportation (PJ)	334	313	278	236	197	173	163

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	2.54	2.66	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	65.6	73	95.4	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	34.4	27	4.63	0.233	0	0	0
Sales of space heating units - Electric	12.4	24.5	48.3	57.6	58.8	58.8	58.7
Heat Pump (%)							
Sales of space heating units - Electric	31	37.4	34.1	31.4	31	31.2	31.3
Resistance (%)							
Sales of space heating units - Fossil (%)	8.35	13.5	10.5	9.63	9.42	9.21	9.21
Sales of space heating units - Gas (%)	48.3	24.7	7.17	1.4	0.846	0.812	0.816
Sales of water heating units - Electric	0	7.68	41.4	51	51.8	51.8	51.8
Heat Pump (%)							
Sales of water heating units - Electric	40.2	54.8	44.8	43.1	43.1	43.1	43.1
Resistance (%)							
Sales of water heating units - Gas Furnace	53.4	32.3	8.69	0.78	0.033	0	0
(%)							
Sales of water heating units - Other (%)	6.41	5.3	5.09	5.09	5.1	5.11	5.12

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	737	1,953	3,062	4,679	5,048	4,837
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.347	0	1.51	0	5.84	0	9.31
units)							
Public EV charging plugs - L2 (1000 units)	1.3	0	36.3	0	141	0	224
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 (%)	1.62	1.88	1.29	0.412	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.67	14.4	45.3	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.3	78.9	50	17	3.35	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.18	4.37	3.13	1.17	0.284	0.062	0
Vehicle sales - Light-duty - hydrogen FC	0.111	0.344	0.209	0.065	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.105	0.101	0.067	0.023	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base	0	0.417	0	0	0.179	0.218	26.6
(billion \$2018)							
Capital invested - Solar PV - Base (billion	0	0	0	0	0	0	16.9
\$2018)							
Capital invested - Wind - Base (billion	0	0	2.58	2.21	4.06	5.44	5.95
\$2018)							
Installed (cumulative) - OffshoreWind -	0	109	109	109	197	330	20,397
Base land use assumptions (MW)							
Installed (cumulative) - Solar - Base land	837	837	837	837	837	837	19,062
use assumptions (MW)							
Installed (cumulative) - Wind - Base land	4,188	4,188	5,678	7,051	9,692	13,427	17,751
use assumptions (MW)							

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	522	0	0	422	630	89,410
assumptions (GWh)							
OffshoreWind - Constrained land use	0	568	0	0	155	6,699	82,519
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	2,011	0	0	0	0	0	36,264
Solar - Constrained land use assumptions	2,011	0	0	0	0	0	39,529
(GWh)							
Wind - Base land use assumptions (GWh)	14,258	0	5,415	4,691	8,281	11,072	12,342
Wind - Constrained land use assumptions	14,129	0	5,088	14,930	31,319	24,381	49,963
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,084
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-74.1
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,158
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-558
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-37
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-595
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,788
Aggressive deployment - Cropland							.,
measures (1000 hectares)							
Land impacted for carbon sink -							126
Aggressive deployment - Permanent							0
conservation cover (1000 hectares)							
Land impacted for carbon sink -						+	1,914
Aggressive deployment - Total (1000							1,714
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							U
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate						+	926
deployment - Cropland measures (1000							720
hectares)							
Land impacted for carbon sink - Moderate						+	62.8
deployment - Permanent conservation							02.8
cover (1000 hectares)							
							000
Land impacted for carbon sink - Moderate							988
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							-3,070
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-60,233
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,267
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-11,025
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-5,746
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-20,097
retention of HWP (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase							-660
trees outside forests (1000 tC02e/y)							, -, ,
Carbon sink potential - High - Reforest							-6,564
cropland (1000 tCO2e/y)							0.770
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,779
Carbon sink potential - High - Restore							-8,025
productivity (1000 tCO2e/y)							-0,023
Carbon sink potential - Low - Accelerate							-1,538
regeneration (1000 tC02e/y)							1,000
Carbon sink potential - Low - All (not							-22,111
counting overlap) (1000 tCO2e/y)							,
Carbon sink potential - Low - Avoid							-211
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-4,235
rotation length (1000 tCO2e/y)							•
Carbon sink potential - Low - Improve							-2,923
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-6,699
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-231
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-3,282
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-286
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-2,705
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-2,304
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-41,121
counting overlap) (1000 tC02e/y)							
Carbon sink potential - Mid - Avoid							-739
deforestation (1000 tC02e/y)							
Carbon sink potential - Mid - Extend							-7,630
rotation length (1000 tC02e/y)							/ 00/
Carbon sink potential - Mid - Improve							-4,284
plantations (1000 tCO2e/y)							10 000
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)							-13,398
Carbon sink potential - Mid - Increase							-446
trees outside forests (1000 tC02e/y)							-440
Carbon sink potential - Mid - Reforest							-4,923
cropland (1000 tC02e/y)							-4,723
Carbon sink potential - Mid - Reforest							-2,033
pasture (1000 tC02e/y)							2,000
Carbon sink potential - Mid - Restore							-5,365
productivity (1000 tCO2e/y)							0,000
Land impacted for carbon sink potential -							502
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							172
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							5,622
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2,117
High - Improve plantations (1000							
hectares)							

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

Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050
High - Increase retention of HWP (1000							(
hectares)							
Land impacted for carbon sink potential -							62.
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							434
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							10
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,660
High - Restore productivity (1000							
hectares)							44 (7
Land impacted for carbon sink potential -							11,67
High - Total impacted (over 30 years)							
(1000 hectares) Land impacted for carbon sink potential -							25
Low - Accelerate regeneration (1000							25
hectares)							
Land impacted for carbon sink potential -							16
Low - Avoid deforestation (over 30 years)							10
(1000 hectares)							
Land impacted for carbon sink potential -							2,154
Low - Extend rotation length (1000							_,
hectares)							
Land impacted for carbon sink potential -							1,058
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							(
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							3:
Low - Increase trees outside forests							
(1000 hectares)							04
Land impacted for carbon sink potential -							21
Land impacted for carbon sink potential -							18.0
Low - Reforest pasture (1000 hectares)							10.0
Land impacted for carbon sink potential -							1,609
Low - Restore productivity (1000							1,00
hectares)							
Land impacted for carbon sink potential -							5,503
Low - Total impacted (over 30 years)							0,000
(1000 hectares)							
Land impacted for carbon sink potential -							37
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							160
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,888
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,59
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							(
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							47.9
Mid - Increase trees outside forests (1000						[

Table 33: E+RE+	. cronario -	DTII AD A.	I and cinke -	Forests	(continued)
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Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							325
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							135
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							3,241
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,773
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		36.5	0.043	0.043	0.027	0.016	0
Coal (million 2019\$)							
Monetary damages from air pollution -		35.6	16.4	9.85	8.49	6.96	1.27
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		414	387	294	170	77.9	31.3
Transportation (million 2019\$)							
Premature deaths from air pollution -		4.12	0.005	0.005	0.003	0.002	0
Coal (deaths)							
Premature deaths from air pollution -		4.02	1.85	1.11	0.958	0.786	0.143
Natural Gas (deaths)							
Premature deaths from air pollution -		46.6	43.5	33.1	19.1	8.76	3.52
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 - Cumulative 5-yr (million \$2018)	0	13,358	14,518	0	0	0	0
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Sales of space heating units - Electric Heat Pump (%)	2.5	16.7	41.2	54.8	56.6	56.7	56.7
Sales of space heating units - Electric Resistance (%)	16.7	17.5	36.3	42	42.6	42.6	42.6
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	80.8	65.8	22.5	3.25	0.79	0.695	0.695
Sales of water heating units - Electric Heat Pump (%)	1	10.3	52.2	64.9	66	66	66
Sales of water heating units - Electric Resistance (%)	3.08	6.46	25	32.5	33.3	33.3	33.3
Sales of water heating units - Gas Furnace (%)	95.1	82.6	22.2	1.99	0.085	0	0
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.38	2.48	3.93	4.2	3.62	3.78
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)	93.8	95	93.3	89	85.5	84.8	85.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	209	215	214	219	226	230	236
Final energy use - Residential (PJ)	151	140	123	104	88.4	78.3	72.2
Final energy use - Transportation (PJ)	334	313	278	236	197	173	163

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	2.54	2.66	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	65.6	73	95.4	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	34.4	27	4.63	0.233	0	0	0
Sales of space heating units - Electric	12.4	24.5	48.3	57.6	58.8	58.8	58.7
Heat Pump (%)							
Sales of space heating units - Electric	31	37.4	34.1	31.4	31	31.2	31.3
Resistance (%)							
Sales of space heating units - Fossil (%)	8.35	13.5	10.5	9.63	9.42	9.21	9.21
Sales of space heating units - Gas (%)	48.3	24.7	7.17	1.4	0.846	0.812	0.816
Sales of water heating units - Electric	0	7.68	41.4	51	51.8	51.8	51.8
Heat Pump (%)							
Sales of water heating units - Electric	40.2	54.8	44.8	43.1	43.1	43.1	43.1
Resistance (%)							
Sales of water heating units - Gas Furnace	53.4	32.3	8.69	0.78	0.033	0	0
(%)							
Sales of water heating units - Other (%)	6.41	5.3	5.09	5.09	5.1	5.11	5.12

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	737	1,953	3,062	4,679	5,048	4,837
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.347	0	1.51	0	5.84	0	9.31
_units)							
Public EV charging plugs - L2 (1000 units)	1.3	0	36.3	0	141	0	224
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 (%)	1.62	1.88	1.29	0.412	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.67	14.4	45.3	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.3	78.9	50	17	3.35	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.18	4.37	3.13	1.17	0.284	0.062	0
Vehicle sales - Light-duty - hydrogen FC	0.111	0.344	0.209	0.065	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.105	0.101	0.067	0.023	0.005	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 - Offshore Wind - Base (billion \$2018)		0.417	0	0	0	0	1.04
Capital invested - Offshore Wind - Constrained (billion \$2018)		0.46	0	0	0	0	1.11
Capital invested - Solar PV - Base (billion \$2018)		2.37	0.587	0.212	0.709	2.04	1.48
Capital invested - Solar PV - Constrained (billion \$2018)		1.33	1.51	1.35	1.07	2.88	1.77
Capital invested - Wind - Base (billion \$2018)		0.067	1.42	0.908	1.46	0.52	0
Capital invested - Wind - Constrained (billion \$2018)		0.084	2.07	0.174	2.85	3.08	0

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	522	0	0	0	0	3,767
assumptions (GWh)							
OffshoreWind - Constrained land use	0	568	0	0	0	0	3,254
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	4,444	3,547	958	382	1,364	4,114	3,186
Solar - Constrained land use assumptions	3,569	1,983	2,524	2,396	2,034	5,837	3,876
(GWh)							
Wind - Base land use assumptions (GWh)	14,258	131	3,023	2,007	3,288	1,213	0
Wind - Constrained land use assumptions	14,129	159	4,239	361	5,627	6,037	0
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,084
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-74.1
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,158
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-558
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-37
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-595
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							1,788
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							126
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							1,914
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							926
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							62.8
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							988
deployment - Total (1000 hectares)							

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

	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-3,070
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-60,233
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,267
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-11,025
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-5,746
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-20,097
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-660
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-6,564
cropland (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-3,779
pasture (1000 tCO2e/y)							•
Carbon sink potential - High - Restore							-8,025
productivity (1000 tCO2e/y)							-,-
Carbon sink potential - Low - Accelerate							-1,538
regeneration (1000 tCO2e/y)							.,
Carbon sink potential - Low - All (not							-22,111
counting overlap) (1000 tCO2e/y)							,
Carbon sink potential - Low - Avoid							-211
deforestation (1000 tC02e/y)							
Carbon sink potential - Low - Extend							-4,235
rotation length (1000 tCO2e/y)							,
Carbon sink potential - Low - Improve							-2,923
plantations (1000 tCO2e/y)							_,
Carbon sink potential - Low - Increase							-6,699
retention of HWP (1000 tCO2e/y)							0,077
Carbon sink potential - Low - Increase							-231
trees outside forests (1000 tC02e/y)							20.
Carbon sink potential - Low - Reforest							-3,282
cropland (1000 tCO2e/y)							0,202
Carbon sink potential - Low - Reforest							-286
pasture (1000 tC02e/y)							200
Carbon sink potential - Low - Restore							-2,705
productivity (1000 tCO2e/y)							-2,100
Carbon sink potential - Mid - Accelerate							-2,304
·							-2,304
regeneration (1000 tCO2e/y)							

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

Carbon sink notantial Mid All (not	2020	2025	2030	2035	2040	2045	2050 -41,121
Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)							-41,121
Carbon sink potential - Mid - Avoid							-739
deforestation (1000 tC02e/y)							-139
Carbon sink potential - Mid - Extend							-7,630
rotation length (1000 tC02e/y)							-1,030
Carbon sink potential - Mid - Improve							-4,284
plantations (1000 tCO2e/y)							-4,204
Carbon sink potential - Mid - Increase							-13,398
retention of HWP (1000 tC02e/y)							-13,370
Carbon sink potential - Mid - Increase							-446
trees outside forests (1000 tC02e/y)							770
Carbon sink potential - Mid - Reforest							-4,923
cropland (1000 tCO2e/y)							7,720
Carbon sink potential - Mid - Reforest							-2,033
pasture (1000 tC02e/y)							2,000
Carbon sink potential - Mid - Restore							-5,365
productivity (1000 tCO2e/y)							0,000
Land impacted for carbon sink potential -							502
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							172
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							5,622
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2,117
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							62.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							434
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							107
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,660
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							11,677
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							251
Low - Accelerate regeneration (1000							
hectares)							4.4
Land impacted for carbon sink potential -							161
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							0.157
Land impacted for carbon sink potential -							2,154
Low - Extend rotation length (1000							
hectares)							1050
Land impacted for carbon sink potential -							1,058
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000							C
LOW - INCRESSE PETENTION OF HWY HILLIN					1		

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 -							33
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							217
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							18.6
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,609
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,503
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							377
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							166
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,888
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,593
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 -							47.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							325
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							135
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							3,241
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,773
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 - Coal (million 2019\$)		36.5	0.043	0.043	0.027	0.016	0
Monetary damages from air pollution - Natural Gas (million 2019\$)		38	17.4	20	22.8	14.5	6.62
Monetary damages from air pollution - Transportation (million 2019\$)		414	387	294	170	77.9	31.3
Premature deaths from air pollution - Coal (deaths)		4.12	0.005	0.005	0.003	0.002	0
Premature deaths from air pollution - Natural Gas (deaths)		4.29	1.96	2.25	2.57	1.64	0.748
Premature deaths from air pollution - Transportation (deaths)		46.6	43.5	33.1	19.1	8.76	3.52

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	13,324	14,288	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	27.5	31	36.1	49.7	68.6	80.2	84.3
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Sales of space heating units - Electric	2.5	12.5	15.3	23.6	37.7	49.3	54.5
Heat Pump (%)							
Sales of space heating units - Electric	16.7	13.9	16.1	22.4	32.2	39	41.6
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	80.8	73.6	68.6	54	30.1	11.7	3.87
(%)							
Sales of water heating units - Electric	1	2.5	7.27	21.1	42.9	58.1	63.8
Heat Pump (%)							
Sales of water heating units - Electric	3.08	3.16	5.27	11.4	21.5	29	32.1
Resistance (%)							
Sales of water heating units - Gas Furnace	95.1	93.7	86.8	66.8	35	12.3	3.44
(%)							
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		1.88	1.92	2.22	2.29	3.56	3.78
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)	93.8	95.2	96.6	96.8	95.9	94.4	93.4
Final energy use - Industry (PJ)	209	215	215	222	230	234	240
Final energy use - Residential (PJ)	151	140	128	117	105	92.8	81.8
Final energy use - Transportation (PJ)	334	315	290	270	254	235	213

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	2.53	2.65	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	65.5	66.4	69.6	77.9	89.5	96.6	99.1
Resistance (%)							
Sales of cooking units - Gas (%)	34.5	33.6	30.4	22.1	10.5	3.4	0.915
Sales of space heating units - Electric	12.4	20.2	22.9	30.9	43.8	53.4	57.2
Heat Pump (%)							
Sales of space heating units - Electric	31	37.9	37.5	36.3	34.2	32.4	31.5
Resistance (%)							
Sales of space heating units - Fossil (%)	8.35	14	13.7	12.7	11	9.88	9.53
Sales of space heating units - Gas (%)	48.3	27.9	25.9	20.1	10.9	4.35	1.81
Sales of water heating units - Electric	0	1.35	5.19	16.3	33.7	45.7	50.1
Heat Pump (%)							
Sales of water heating units - Electric	40.2	56.7	55.5	52.2	47.4	44.4	43.4
Resistance (%)							
Sales of water heating units - Gas Furnace	53.4	36.6	34	26.2	13.7	4.82	1.35
(%)							
Sales of water heating units - Other (%)	6.41	5.35	5.33	5.3	5.21	5.14	5.13

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	130	249	865	2,649	3,885
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.347	0	0.57	0	2.25	0	5.96
units)							
Public EV charging plugs - L2 (1000 units)	1.3	0	13.7	0	54.1	0	144
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 (%)	1.63	2.03	2.07	1.65	1.06	0.547	0.234
Vehicle sales - Light-duty - EV (%)	1.8	4.49	11.5	25.2	47.7	71.6	87.4
Vehicle sales - Light-duty - gasoline (%)	92	87.8	80.2	67.5	47	25.3	11.2
Vehicle sales - Light-duty - hybrid (%)	4.33	5.15	5.81	5.32	4.03	2.4	1.17
Vehicle sales - Light-duty - hydrogen FC	0.113	0.382	0.33	0.254	0.181	0.101	0.047
(%)							
Vehicle sales - Light-duty - other (%)	0.106	0.11	0.1	0.087	0.063	0.035	0.016
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0

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

T.		0005	0000	0005	00/0	0015	2252
Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	0	234	604	650
Conversion capital investment -	0	0	0	0	3,120	4,937	607
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	4	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	0	0	0	0
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	4.01	10.4	11.1
Annual - BECCS (MMT)		0	0	0	4.01	10.4	11.1
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	4.01	14.4	25.5
Cumulative - BECCS (MMT)		0	0	0	4.01	14.4	25.5
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	0	497	871	1,159	1,234
Cumulative investment - All (million \$2018)		0	0	1,561	1,809	2,020	2,068
Cumulative investment - Spur (million \$2018)		0	0	0	248	460	507
Cumulative investment - Trunk (million \$2018)		0	0	1,561	1,561	1,561	1,561
Spur (km)		0	0	0	373	662	737
Trunk (km)		0	0	497	497	497	497

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,084
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Pasture to energy crops							
(1000 tCO2e/y)							
Carbon sink potential - Aggressive							-74.1
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,158
deployment - Total (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							(
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-558
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							(
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Moderate							(
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Moderate							-3
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-59
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink -							
Aggressive deployment - Corn-ethanol to							,
energy grasses (1000 hectares)							
Land impacted for carbon sink -							4,41
Aggressive deployment - Cropland							4,41
measures (1000 hectares)							
Land impacted for carbon sink -							0.00
Aggressive deployment - Cropland to							0.00
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							4.0
							4.0
Aggressive deployment - Pasture to							
energy crops (1000 hectares)							10
Land impacted for carbon sink -							12
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							4,54
Aggressive deployment - Total (1000							
nectares)							
Land impacted for carbon sink - Moderate							(
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							92
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							0.00
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							4.0
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							62.
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							99
rano inipacien for carrion sink - minerare i							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - All (not counting overlap) (1000 tC02e/y)							-60,233
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,267

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend							-11,025
rotation length (1000 tCO2e/y)							/
Carbon sink potential - High - Improve							-5,746
plantations (1000 tCO2e/y)							00.00
Carbon sink potential - High - Increase							-20,09
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-660
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-6,564
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-3,779
pasture (1000 tC02e/y)							0.00
Carbon sink potential - High - Restore							-8,025
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-1,538
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-22,11
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-21
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-4,23
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-2,923
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-6,699
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-23
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-3,282
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-28
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-2,70
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-2,304
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-41,12
counting overlap) (1000 tCO2e/y)							·
Carbon sink potential - Mid - Avoid							-739
deforestation (1000 tC02e/y)							
Carbon sink potential - Mid - Extend							-7,630
rotation length (1000 tCO2e/y)							,
Carbon sink potential - Mid - Improve							-4,28
plantations (1000 tCO2e/y)							.,_0
Carbon sink potential - Mid - Increase							-13,398
retention of HWP (1000 tCO2e/y)							10,07
Carbon sink potential - Mid - Increase							-44(
trees outside forests (1000 tCO2e/y)							7-70
Carbon sink potential - Mid - Reforest							-4,92
cropland (1000 tCO2e/y)							-4,72
Carbon sink potential - Mid - Reforest							-2,03
pasture (1000 tC02e/y)							-2,00
Carbon sink potential - Mid - Restore							-5,36
							-5,36
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							50
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							17
High - Avoid deforestation (over 30 years)							

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

Thom	2020	2025		2035	2040	2045	2050
Item	2020	2025	2030	2035	2040	2045	
Land impacted for carbon sink potential -							5,622
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2,117
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							62.7
High - Increase trees outside forests							0
(1000 hectares)							
Land impacted for carbon sink potential -							434
							434
High - Reforest cropland (1000 hectares)							107
Land impacted for carbon sink potential -							107
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,660
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							11,677
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							251
Low - Accelerate regeneration (1000							201
hectares)							
Land impacted for carbon sink potential -							161
							101
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,154
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,058
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 -							33
Low - Increase trees outside forests							33
(1000 hectares)							017
Land impacted for carbon sink potential -							217
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							18.6
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,609
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,503
Low - Total impacted (over 30 years)							0,000
(1000 hectares)							
•							077
Land impacted for carbon sink potential -							377
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							166
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -	+						3,888
Mid - Extend rotation length (1000							5,500
hectares)							
	1	-					1 500
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,593
nuig improve plentetione [7(1(1) heetenee]	1	1	1 1				

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							47.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							325
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							135
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							3,241
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,773
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		36.5	0.043	0.043	0.027	0.016	0
Coal (million 2019\$)							
Monetary damages from air pollution -		39.2	20.1	14.5	13.3	11	8.87
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		421	425	414	372	296	204
Transportation (million 2019\$)							
Premature deaths from air pollution -		4.12	0.005	0.005	0.003	0.002	0
Coal (deaths)							
Premature deaths from air pollution -		4.43	2.27	1.63	1.5	1.24	1
Natural Gas (deaths)							
Premature deaths from air pollution -		47.3	47.8	46.5	41.9	33.3	22.9
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	13,236	13,602	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	27.5	29	29	29	29	28.9	28.9
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	71	71	71	71	71.1	71.1
Sales of space heating units - Electric	2.5	22.4	55	63.9	64.6	64.7	64.7
Heat Pump (%)							
Sales of space heating units - Electric	16.7	16.3	26	31	34.1	34.6	34.6
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	80.8	61.3	19	5.16	1.26	0.741	0.694
(%)							
Sales of water heating units - Electric	1	0.818	0.818	0.822	0.828	0.831	0.832
Heat Pump (%)							
Sales of water heating units - Electric	3.08	2.41	2.42	2.43	2.43	2.43	2.43
Resistance (%)							
Sales of water heating units - Gas Furnace	95.1	96.1	96.1	96.1	96.1	96.1	96.1
(%)							
Sales of water heating units - Other (%)	0.791	0.625	0.628	0.63	0.63	0.629	0.629

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.31	2.4	2.04	2.08	2.23	2.28
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	93.8	96.3	99.1	101	104	110	118
Final energy use - Industry (PJ)	209	222	230	240	253	268	285
Final energy use - Residential (PJ)	151	140	129	121	115	111	107
Final energy use - Transportation (PJ)	334	316	295	284	286	295	308

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	2.54	2.44	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Resistance (%)							
Sales of cooking units - Gas (%)	34.8	34.8	34.8	34.8	34.8	34.8	34.8
Sales of space heating units - Electric	10.6	29.2	30	31.3	32.8	34.9	37.8
Heat Pump (%)							
Sales of space heating units - Electric	31.7	33	32.6	31.9	30.8	28.9	25.7
Resistance (%)							
Sales of space heating units - Fossil (%)	8.51	13	11.8	11	10.8	10.7	10.8
Sales of space heating units - Gas (%)	49.2	24.7	25.6	25.8	25.6	25.6	25.6
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	40.2	57.1	57	57	56.9	56.9	56.9
Resistance (%)							
Sales of water heating units - Gas Furnace	53.4	37.5	37.6	37.6	37.6	37.7	37.7
Sales of water heating units - Other (%)	6.41	5.36	5.36	5.41	5.42	5.43	5.44

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
1.51	1.31	1.57	2.37	3.69	5.71	7.57
1.63	2.03	2.2	2.04	1.84	1.72	1.63
3.32	5.28	6.04	7.41	9.04	10.5	11.7
90.6	87.1	85.1	83.4	81.3	79.4	77.8
4.2	5.06	6.2	6.77	7.36	7.98	8.47
0.111	0.379	0.35	0.312	0.31	0.311	0.322
0.105	0.109	0.106	0.106	0.106	0.105	0.108
65.2	63.5	61.6	59.6	58	56.5	55.2
0.027	0.105	0.329	0.671	0.895	0.973	0.993
34	35.5	37	38.5	39.7	40.8	41.7
0.365	0.427	0.496	0.577	0.674	0.793	0.929
0.175	0.208	0.242	0.285	0.339	0.409	0.487
0.255	0.271	0.298	0.345	0.42	0.528	0.671
	98.1 0 0.229 0.083 0.119 1.51 1.63 3.32 90.6 4.2 0.111 0.105 65.2 0.027 34 0.365 0.175	98.1 98.2 0 0 0.229 0.242 0.083 0.096 0.119 0.138 1.51 1.31 1.63 2.03 3.32 5.28 90.6 87.1 4.2 5.06 0.111 0.379 0.105 0.109 65.2 63.5 0.027 0.105 34 35.5 0.365 0.427 0.175 0.208	98.1 98.2 97.9 0 0 0 0.229 0.242 0.257 0.083 0.096 0.112 0.119 0.138 0.16 1.51 1.31 1.57 1.63 2.03 2.2 3.32 5.28 6.04 90.6 87.1 85.1 4.2 5.06 6.2 0.111 0.379 0.35 0.105 0.109 0.106 65.2 63.5 61.6 0.027 0.105 0.329 34 35.5 37 0.365 0.427 0.496 0.175 0.208 0.242	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 0.119 0.138 0.16 0.186 1.51 1.31 1.57 2.37 1.63 2.03 2.2 2.04 3.32 5.28 6.04 7.41 90.6 87.1 85.1 83.4 4.2 5.06 6.2 6.77 0.111 0.379 0.35 0.312 0.105 0.109 0.106 0.106 65.2 63.5 61.6 59.6 0.027 0.105 0.329 0.671 34 35.5 37 38.5 0.365 0.427 0.496 0.577 0.175 0.208 0.242 0.285	98.1 98.2 97.9 97 95.6 0 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 0.119 0.138 0.16 0.186 0.216 1.51 1.31 1.57 2.37 3.69 1.63 2.03 2.2 2.04 1.84 3.32 5.28 6.04 7.41 9.04 90.6 87.1 85.1 83.4 81.3 4.2 5.06 6.2 6.77 7.36 0.111 0.379 0.35 0.312 0.31 0.105 0.109 0.106 0.106 0.106 65.2 63.5 61.6 59.6 58 0.027 0.105 0.329 0.671 0.895 34 35.5 37 38.5 39.7 0.365 0.427 0.496 0	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 0.119 0.138 0.16 0.186 0.216 0.25 1.51 1.31 1.57 2.37 3.69 5.71 1.63 2.03 2.2 2.04 1.84 1.72 3.32 5.28 6.04 7.41 9.04 10.5 90.6 87.1 85.1 83.4 81.3 79.4 4.2 5.06 6.2 6.77 7.36 7.98 0.111 0.379 0.35 0.312 0.31 0.311 0.105 0.109 0.106 0.106 0.106 0.105 65.2 63.5 61.6 59.6 58 56.5 0.027 0.105 0.329

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,070
Carbon sink potential - High - All (not	+						-60,233
counting overlap) (1000 tCO2e/y)							00,200
Carbon sink potential - High - Avoid							-1,267
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-11,025
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-5,746
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-20,097
retention of HWP (1000 tC02e/y)							
Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)							-660
Carbon sink potential - High - Reforest							-6,564
cropland (1000 tCO2e/y)							-0,504
Carbon sink potential - High - Reforest							-3,779
pasture (1000 tCO2e/y)							0,117
Carbon sink potential - High - Restore							-8,025
productivity (1000 tCO2e/y)							-,-
Carbon sink potential - Low - Accelerate							-1,538
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-22,111
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-211
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-4,235
rotation length (1000 tC02e/y)							
Carbon sink potential - Low - Improve							-2,923
plantations (1000 tCO2e/y) Carbon sink potential - Low - Increase							-6,699
retention of HWP (1000 tCO2e/y)							-0,099
Carbon sink potential - Low - Increase	+		-				-231
trees outside forests (1000 tC02e/y)							201
Carbon sink potential - Low - Reforest							-3,282
cropland (1000 tCO2e/y)							0,202
Carbon sink potential - Low - Reforest							-286
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-2,705
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-2,304
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-41,121
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-739
deforestation (1000 tC02e/y)							7/00
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,630
Carbon sink potential - Mid - Improve							-4,284
plantations (1000 tCO2e/y)							-4,204
Carbon sink potential - Mid - Increase							-13,398
retention of HWP (1000 tCO2e/y)							10,070
Carbon sink potential - Mid - Increase							-446
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-4,923
cropland (1000 tCO2e/y)							,
Carbon sink potential - Mid - Reforest							-2,033
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-5,365
productivity (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							502
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							172
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							5,622
High - Extend rotation length (1000							
hectares)							0 117
Land impacted for carbon sink potential -							2,117
High - Improve plantations (1000							
hectares)							0
Land impacted for carbon sink potential -							U
High - Increase retention of HWP (1000 hectares)							
Land impacted for carbon sink potential -							62.7
High - Increase trees outside forests							02.7
(1000 hectares)							
Land impacted for carbon sink potential -	-						434
High - Reforest cropland (1000 hectares)							454
Land impacted for carbon sink potential -							107
High - Reforest pasture (1000 hectares)							107
Land impacted for carbon sink potential -	-						2,660
High - Restore productivity (1000							2,000
hectares)							
Land impacted for carbon sink potential -							11,677
High - Total impacted (over 30 years)							11,011
(1000 hectares)							
Land impacted for carbon sink potential -							251
Low - Accelerate regeneration (1000							2.01
hectares)							
Land impacted for carbon sink potential -							161
Low - Avoid deforestation (over 30 years)							101
(1000 hectares)							
Land impacted for carbon sink potential -							2,154
Low - Extend rotation length (1000							2,104
hectares)							
Land impacted for carbon sink potential -							1,058
Low - Improve plantations (1000							.,000
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							33
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							217
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							18.6
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,609
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,503
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							377
Mid - Accelerate regeneration (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							166
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,888
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,593
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 -							47.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							325
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							135
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							3,241
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,773
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural	-34.3		-7.18				-5.98
uptake (Mt CO2e/y)							
Business-as-usual carbon sink - Retained	-5.47		-9.18				-9.66
in Hardwood Products (Mt CO2e/y)							
Business-as-usual carbon sink - Total (Mt	-39.7		-16.4				-15.6
CO2e/y)							

Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		100	63.7	18.3	13.8	12.6	11.8
Coal (million 2019\$)							
Monetary damages from air pollution -		47.2	44.8	42	35.4	32.9	31.9
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		421	431	441	453	464	476
Transportation (million 2019\$)							
Premature deaths from air pollution -		11.3	7.2	2.07	1.56	1.42	1.34
Coal (deaths)							
Premature deaths from air pollution -		5.32	5.06	4.75	4	3.72	3.6
Natural Gas (deaths)							
Premature deaths from air pollution -		47.3	48.5	49.6	50.9	52.2	53.6
Transportation (deaths)							