

Net-Zero America - wisconsin 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.

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)	0	19,303	21,086	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	0.938	6.01	29.4	77.8	88.2	89	89.1
Sales of space heating units - Electric Resistance (%)	3.03	3.48	5.44	9.73	10.5	10.6	10.6
Sales of space heating units - Fossil (%)	5.62	2.66	0.503	0.021	0	0	0
Sales of space heating units - Gas Furnace (%)	90.4	87.9	64.6	12.4	1.3	0.384	0.356
Sales of water heating units - Electric Heat Pump (%)	0.306	1.32	13.9	42.1	48.3	48.8	48.8
Sales of water heating units - Electric Resistance (%)	2.97	4.18	16.6	44.4	50.5	51	51
Sales of water heating units - Gas Furnace (%)	96.6	94.3	69.4	13.2	1.05	0.035	0
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.38	3.48	6.55	7	5.91	6.17
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)	194	191	184	171	157	146	140
Final energy use - Industry (PJ)	516	524	516	503	496	492	490
Final energy use - Residential (PJ)	247	230	215	188	157	132	115
Final energy use - Transportation (PJ)	508	474	413	338	271	230	212

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	3.31	4.14	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	51.1	61.5	93.4	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	48.9	38.5	6.59	0.332	0	0	0
Sales of space heating units - Electric	3.66	8.85	32.5	79.5	89.5	90.4	90.3
Heat Pump (%)							
Sales of space heating units - Electric	13.4	18.8	15	6.74	4.9	4.78	4.99
Resistance (%)							
Sales of space heating units - Fossil (%)	9.47	16	12.3	6.05	4.79	4.67	4.5
Sales of space heating units - Gas (%)	73.5	56.3	40.2	7.71	0.776	0.203	0.19
Sales of water heating units - Electric	0	0.766	10.6	32.6	37.2	37.5	37.6
Heat Pump (%)							
Sales of water heating units - Electric	24.6	40.6	46.1	59	62.1	62.3	62.3
Resistance (%)							
Sales of water heating units - Gas Furnace	75.4	58.6	43.2	8.25	0.653	0.021	0
(%)							
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.114	0.112	0.112	0.113

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,089	2,796	4,523	6,855	7,457	7,112
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.143	0	2.06	0	9	0	14.5
_units)							
Public EV charging plugs - L2 (1000 units)	0.459	0	49.6	0	216	0	350
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 (%)	1.58	1.84	1.27	0.407	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.8	14.8	45.9	81.6	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.1	78.4	49.4	16.7	3.32	0.591	0
Vehicle sales - Light-duty - hybrid (%)	4.31	4.46	3.18	1.18	0.288	0.063	0
Vehicle sales - Light-duty - hydrogen FC	0.111	0.342	0.206	0.064	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.103	0.099	0.065	0.023	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)	0	0	0.104	1.36	0.29	0	0.356
Capital invested - Solar PV - Constrained (billion \$2018)	0	0.719	0.334	1.27	1.13	0.49	0.187
Capital invested - Wind - Base (billion \$2018)	0	1.17	2.17	2.36	4.1	6.87	14.1
Capital invested - Wind - Constrained (billion \$2018)	0	1.44	3.18	14.1	13	9.68	4.97
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Rooftop PV (MW)	103	184	235	313	416	536	679
Installed (cumulative) - Solar - Base land use assumptions (MW)	404	404	491	1,728	2,006	2,006	2,391
Installed (cumulative) - Wind - Base land use assumptions (MW)	737	1,535	3,166	5,072	8,544	14,671	27,957

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	830	0	152	2,156	473	0	668
Solar - Constrained land use assumptions (GWh)	788	0	152	663	686	218	351

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

	•	•	•				
Item	2020	2025	2030	2035	2040	2045	2050
Wind - Base land use assumptions (GWh)	3,031	2,823	5,534	6,350	11,354	20,096	43,687
Wind - Constrained land use assumptions	3,031	1,385	6,515	31,976	39,110	28,200	15,387
(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	653	1,824
Conversion capital investment -	0	0	0	0	0	9,964	24,682
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	11	14
(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	4
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	11
(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	12.8	25.1
Annual - BECCS (MMT)		0	0	0	0	12.8	25.1
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	0	12.8	37.9
Cumulative - BECCS (MMT)		0	0	0	0	12.8	37.9
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	0	0	176	1,528
Cumulative investment - All (million \$2018)		0	0	0	0	253	1,249
Cumulative investment - Spur (million \$2018)		0	0	0	0	253	1,249
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Spur (km)		0	0	0	0	176	1,528
Trunk (km)		0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-1,228
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-4,557
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-189
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-5,975
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Moderate							-1,228
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,397
deployment - Cropland measures (1000							_,
tCO2e/y)							
Carbon sink potential - Moderate							-94.6
deployment - Permanent conservation							7
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-3,720
deployment - Total (1000 tC02e/y)							0,120
Land impacted for carbon sink -							479
Aggressive deployment - Corn-ethanol to							717
energy grasses (1000 hectares)							
Land impacted for carbon sink -	+		+				3,259
Aggressive deployment - Cropland							0,207
measures (1000 hectares)							
Land impacted for carbon sink -							344
Aggressive deployment - Permanent							344
conservation cover (1000 hectares)							
Land impacted for carbon sink -							4,082
Aggressive deployment - Total (1000							4,062
' '							
hectares) Land impacted for carbon sink - Moderate							479
							419
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							1,716
Land impacted for carbon sink - Moderate							1,716
deployment - Cropland measures (1000							
hectares)							170
Land impacted for carbon sink - Moderate							172
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							2,367
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-392
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-32,495
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,104
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-8,126
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-912
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,364
retention of HWP (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase							-1,651
trees outside forests (1000 tC02e/y)							2.5.5.5
Carbon sink potential - High - Reforest							-2,230
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-6,496
pasture (1000 tC02e/y)							/ 010
Carbon sink potential - High - Restore							-4,219
productivity (1000 tC02e/y) Carbon sink potential - Low - Accelerate							-197
regeneration (1000 tCO2e/y)							-197
Carbon sink potential - Low - All (not							0.0/1
counting overlap) (1000 tCO2e/y)							-9,861
Carbon sink potential - Low - Avoid							-351
deforestation (1000 tC02e/y)							-331
Carbon sink potential - Low - Extend							-3,121
rotation length (1000 tC02e/y)							-3,121
Carbon sink potential - Low - Improve							-464
plantations (1000 tC02e/y)							-404
Carbon sink potential - Low - Increase							-2,121
retention of HWP (1000 tCO2e/y)							-2,121
Carbon sink potential - Low - Increase							-578
trees outside forests (1000 tC02e/y)							-510
Carbon sink potential - Low - Reforest							-1,115
cropland (1000 tCO2e/y)							-1,113
Carbon sink potential - Low - Reforest							-492
pasture (1000 tCO2e/y)							-472
Carbon sink potential - Low - Restore							-1,422
productivity (1000 tC02e/y)							-1,422
Carbon sink potential - Mid - Accelerate							-294
regeneration (1000 tCO2e/y)							-274
Carbon sink potential - Mid - All (not							-21,170
counting overlap) (1000 tC02e/y)							21,110
Carbon sink potential - Mid - Avoid							-1,227
deforestation (1000 tC02e/y)							1,221
Carbon sink potential - Mid - Extend							-5,624
rotation length (1000 tCO2e/y)							0,024
Carbon sink potential - Mid - Improve							-680
plantations (1000 tCO2e/y)							000
Carbon sink potential - Mid - Increase							-4,243
retention of HWP (1000 tCO2e/y)							7,270
Carbon sink potential - Mid - Increase							-1,114
trees outside forests (1000 tCO2e/y)							.,
Carbon sink potential - Mid - Reforest							-1,673
cropland (1000 tCO2e/y)							1,010
Carbon sink potential - Mid - Reforest							-3,494
pasture (1000 tC02e/y)							G ₁ . , , .
Carbon sink potential - Mid - Restore							-2,820
productivity (1000 tCO2e/y)							_,0_0
Land impacted for carbon sink potential -							64.2
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							285
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -					+		4,144
High - Extend rotation length (1000							.,
hectares)							
Land impacted for carbon sink potential -							336
High - Improve plantations (1000							
hectares)							

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

2020	2025	2030	2035	2040	2045	2050
						0
						157
						147
						147
						185
						100
						1,398
						1,370
						6,716
						-,
						32.1
						267
						1,588
						168
						0
						00.5
						82.5
						73.7
						13.1
						32
						32
						846
						040
						3,089
						-,
						48.1
						276
						2,866
						253
						0
						100
						120
	2020		2020 2025 2030			

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							111
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							231
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,704
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,608
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)		420	354	284	214	135	93.3
Natural gas consumption - Cumulative		0	0	0	0	0	8,559
(tcf)							
Natural gas production - Annual (tcf)		0	0	0	0	0	0
Oil consumption - Annual (million bbls)		112	99.9	80.7	62.9	48.7	38
Oil consumption - Cumulative (million		0	0	0	0	0	2,487
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 -		455	0.374	0.363	0.319	0.222	0.013
Coal (million 2019\$)							
Monetary damages from air pollution -		134	93.8	52.9	42.8	27	12.1
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,048	981	749	435	201	81.6
Transportation (million 2019\$)							
Premature deaths from air pollution -		51.4	0.042	0.041	0.036	0.025	0.001
Coal (deaths)							
Premature deaths from air pollution -		15.1	10.6	5.97	4.84	3.05	1.37
Natural Gas (deaths)							
Premature deaths from air pollution -		118	110	84.2	49	22.6	9.18
Transportation (deaths)							

Table 16: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		1,079	1,220	1,016	574	900	1,821
By economic sector - Construction (jobs)		4,987	5,073	6,937	7,464	9,195	14,789
By economic sector - Manufacturing		6,804	7,976	10,231	9,740	8,396	11,665
(jobs)							
By economic sector - Mining (jobs)		2,322	1,587	1,067	687	423	269
By economic sector - Other (jobs)		312	344	666	704	906	1,560
By economic sector - Pipeline (jobs)		528	452	362	275	213	360
By economic sector - Professional (jobs)		2,918	2,957	3,558	4,075	6,429	11,532
By economic sector - Trade (jobs)		2,602	2,258	2,526	2,568	3,366	5,661
By economic sector - Utilities (jobs)		6,264	5,853	7,176	8,101	10,069	15,287
By education level - All sectors -		8,381	8,391	10,424	10,849	12,626	19,752
Associates degree or some college (jobs)							
By education level - All sectors -		5,788	5,658	6,651	6,822	8,148	12,964
Bachelors degree (jobs)							
By education level - All sectors - Doctoral		177	172	197	209	293	503
degree (jobs)							
By education level - All sectors - High		12,126	12,188	14,736	14,710	16,816	26,439
school diploma or less (jobs)							

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

Table 10. L+ Scellal 10 - IMPACIS - Jubs (cui	•						
Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Masters		1,345	1,309	1,531	1,597	2,015	3,285
or professional degree (jobs)							
By resource sector - Biomass (jobs)		2,792	2,909	2,325	1,396	3,327	7,932
By resource sector - CO2 (jobs)		0	0	0	0	206	1,869
By resource sector - Coal (jobs)		1,355	369	0	0	0	0
By resource sector - Grid (jobs)		6,660	6,987	11,146	13,349	16,356	26,106
By resource sector - Natural Gas (jobs)		5,020	4,379	3,611	3,308	3,575	2,390
By resource sector - Nuclear (jobs)		649	508	185	0	0	0
By resource sector - Oil (jobs)		4,997	4,076	3,041	2,199	1,592	1,166
By resource sector - Solar (jobs)		2,968	3,291	6,000	5,459	4,772	7,090
By resource sector - Wind (jobs)		3,376	5,199	7,231	8,477	10,071	16,390
Median wages - Annual - All (\$2019 per		60,691	60,843	61,317	62,867	64,760	65,800
job)							
On-Site or In-Plant Training - Total jobs - 1		4,344	4,328	5,338	5,538	6,451	10,081
to 4 years (jobs)							
On-Site or In-Plant Training - Total jobs - 4		1,677	1,637	2,023	2,147	2,617	4,140
to 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		4,470	4,481	5,413	5,519	6,500	10,311
None (jobs)							
On-Site or In-Plant Training - Total jobs -		228	229	286	299	351	551
Over 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		17,098	17,044	20,479	20,684	23,980	37,861
Up to 1 year (jobs)							
On-the-Job Training - All sectors - 1 to 4		5,522	5,497	6,802	7,102	8,311	12,985
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,592	1,558	1,955	2,095	2,571	4,072
years (jobs)							
On-the-Job Training - All sectors - None		1,509	1,487	1,775	1,786	2,097	3,347
(jobs)							
On-the-Job Training - All sectors - Over 10		270	276	341	343	377	582
years (jobs)							
On-the-Job Training - All sectors - Up to 1		18,925	18,900	22,666	22,862	26,542	41,957
year (jobs)							
Related work experience - All sectors - 1		9,892	9,793	11,821	12,139	14,288	22,516
to 4 years (jobs)							
Related work experience - All sectors - 4		6,290	6,233	7,587	7,865	9,254	14,555
to 10 years (jobs)							
Related work experience - All sectors -		4,057	4,045	4,880	4,945	5,772	9,107
None (jobs)							
Related work experience - All sectors -		1,734	1,737	2,117	2,173	2,482	3,869
Over 10 years (jobs)							
Related work experience - All sectors - Up		5,845	5,910	7,134	7,065	8,102	12,896
to 1 year (jobs)							
Wage income - All (million \$2019)		1,688	1,687	2,057	2,149	2,584	4,142

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	19,301	21,085	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	41	45.8	49.8	60.5	75.4	84.5	87.7
Resistance (%)							
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Sales of space heating units - Electric	0.938	4.33	5.66	9.99	20.2	33.1	40.9
Heat Pump (%)							
Sales of space heating units - Electric	3.03	3.36	3.47	3.84	4.75	5.92	6.59
Resistance (%)							
Sales of space heating units - Fossil (%)	5.62	3.12	3.01	2.66	2.19	1.88	1.77
Sales of space heating units - Gas Furnace	90.4	89.2	87.9	83.5	72.8	59.1	50.7
(%)							

Table 17: F- scenario -	DTI I AP 1. Efficiency	/Flectrification -	Commercial (continued)
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Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric	0.306	0.605	1.35	3.8	9.77	17.5	22.2
Heat Pump (%)							
Sales of water heating units - Electric	2.97	3.47	4.17	6.6	12.5	20.1	24.7
Resistance (%)							
Sales of water heating units - Gas Furnace	96.6	95.7	94.3	89.4	77.6	62.3	52.9
(%)							
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.66	2.66	3.62	3.74	5.53	5.85
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)	194	191	186	183	179	175	171
Final energy use - Industry (PJ)	516	524	517	508	504	500	498
Final energy use - Residential (PJ)	247	230	218	208	197	184	171
Final energy use - Transportation (PJ)	509	478	433	396	369	336	297

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	3.29	4.06	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	50.9	52.2	56.7	68.5	85	95.2	98.7
Resistance (%)							
Sales of cooking units - Gas (%)	49.1	47.8	43.3	31.5	15	4.84	1.3
Sales of space heating units - Electric	3.66	7.03	8.43	13	23.5	36.7	44.5
Heat Pump (%)							
Sales of space heating units - Electric	13.4	19	18.7	17.9	16	13.7	12.5
Resistance (%)							
Sales of space heating units - Fossil (%)	9.47	16.4	16.3	15.5	14	12.3	11.1
Sales of space heating units - Gas (%)	73.5	57.5	56.6	53.6	46.4	37.4	31.9
Sales of water heating units - Electric	0	0.205	0.783	2.7	7.35	13.3	17
Heat Pump (%)							
Sales of water heating units - Electric	24.6	40.2	40.4	41.4	44.2	47.7	49.9
Resistance (%)							
Sales of water heating units - Gas Furnace	75.4	59.4	58.7	55.8	48.3	38.9	33
(%)							
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.115	0.115	0.115	0.115

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	0	177	370	1,251	3,933	5,731
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.143	0	0.646	0	3.34	0	9.32
units)							
Public EV charging plugs - L2 (1000 units)	0.459	0	15.5	0	80.4	0	224
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 (%)	1.6	2	2.06	1.64	1.05	0.542	0.232

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - EV (%)	1.85	4.59	11.7	25.6	48.1	71.8	87.5
Vehicle sales - Light-duty - gasoline (%)	91.9	87.6	79.9	67	46.6	25.1	11
Vehicle sales - Light-duty - hybrid (%)	4.47	5.28	5.94	5.42	4.08	2.42	1.18
Vehicle sales - Light-duty - hydrogen FC	0.113	0.381	0.328	0.251	0.179	0.099	0.046
(%)							
Vehicle sales - Light-duty - other (%)	0.104	0.108	0.098	0.086	0.062	0.034	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							-1,228
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-4,55
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-189
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-5,975
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,228
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,39
deployment - Cropland measures (1000							·
tCO2e/y)							
Carbon sink potential - Moderate							-94.6
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-3,720
deployment - Total (1000 tCO2e/y)							-7:
Land impacted for carbon sink -						+	479
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							3,259
Aggressive deployment - Cropland							0,20
measures (1000 hectares)							
Land impacted for carbon sink -						+	344
Aggressive deployment - Permanent							04-
conservation cover (1000 hectares)							
Land impacted for carbon sink -							4,082
Aggressive deployment - Total (1000							4,002
hectares)							
Land impacted for carbon sink - Moderate							479
							40
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							1 71
Land impacted for carbon sink - Moderate							1,716
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							172
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 - Moderate							2,367
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							-392
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-32,495
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,104
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-8,126
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-912
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,364
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,651
trees outside forests (1000 tCO2e/y)							•
Carbon sink potential - High - Reforest							-2,230
cropland (1000 tCO2e/y)							_,
Carbon sink potential - High - Reforest							-6,496
pasture (1000 tC02e/y)							0,470
Carbon sink potential - High - Restore							-4,219
productivity (1000 tCO2e/y)							-4,217
							-197
Carbon sink potential - Low - Accelerate							-197
regeneration (1000 tCO2e/y)							0.071
Carbon sink potential - Low - All (not							-9,861
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-351
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,121
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-464
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-2,121
retention of HWP (1000 tCO2e/y)							,
Carbon sink potential - Low - Increase							-578
trees outside forests (1000 tC02e/y)							0.0
Carbon sink potential - Low - Reforest							-1,115
cropland (1000 tCO2e/y)							-1,110
Carbon sink potential - Low - Reforest							-492
							-492
pasture (1000 tC02e/y)							1 / 00
Carbon sink potential - Low - Restore							-1,422
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-294
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-21,170
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,227
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-5,624
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-680
plantations (1000 tCO2e/y)							230
Carbon sink potential - Mid - Increase							-4,243
retention of HWP (1000 tCO2e/y)							7,240
Carbon sink potential - Mid - Increase		+				+	-1,114
•							-1,114
trees outside forests (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest							-1,673
cropland (1000 tCO2e/y)							0 / 0 /
Carbon sink potential - Mid - Reforest							-3,494
pasture (1000 tC02e/y)							0.000
Carbon sink potential - Mid - Restore							-2,820
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							64.2
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							285
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,144
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							336
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 -							157
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							147
High - Reforest cropland (1000 hectares)							1-71
Land impacted for carbon sink potential -							185
High - Reforest pasture (1000 hectares)							100
Land impacted for carbon sink potential -							1,398
							1,396
High - Restore productivity (1000							
hectares)							/ 71/
Land impacted for carbon sink potential -							6,716
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							32.1
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							267
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,588
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							168
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 -							82.5
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							73.7
Low - Reforest cropland (1000 hectares)							10.1
Land impacted for carbon sink potential -							32
·							32
Low - Reforest pasture (1000 hectares)							0//
Land impacted for carbon sink potential -							846
Low - Restore productivity (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							3,089
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							48.1
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							276
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,866
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							253
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 -							120
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							111
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							231
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,704
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,608
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 24: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		455	0.374	0.363	0.319	0.222	0.013
Monetary damages from air pollution - Natural Gas (million 2019\$)		126	66.5	27.2	12.7	5.01	3.96
Monetary damages from air pollution - Transportation (million 2019\$)		1,066	1,081	1,057	957	766	529
Premature deaths from air pollution - Coal (deaths)		51.4	0.042	0.041	0.036	0.025	0.001
Premature deaths from air pollution - Natural Gas (deaths)		14.3	7.5	3.08	1.43	0.566	0.448
Premature deaths from air pollution - Transportation (deaths)		120	122	119	108	86.2	59.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	19,303	21,086	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	41	54.2	82.9	88.6	88.9	88.9	88.9
Resistance (%)							
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric	0.938	6.01	29.4	77.8	88.2	89	89.1
Heat Pump (%)							
Sales of space heating units - Electric	3.03	3.48	5.44	9.73	10.5	10.6	10.6
Resistance (%)							
Sales of space heating units - Fossil (%)	5.62	2.66	0.503	0.021	0	0	0

Table 25: F+RF+	scenario - DII I AR 1	Efficiency/Electrification -	Commercial (continued)
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Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	90.4	87.9	64.6	12.4	1.3	0.384	0.356
Sales of water heating units - Electric Heat Pump (%)	0.306	1.32	13.9	42.1	48.3	48.8	48.8
Sales of water heating units - Electric Resistance (%)	2.97	4.18	16.6	44.4	50.5	51	51
Sales of water heating units - Gas Furnace (%)	96.6	94.3	69.4	13.2	1.05	0.035	0
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.38	3.48	6.55	7	5.91	6.17
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)	194	191	184	171	157	146	140
Final energy use - Industry (PJ)	516	524	516	503	496	492	490
Final energy use - Residential (PJ)	247	230	215	188	157	132	115
Final energy use - Transportation (PJ)	508	474	413	338	271	230	212

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	3.31	4.14	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	51.1	61.5	93.4	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	48.9	38.5	6.59	0.332	0	0	0
Sales of space heating units - Electric	3.66	8.85	32.5	79.5	89.5	90.4	90.3
Heat Pump (%)							
Sales of space heating units - Electric	13.4	18.8	15	6.74	4.9	4.78	4.99
Resistance (%)							
Sales of space heating units - Fossil (%)	9.47	16	12.3	6.05	4.79	4.67	4.5
Sales of space heating units - Gas (%)	73.5	56.3	40.2	7.71	0.776	0.203	0.19
Sales of water heating units - Electric	0	0.766	10.6	32.6	37.2	37.5	37.6
Heat Pump (%)							
Sales of water heating units - Electric	24.6	40.6	46.1	59	62.1	62.3	62.3
Resistance (%)							
Sales of water heating units - Gas Furnace	75.4	58.6	43.2	8.25	0.653	0.021	0
(%)							
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.114	0.112	0.112	0.113

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,089	2,796	4,523	6,855	7,457	7,112
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.143	0	2.06	0	9	0	14.5
units)							
Public EV charging plugs - L2 (1000 units)	0.459	0	49.6	0	216	0	350
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							

Table 29: E+RE+ scena	nio DILLAD 1. Efficience	v/Electrification	Transportation	(nontinued)
Table 29. E+RE+ Scellu	II IU - PILLAR I. EIIIUIEIIU	: 7/ = 12011 1110011011 -	Trunsbortution	COMUNICEUM

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.58	1.84	1.27	0.407	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.8	14.8	45.9	81.6	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.1	78.4	49.4	16.7	3.32	0.591	0
Vehicle sales - Light-duty - hybrid (%)	4.31	4.46	3.18	1.18	0.288	0.063	0
Vehicle sales - Light-duty - hydrogen FC	0.111	0.342	0.206	0.064	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.103	0.099	0.065	0.023	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)	0	0	0.207	0.28	0.969	0.509	7.33
Capital invested - Wind - Base (billion \$2018)	0	1.23	2.48	3.09	9.85	22.7	26.9
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Solar - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	830	0	303	444	1,615	903	13,765
Solar - Constrained land use assumptions (GWh)	830	0	682	1,479	552	0	17,705
Wind - Base land use assumptions (GWh)	3,031	2,960	6,304	8,256	27,308	66,670	81,297
Wind - Constrained land use assumptions (GWh)	3,031	1,703	9,238	44,103	50,614	16,719	29,313

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-1,228
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-4,557
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-189
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-5,975
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,228
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-2,397
deployment - Cropland measures (1000							
tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-94.6
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-3,720
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							479
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							3,259
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							344
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							4,082
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							479
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,716
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							172
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							2,367
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-392
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-32,495
Carbon sink potential - High - Avoid							-2,104
deforestation (1000 tCO2e/y) Carbon sink potential - High - Extend							-8,126
rotation length (1000 tC02e/y) Carbon sink potential - High - Improve plantations (1000 tC02e/y)							-912
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,364
Carbon sink potential - High - Increase							-1,651
trees outside forests (1000 tC02e/y) Carbon sink potential - High - Reforest							-2,230
cropland (1000 tCO2e/y) Carbon sink potential - High - Reforest							-6,496
pasture (1000 tCO2e/y) Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,219
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-197
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-9,861
Carbon sink potential - Low - Avoid							-351
deforestation (1000 tCO2e/y) Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,121

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Improve							-464
plantations (1000 tCO2e/y)							0.101
Carbon sink potential - Low - Increase							-2,121
retention of HWP (1000 tCO2e/y)							F70
Carbon sink potential - Low - Increase							-578
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-1,115
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-492
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,422
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-294
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-21,170
counting overlap) (1000 tCO2e/y)							•
Carbon sink potential - Mid - Avoid							-1,227
deforestation (1000 tCO2e/y)							.,
Carbon sink potential - Mid - Extend							-5,624
rotation length (1000 tC02e/y)							0,024
Carbon sink potential - Mid - Improve		+	+				-680
plantations (1000 tCO2e/y)							-000
							/ 0/0
Carbon sink potential - Mid - Increase							-4,243
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-1,114
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,673
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-3,494
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-2,820
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							64.2
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -			+				285
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,144
High - Extend rotation length (1000							4,144
hectares)							
Land impacted for carbon sink potential -							336
							330
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 -							157
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							147
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							185
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -			-				1,398
High - Restore productivity (1000							1,070
hectares)							
-							<u> </u>
Land impacted for carbon sink potential -							6,716
High - Total impacted (over 30 years)							
(1000 hectares)							

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

2050
32.1
32.1
267
267
1,588
168
0
82.5
73.7
32
846
3,089
48.1
276
2,866
253
0
120
111
231
_01
1,704
1,104
5,608
0,000

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		455	0.374	0.363	0.319	0.222	0.013
Coal (million 2019\$)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		120	71.9	35	23.8	9.59	3.96
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,048	981	749	435	201	81.6
Transportation (million 2019\$)							
Premature deaths from air pollution -		51.4	0.042	0.041	0.036	0.025	0.001
Coal (deaths)							
Premature deaths from air pollution -		13.5	8.12	3.95	2.69	1.08	0.447
Natural Gas (deaths)							
Premature deaths from air pollution -		118	110	84.2	49	22.6	9.18
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	19,303	21,086	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	41	54.2	82.9	88.6	88.9	88.9	88.9
Resistance (%)							
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric	0.938	6.01	29.4	77.8	88.2	89	89.1
Heat Pump (%)							
Sales of space heating units - Electric	3.03	3.48	5.44	9.73	10.5	10.6	10.6
Resistance (%)							
Sales of space heating units - Fossil (%)	5.62	2.66	0.503	0.021	0	0	0
Sales of space heating units - Gas Furnace	90.4	87.9	64.6	12.4	1.3	0.384	0.356
(%)							
Sales of water heating units - Electric	0.306	1.32	13.9	42.1	48.3	48.8	48.8
Heat Pump (%)							
Sales of water heating units - Electric	2.97	4.18	16.6	44.4	50.5	51	51
Resistance (%)							
Sales of water heating units - Gas Furnace	96.6	94.3	69.4	13.2	1.05	0.035	0
(%)							
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.38	3.48	6.55	7	5.91	6.17
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)	194	191	184	171	157	146	140
Final energy use - Industry (PJ)	516	524	516	503	496	492	490
Final energy use - Residential (PJ)	247	230	215	188	157	132	115
Final energy use - Transportation (PJ)	508	474	413	338	271	230	212

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	3.31	4.14	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	51.1	61.5	93.4	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	48.9	38.5	6.59	0.332	0	0	0
Sales of space heating units - Electric	3.66	8.85	32.5	79.5	89.5	90.4	90.3
Heat Pump (%)							
Sales of space heating units - Electric	13.4	18.8	15	6.74	4.9	4.78	4.99
Resistance (%)							

Table 38: E+RE-	acanania DII	I AD 1. Eff	icionou/Floota	ification	Dooidontial	(continued)
14016 20: E+KE-	SCEHULTO - PIL	LAK I. EIII	ICIEHCV/EIECH	IIICULIUII	Residentiali	COMUNICEUM

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Fossil (%)	9.47	16	12.3	6.05	4.79	4.67	4.5
Sales of space heating units - Gas (%)	73.5	56.3	40.2	7.71	0.776	0.203	0.19
Sales of water heating units - Electric Heat Pump (%)	0	0.766	10.6	32.6	37.2	37.5	37.6
Sales of water heating units - Electric Resistance (%)	24.6	40.6	46.1	59	62.1	62.3	62.3
Sales of water heating units - Gas Furnace (%)	75.4	58.6	43.2	8.25	0.653	0.021	0
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.114	0.112	0.112	0.113

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -	0	1,089	2,796	4,523	6,855	7,457	7,112
Cumulative 5-yr (million \$2018)		,	, -	,-	-,	, -	,
Public EV charging plugs - DC Fast (1000	0.143	0	2.06	0	9	0	14.5
units)							
Public EV charging plugs - L2 (1000 units)	0.459	0	49.6	0	216	0	350
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 (%)	1.58	1.84	1.27	0.407	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.8	14.8	45.9	81.6	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.1	78.4	49.4	16.7	3.32	0.591	0
Vehicle sales - Light-duty - hybrid (%)	4.31	4.46	3.18	1.18	0.288	0.063	0
Vehicle sales - Light-duty - hydrogen FC	0.111	0.342	0.206	0.064	0.013	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.103	0.099	0.065	0.023	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0.075	0
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	0.095	0.11	0.273	0
Capital invested - Wind - Base (billion \$2018)		1.09	0.945	0.889	1.06	1.88	0.039
Capital invested - Wind - Constrained (billion \$2018)		0.324	0.812	2.3	3.78	11.6	0.156

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	830	0	0	0	0	132	0
Solar - Constrained land use assumptions	830	0	0	152	184	480	0
(GWh)							
Wind - Base land use assumptions (GWh)	3,031	2,650	2,425	2,449	3,011	5,538	118
Wind - Constrained land use assumptions	3,031	753	1,998	6,053	10,535	34,013	483
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-1,228
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-4,557
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-189
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-5,975
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,228
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,397
deployment - Cropland measures (1000							_,
tCO2e/y)							
Carbon sink potential - Moderate							-94.6
deployment - Permanent conservation							7 1.0
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-3,720
deployment - Total (1000 tC02e/y)							0,120
Land impacted for carbon sink -						+	479
Aggressive deployment - Corn-ethanol to							417
energy grasses (1000 hectares)							
Land impacted for carbon sink -							3,259
Aggressive deployment - Cropland							3,237
measures (1000 hectares)							0//
Land impacted for carbon sink -							344
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							,
Land impacted for carbon sink -							4,082
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							479
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,716
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							172
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							2,367
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-392
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-32,495
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,104
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-8,126
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-912
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,364
retention of HWP (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase							-1,65
trees outside forests (1000 tC02e/y)							0.007
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-2,230
Carbon sink potential - High - Reforest pasture (1000 tC02e/y)							-6,496
Carbon sink potential - High - Restore productivity (1000 tC02e/y)							-4,219
Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)							-19 ⁻
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-9,86
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-35
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,12
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-464
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,12
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-578
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,11
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-49
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,42
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-29
Carbon sink potential - Mid - All (not counting overlap) (1000 tC02e/y)							-21,17
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,22
Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y)							-5,62
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-68
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)							-4,24
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-1,11
Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y)							-1,67
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y) Carbon sink potential - Mid - Restore							-3,49 -2,82
productivity (1000 tCO2e/y) Land impacted for carbon sink potential -							-2,82
High - Accelerate regeneration (1000 hectares)							04
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years)							28
(1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,14
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							33

Table 43: 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 -							157
High - Increase trees outside forests							101
(1000 hectares)							
Land impacted for carbon sink potential -							14
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							185
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,398
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,716
High - Total impacted (over 30 years)							
(1000 hectares) Land impacted for carbon sink potential -							32.
Low - Accelerate regeneration (1000							32.
hectares)							
Land impacted for carbon sink potential -							26
Low - Avoid deforestation (over 30 years)							201
(1000 hectares)							
Land impacted for carbon sink potential -							1,588
Low - Extend rotation length (1000							•
hectares)							
Land impacted for carbon sink potential -							168
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							(
Low - Increase retention of HWP (1000							
hectares)							00.1
Land impacted for carbon sink potential -							82.5
Low - Increase trees outside forests (1000 hectares)							
Land impacted for carbon sink potential -							73.
Low - Reforest cropland (1000 hectares)							13.
Land impacted for carbon sink potential -							32
Low - Reforest pasture (1000 hectares)							0.
Land impacted for carbon sink potential -							846
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							3,089
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							48.
Mid - Accelerate regeneration (1000							
hectares)							07
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years)							270
(1000 hectares)							
Land impacted for carbon sink potential -							2,86
Mid - Extend rotation length (1000							2,000
hectares)							
Land impacted for carbon sink potential -			+				25
Mid - Improve plantations (1000 hectares)							200
Land impacted for carbon sink potential -			+				(
Mid - Increase retention of HWP (1000							,
hectares)							
Land impacted for carbon sink potential -							120
Mid - Increase trees outside forests (1000							
hectares)							

Table 43: E+RE-	econario -	DTIIADA	· I and einke .	Forests	(continued)
1auit 45. E+KE-	SCEIIUI 10 -	PILLAR	o. Luiiu Siiiks ·	- ศบาษธเธา	CUILLIIUEUI

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							111
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							231
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,704
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,608
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 -		455	0.374	0.363	0.319	0.222	0.013
Coal (million 2019\$)							
Monetary damages from air pollution -		139	97.1	147	108	38.6	14.8
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		1,048	981	749	435	201	81.6
Transportation (million 2019\$)							
Premature deaths from air pollution -		51.4	0.042	0.041	0.036	0.025	0.001
Coal (deaths)							
Premature deaths from air pollution -		15.7	11	16.6	12.2	4.36	1.67
Natural Gas (deaths)							
Premature deaths from air pollution -		118	110	84.2	49	22.6	9.18
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)	0	19,301	21,085	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Sales of space heating units - Electric Heat Pump (%)	0.938	4.33	5.66	9.99	20.2	33.1	40.9
Sales of space heating units - Electric Resistance (%)	3.03	3.36	3.47	3.84	4.75	5.92	6.59
Sales of space heating units - Fossil (%)	5.62	3.12	3.01	2.66	2.19	1.88	1.77
Sales of space heating units - Gas Furnace (%)	90.4	89.2	87.9	83.5	72.8	59.1	50.7
Sales of water heating units - Electric Heat Pump (%)	0.306	0.605	1.35	3.8	9.77	17.5	22.2
Sales of water heating units - Electric Resistance (%)	2.97	3.47	4.17	6.6	12.5	20.1	24.7
Sales of water heating units - Gas Furnace (%)	96.6	95.7	94.3	89.4	77.6	62.3	52.9
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.66	2.66	3.62	3.74	5.53	5.85
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)	194	191	186	183	179	175	171

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	516	524	517	508	504	500	498
Final energy use - Residential (PJ)	247	230	218	208	197	184	171
Final energy use - Transportation (PJ)	509	478	433	396	369	336	297

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	3.29	4.06	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	50.9	52.2	56.7	68.5	85	95.2	98.7
Resistance (%)							
Sales of cooking units - Gas (%)	49.1	47.8	43.3	31.5	15	4.84	1.3
Sales of space heating units - Electric	3.66	7.03	8.43	13	23.5	36.7	44.5
Heat Pump (%)							
Sales of space heating units - Electric	13.4	19	18.7	17.9	16	13.7	12.5
Resistance (%)							
Sales of space heating units - Fossil (%)	9.47	16.4	16.3	15.5	14	12.3	11.1
Sales of space heating units - Gas (%)	73.5	57.5	56.6	53.6	46.4	37.4	31.9
Sales of water heating units - Electric	0	0.205	0.783	2.7	7.35	13.3	17
Heat Pump (%)							
Sales of water heating units - Electric	24.6	40.2	40.4	41.4	44.2	47.7	49.9
Resistance (%)							
Sales of water heating units - Gas Furnace	75.4	59.4	58.7	55.8	48.3	38.9	33
(%)							
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.115	0.115	0.115	0.115

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	177	370	1,251	3,933	5,731
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.143	0	0.646	0	3.34	0	9.32
units)							
Public EV charging plugs - L2 (1000 units)	0.459	0	15.5	0	80.4	0	224
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 (%)	1.6	2	2.06	1.64	1.05	0.542	0.232
Vehicle sales - Light-duty - EV (%)	1.85	4.59	11.7	25.6	48.1	71.8	87.5
Vehicle sales - Light-duty - gasoline (%)	91.9	87.6	79.9	67	46.6	25.1	11
Vehicle sales - Light-duty - hybrid (%)	4.47	5.28	5.94	5.42	4.08	2.42	1.18
Vehicle sales - Light-duty - hydrogen FC	0.113	0.381	0.328	0.251	0.179	0.099	0.046
(%)							
Vehicle sales - Light-duty - other (%)	0.104	0.108	0.098	0.086	0.062	0.034	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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)	0	0	0	0	0	2,034	3,688
Conversion capital investment -	0	0	0	0	0	21,604	18,471
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	25	28
(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	16
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	0	27.8	31.1
Annual - BECCS (MMT)		0	0	0	0	27.8	31.1
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	0	27.8	58.9
Cumulative - BECCS (MMT)		0	0	0	0	27.8	58.9
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	0	0	583	380
Cumulative investment - All (million \$2018)		0	0	0	0	928	788
Cumulative investment - Spur (million \$2018)		0	0	0	0	928	788
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Spur (km)		0	0	0	0	583	380
Trunk (km)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-1,571
deployment - Corn-ethanol to energy							.,
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-4,130
deployment - Cropland measures (1000							,
tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							
crops (1000 tC02e/y)							
Carbon sink potential - Aggressive							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Aggressive						+	-170
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-5,872
deployment - Total (1000 tC02e/y)							0,012
Carbon sink potential - Moderate							-1,571
deployment - Corn-ethanol to energy							1,011
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-2,172
deployment - Cropland measures (1000							2,112
tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy							U
crops (1000 tC02e/y)							
Carbon sink potential - Moderate							0
deployment - Pasture to energy crops							Ū
(1000 tC02e/y)							
Carbon sink potential - Moderate							-85.2
deployment - Permanent conservation							00.2
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-3,828
deployment - Total (1000 tC02e/y)							0,020
Land impacted for carbon sink -							798
Aggressive deployment - Corn-ethanol to							170
energy grasses (1000 hectares)							
Land impacted for carbon sink -							7,286
Aggressive deployment - Cropland							1,200
measures (1000 hectares)							
Land impacted for carbon sink -							33.6
Aggressive deployment - Cropland to							00.0
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							137
Aggressive deployment - Pasture to							101
energy crops (1000 hectares)							
Land impacted for carbon sink -							310
Aggressive deployment - Permanent							510
conservation cover (1000 hectares)							
Land impacted for carbon sink -							8,565
Earra Impublica for our boll office							0,000
Aggressive deployment - Total (1000				1			

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate							798
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,553
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							33.6
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							137
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							155
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							2,677
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-392
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-32,495
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,104
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-8,126
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-912
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-6,364
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,651
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-2,230
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-6,496
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-4,219
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-197
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-9,861
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-351
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,121
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-464
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-2,121
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-578
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-1,115
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-492
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,422
productivity (1000 tCO2e/y)							

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

counting overlap] (1000 tCO2e/v) Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/v) Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/v) Carbon sink potential - Mid - Improve plantations (1000 tCO2e/v) Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/v) Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/v) Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/v) Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/v) Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/v) Carbon sink potential - Mid - Reforest post sink potential - Mid - Restore productivity (1000 tCO2e/v) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/v) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/v) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/v) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/v) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/v) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/v) Carbon sink potential - Mid - Restore productivity (1000 tCO2e/v) Carbon sink potential - Mid - Restore sink potential - Mid - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - Mid - Increase retention of hwp (1000 hectares) Land impacted for carbon sink potential - Mid - Reforest productivity (1000 hectares) Land impacted for carbon sink potential - Mid - Reforest productivity (1000 hectares) Land impacted for carbon sink potential - Mid - Reforest productivity (1000 hectares) Land impacted for carbon sink potential - Mid - Reforest productivity (1000 hectares) Land impacted for carbon sink potential - Mid - Reforest productivity (1000 hectares)	2050
regeneration (1000 tC02e/y) Carbon sink potential - Mid - Al (not counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest corpland (1000 tC02e/y) Carbon sink potential - Mid - Reforest corpland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Avoid deforestation (1000 tc02e/y) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Reforest crapland (1000 hectares) Land impacted for carbon sink potential - High - Reforest crapland (1000 hectares) Land impacted for carbon sink potential - High - Reforest crapland (1000 hectares) Land impacted for carbon sink potential - High - Reforest crapland (1000 hectares) Land impacted for carbon sink potential - High - Reforest crapland (1000 hectares)	-294
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Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y) Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore productivity (1000 tC02e/y) Carbon sink potential - Mid - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - High - Increase tree for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase retension of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase retension of HWP (1000 hectares) Land impacted for carbon sink potential - High - Reforest carbon sink potential - High - Reforest carbon sink potential - High - Reforest position of the potential - High - Reforest position	21,110
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Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y) Carbon sink potential - Mid - Improve plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase trese outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest troopland (1000 tC02e/y) Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore productivity (1000 tC02e/y) Carbon sink potential - Mid - Restore productivity (1000 tC02e/y) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Reforest copland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest posturity (1000 hectares) Land impacted for carbon sink potential - High - Reforest copland (1000 hectares) Land impacted for carbon sink potential - High - Reforest posturity (1000 hectares) Land impacted for carbon sink potential - High - Reforest posturity (1000 hectares) Land impacted for carbon sink potential - High - Reforest posturity (1000 hectares) Land impacted for carbon sink potential - High - Reforest posturity (1000 hectares) Land impacted for carbon sink potential - High - Reforest posturity (1000 hectares) Land impacted for carbon sink potential - High - Reforest posturi	1,221
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Carbon sink potential - Mid - Improve plantations (1000 tC02e/v) Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/v) Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/v) Carbon sink potential - Mid - Reforest cropland (1000 tC02e/v) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/v) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/v) Carbon sink potential - Mid - Restore productivity (1000 tC02e/v) Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares) Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Improve plantations (1000 hectares) Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0,024
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Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares) Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares) Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) Land impacted for carbon sink potential -	
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High - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) Land impacted for carbon sink potential -	147
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) Land impacted for carbon sink potential -	
High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) Land impacted for carbon sink potential -	185
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares) Land impacted for carbon sink potential -	100
High - Restore productivity (1000 hectares) Land impacted for carbon sink potential -	1,398
hectares) Land impacted for carbon sink potential -	1,070
Land impacted for carbon sink potential -	
	6,716
High - Lotal impacted lover 311 years	0,110
High - Total impacted (over 30 years) (1000 hectares)	
Land impacted for carbon sink potential -	32.1
Low - Accelerate regeneration (1000	32.1
hectares)	
Land impacted for carbon sink potential -	267
Low - Avoid deforestation (over 30 years)	
(1000 hectares)	4555
	1,588
Low - Extend rotation length (1000	
hectares)	
Land impacted for carbon sink potential -	168
Low - Improve plantations (1000	
hectares)	

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							82.5
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							73.7
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							32
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							846
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							3,089
Low - Total impacted (over 30 years)							•
(1000 hectares)							
Land impacted for carbon sink potential -							48.1
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							276
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,866
Mid - Extend rotation length (1000							,
hectares)							
Land impacted for carbon sink potential -							253
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 -							120
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							111
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							231
Mid - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential -							1,704
Mid - Restore productivity (1000							.,
hectares)							
Land impacted for carbon sink potential -		+					5,608
Mid - Total impacted (over 30 years) (1000							3,000
hectares)							
1100(01 00)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		455	0.374	0.363	0.319	0.222	0.013
Monetary damages from air pollution -		127	59.8	34	22.1	10.4	4.7
Natural Gas (million 2019\$)							
Monetary damages from air pollution - Transportation (million 2019\$)		1,066	1,081	1,057	957	766	529
Premature deaths from air pollution - Coal (deaths)		51.4	0.042	0.041	0.036	0.025	0.001
Premature deaths from air pollution -		14.3	6.76	3.84	2.49	1.18	0.53
Natural Gas (deaths) Premature deaths from air pollution -		120	122	119	108	86.2	59.5
Transportation (deaths)		120	122	117	100	00.2	07.0

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -	0	19,095	19,795	0	0	0	0
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	41	44.2	44.3	44.3	44.3	44.4	44.5
Resistance (%)							
Sales of cooking units - Gas (%)	59	55.8	55.7	55.7	55.7	55.6	55.5
Sales of space heating units - Electric	0.938	11.3	43.3	70.2	74.9	75.5	75.5
Heat Pump (%)							
Sales of space heating units - Electric	3.03	4.33	9.16	17.5	23.2	24.1	24.1
Resistance (%)							
Sales of space heating units - Fossil (%)	5.62	2.84	1.46	0.267	0.031	0.001	0
Sales of space heating units - Gas Furnace	90.4	81.6	46.1	12	1.88	0.453	0.355
(%)							
Sales of water heating units - Electric	0.306	0.343	0.347	0.346	0.34	0.342	0.342
Heat Pump (%)							
Sales of water heating units - Electric	2.97	3.21	3.18	3.19	3.17	3.16	3.16
Resistance (%)							
Sales of water heating units - Gas Furnace	96.6	96.3	96.3	96.3	96.3	96.3	96.3
(%)							
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.26	3.34	4.1	4.26	3.93	4.03
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)	193	194	192	189	185	185	190			
Final energy use - Industry (PJ)	516	542	554	566	585	606	631			
Final energy use - Residential (PJ)	247	231	221	214	209	206	203			
Final energy use - Transportation (PJ)	508	478	436	411	410	422	438			

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.	0	3.19	3.37	0	0	0	0
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	50.5	50.5	50.5	50.5	50.5	50.5	50.5
Resistance (%)							
Sales of cooking units - Gas (%)	49.5	49.5	49.5	49.5	49.5	49.5	49.5
Sales of space heating units - Electric	2.81	10.6	10.9	11.5	12	12.6	13.4
Heat Pump (%)							
Sales of space heating units - Electric	13.5	18.3	18.1	17.9	17.4	16.8	16.1
Resistance (%)							
Sales of space heating units - Fossil (%)	9.72	15.4	14.9	14.5	14.5	14.6	14.5
Sales of space heating units - Gas (%)	74	55.7	56	56.1	56	56.1	56
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	24.6	40.1	39.9	39.8	39.9	39.7	39.7
Resistance (%)							
Sales of water heating units - Gas Furnace	75.4	59.8	60	60	60	60.1	60.2
(%)							
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.116	0.115	0.116	0.116

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC	0.119	0.138	0.16	0.186	0.216	0.25	0.29
(%)							
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.59	2	2.19	2.04	1.84	1.71	1.63
Vehicle sales - Light-duty - EV (%)	3.45	5.45	6.22	7.64	9.32	10.8	12
Vehicle sales - Light-duty - gasoline (%)	90.4	86.9	84.8	83	80.9	79	77.4
Vehicle sales - Light-duty - hybrid (%)	4.33	5.18	6.35	6.92	7.49	8.09	8.56
Vehicle sales - Light-duty - hydrogen FC	0.111	0.378	0.348	0.309	0.307	0.308	0.318
(%)							
Vehicle sales - Light-duty - other (%)	0.104	0.107	0.104	0.104	0.104	0.103	0.105
Vehicle sales - Medium-duty - diesel (%)	65.2	63.5	61.6	59.6	58	56.5	55.2
Vehicle sales - Medium-duty - EV (%)	0.027	0.105	0.329	0.671	0.895	0.973	0.993
Vehicle sales - Medium-duty - gasoline (%)	34	35.5	37	38.5	39.7	40.8	41.7
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen	0.175	0.208	0.242	0.285	0.339	0.409	0.487
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

Table 64: REF scenario - PILLAR 6: Land si	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate	2020	2023	2030	2000	2040	2043	-392
regeneration (1000 tCO2e/y)							-572
Carbon sink potential - High - All (not						+	-32,495
counting overlap) (1000 tCO2e/y)							-02,470
Carbon sink potential - High - Avoid							-2,104
deforestation (1000 tC02e/y)							2,104
Carbon sink potential - High - Extend							-8,126
rotation length (1000 tCO2e/y)							0,120
Carbon sink potential - High - Improve						+	-912
plantations (1000 tCO2e/y)							7.2
Carbon sink potential - High - Increase							-6,364
retention of HWP (1000 tCO2e/y)							0,00 .
Carbon sink potential - High - Increase						+	-1,651
trees outside forests (1000 tCO2e/y)							.,
Carbon sink potential - High - Reforest							-2,230
cropland (1000 tCO2e/y)							,
Carbon sink potential - High - Reforest							-6,496
pasture (1000 tC02e/y)							•
Carbon sink potential - High - Restore							-4,219
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-197
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-9,861
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-351
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,121
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-464
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-2,121
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-578
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-1,115
cropland (1000 tCO2e/y)							

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

Conhon sink notantial Law Referent	2020	2025	2030	2035	2040	2045	205 -49
Carbon sink potential - Low - Reforest							-49
pasture (1000 tC02e/y)							1.40
Carbon sink potential - Low - Restore							-1,42
productivity (1000 tC02e/y)							
Carbon sink potential - Mid - Accelerate							-29
regeneration (1000 tC02e/y)							04.4
Carbon sink potential - Mid - All (not							-21,17
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,22
deforestation (1000 tC02e/y)							
Carbon sink potential - Mid - Extend							-5,62
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-68
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-4,24
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-1,11
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-1,67
cropland (1000 tCO2e/y)							•
Carbon sink potential - Mid - Reforest							-3,49
pasture (1000 tC02e/y)							-,
Carbon sink potential - Mid - Restore							-2,82
productivity (1000 tCO2e/y)							2,02
Land impacted for carbon sink potential -							64
High - Accelerate regeneration (1000							0-1
hectares)							
Land impacted for carbon sink potential -							28
High - Avoid deforestation (over 30 years)							20
(1000 hectares)							
							/ 1/
Land impacted for carbon sink potential -							4,14
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							33
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							15
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							14
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							18
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,39
High - Restore productivity (1000							,
hectares)							
Land impacted for carbon sink potential -							6,7
High - Total impacted (over 30 years)							٥,.
(1000 hectares)							
Land impacted for carbon sink potential -							32
Low - Accelerate regeneration (1000							02
hectares)							
Land impacted for carbon sink potential -							20
							20
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							4 = -
Land impacted for carbon sink potential -							1,58
Low - Extend rotation length (1000							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							168
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 -							82.5
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							73.7
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							32
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							846
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							3,089
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							48.1
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							276
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,866
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							253
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 -							120
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							111
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							231
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,704
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,608
Mid - Total impacted (over 30 years) (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-24.8		-14.9				-13.3
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.73		-3.12				-3.24
Business-as-usual carbon sink - Total (Mt CO2e/y)	-26.6		-18				-16.5

Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		1,513	876	595	488	439	427
Monetary damages from air pollution - Natural Gas (million 2019\$)		145	141	187	144	123	110
Monetary damages from air pollution - Transportation (million 2019\$)		1,065	1,095	1,126	1,163	1,201	1,239
Premature deaths from air pollution - Coal (deaths)		171	99	67.2	55.1	49.6	48.2
Premature deaths from air pollution - Natural Gas (deaths)		16.4	15.9	21.1	16.2	13.9	12.5
Premature deaths from air pollution - Transportation (deaths)		120	123	127	131	135	139