

Net-Zero America - South Carolina data

October 29, 2021 (updated November 17, 2023)

See the Data Sheet Guide for explanations of the contents of this document. The data herein underlie graphs and tables found in Princeton's Net-Zero America report:

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Table 1: E+ scenario - IMPACTS - Health

Table 1: E+ scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		30.4	0.049	0.046	0.036	0.025	0.002
Fuel Comb - Electric Generation - Coal							
(deaths) Premature deaths from air pollution -		21	16.7	9.98	7.89	3.95	1.45
Fuel Comb - Electric Generation - Natural		21	10.7	9.90	1.09	3.95	1.45
Gas (deaths)							
Premature deaths from air pollution -		117	110	84.4	49.2	22.6	8.97
Mobile - On-Road (deaths)				0	17.2	22.0	0.71
Premature deaths from air pollution - Gas		15.4	14.2	10.8	6.43	3.13	1.47
Stations (deaths)							
Premature deaths from air pollution -		10.2	8.38	5.66	3.2	1.61	0.781
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		1.82	1.48	1.02	0.612	0.302	0.135
Fuel Comb - Residential - Oil (deaths)				1.15	1.00	2 (22	
Premature deaths from air pollution -		2.11	1.9	1.49	1.02	0.602	0.339
Fuel Comb - Residential - Other (deaths)		1.58	1.52	1.46	1.6	1.33	1.25
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal		1.56	1.52	1.46	1.4	1.33	1.25
(deaths)							
Premature deaths from air pollution -		8.36	7.38	5.45	3.45	2.12	1.38
Fuel Comb - Comm/Institutional - Natural		0.00	1.00	0.40	0.40	2.12	1.00
Gas (deaths)							
Premature deaths from air pollution -		1.5	1.25	0.971	0.698	0.486	0.321
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		1.47	1.27	1.06	0.843	0.63	0.422
Fuel Comb - Comm/Institutional - Other							
(deaths)		2 11=		2.24=	2 21 -		
Premature deaths from air pollution -		0.615	0.317	0.317	0.315	0.322	0.321
Industrial Processes - Coal Mining							
(deaths) Premature deaths from air pollution -		24.7	23.3	21.2	16.7	12.4	7.71
Industrial Processes - Oil & Gas		24.1	23.3	21.2	16.7	12.4	7.71
Production (deaths)							
Monetary damages from air pollution -		269	0.437	0.407	0.323	0.225	0.019
Fuel Comb - Electric Generation - Coal		207	0.101	0.101	0.020	0.220	0.017
(million \$2019)							
Monetary damages from air pollution -		186	148	88.4	69.9	35	12.9
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		1,041	979	750	437	201	79.7
Mobile - On-Road (million \$2019)							
Monetary damages from air pollution -		136	126	95.5	56.9	27.7	13
Gas Stations (million \$2019)		00.7	7/ 0	50.0	00.0	1/ 0	/ 00
Monetary damages from air pollution -		90.7	74.2	50.2	28.3	14.3	6.92
Fuel Comb - Residential - Natural Gas (million \$2019)							
Monetary damages from air pollution -		16.1	13.1	9.05	5.43	2.68	1.2
Fuel Comb - Residential - Oil (million		10.1	10.1	7.00	3.43	2.00	1.2
\$2019)							
Monetary damages from air pollution -		18.7	16.9	13.2	9.03	5.33	3.01
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		14	13.5	12.9	12.4	11.7	11
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		74	65.3	48.2	30.5	18.8	12.2
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)							

Table 1: E+ scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		13.3	11.1	8.59	6.18	4.31	2.84
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		13	11.2	9.36	7.46	5.58	3.74
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		5.43	2.79	2.8	2.78	2.84	2.84
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		220	207	189	148	110	68.5
Industrial Processes - Oil & Gas							
Production (million \$2019)							

Table 2: E+ scenario - IMPACTS - Jobs

Table 2: E+ Scenario - IMPACTS - Jobs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		182	370	141	326	739	941
By economic sector - Construction (jobs)		4,994	29,745	22,611	25,601	25,964	26,553
By economic sector - Manufacturing (jobs)		3,012	5,520	5,709	5,529	6,590	6,345
By economic sector - Mining (jobs)		1,727	1,235	795	478	270	148
By economic sector - Other (jobs)		444	5,801	4,138	5,127	5,206	6,122
By economic sector - Pipeline (jobs)		367	312	360	238	227	224
By economic sector - Professional (jobs)		2,907	11,791	9,166	11,012	11,907	12,958
By economic sector - Trade (jobs)		2,029	7,900	6,122	7,322	7,713	8,622
By economic sector - Utilities (jobs)		7,470	14,248	17,105	20,038	22,754	21,229
By resource sector - Biomass (jobs)		782	1,020	403	980	2,696	4,019
By resource sector - CO2 (jobs)		1.58	3.49	961	497	937	1,235
By resource sector - Coal (jobs)		744	0	0	0	0	0
By resource sector - Grid (jobs)		7,528	21,593	27,711	34,081	40,864	39,031
By resource sector - Natural Gas (jobs)		3,626	3,404	2,868	2,985	2,134	1,229
By resource sector - Nuclear (jobs)		2,635	2,593	2,552	2,512	2,126	1,604
By resource sector - Oil (jobs)		4,311	3,403	2,397	1,583	1,006	605
By resource sector - Solar (jobs)		3,490	44,695	29,093	32,489	30,224	34,635
By resource sector - Wind (jobs)		14.7	211	163	543	1,383	783
By education level - All sectors - High school diploma or less (jobs)		9,498	33,327	28,392	32,414	34,896	35,627
By education level - All sectors - Associates degree or some college (jobs)		7,133	24,566	21,342	24,465	26,256	26,755
By education level - All sectors - Bachelors degree (jobs)		5,082	14,733	12,759	14,563	15,670	16,043
By education level - All sectors - Masters or professional degree (jobs)		1,244	3,705	3,188	3,685	3,975	4,106
By education level - All sectors - Doctoral degree (jobs)		175	590	466	542	574	610
Related work experience - All sectors - None (jobs)		3,310	11,215	9,683	11,121	11,997	12,287
Related work experience - All sectors - Up to 1 year (jobs)		4,483	16,105	13,509	15,451	16,616	17,117
Related work experience - All sectors - 1 to 4 years (jobs)		8,428	27,336	23,629	27,051	29,107	29,710
Related work experience - All sectors - 4 to 10 years (jobs)		5,443	17,738	15,362	17,545	18,811	19,129
Related work experience - All sectors - Over 10 years (jobs)		1,468	4,527	3,965	4,501	4,840	4,899
On-the-Job Training - All sectors - None (jobs)		1,276	4,377	3,643	4,167	4,434	4,592
On-the-Job Training - All sectors - Up to 1 year (jobs)		15,329	49,561	42,688	48,832	52,752	54,029

Table 2. F+	scenario	- IMPACTS -	Inhe	(continued)
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Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,824	16,491	14,310	16,358	17,502	17,733
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,485	5,699	4,858	5,589	5,928	6,018
On-the-Job Training - All sectors - Over 10 years (jobs)		218	793	648	724	756	770
On-Site or In-Plant Training - All sectors - None (jobs)		3,752	12,688	10,722	12,257	13,121	13,482
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		13,908	45,130	38,931	44,533	48,075	49,191
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,739	12,773	11,066	12,650	13,550	13,748
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,543	5,658	4,837	5,550	5,892	5,975
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		189	672	591	681	734	745
Wage income - All (million \$2019)		1,208	3,771	3,330	3,854	4,209	4,336

Table 3: E+ scenario - IMPACTS - Fossil fuel industries

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		97	83.4	63.6	45.3	30.8	19.7
Oil consumption - Cumulative (million							1,969
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		254	214	172	129	81.4	56.4
Natural gas consumption - Cumulative							5,174
(tcf)							
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	463	438	386	323	267	233	218
Final energy use - Residential (PJ)	158	150	141	129	119	115	113
Final energy use - Commercial (PJ)	114	114	111	106	101	100	102
Final energy use - Industry (PJ)	358	374	380	387	398	399	404

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.55	3.63	5.67	5.98	4.97	5.12
Cumulative 5-yr (billion \$2018)							

Table 6: E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	17.4	382	746	2,022	3,298	4,317	5,336
Vehicle stocks - LDV – All others (1000	4,450	4,237	4,024	2,933	1,841	1,042	242
units)							
Light-duty vehicle capital costs vs. REF -		856	2,191	3,557	5,385	5,864	5,589
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.1		1.63		7.19		11.6
units)							
Public EV charging plugs - L2 (1000 units)	0.476		39.1		173		280

Table 7: E+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	37.5	51.9	80.7	87.2	87.5	87.4	87.4
Heat Pump (%)							
Sales of space heating units - Electric	25.8	25.3	10.7	7.34	7.15	7.29	7.33
Resistance (%)							
Sales of space heating units - Gas (%)	30.5	15	4.16	1.77	1.69	1.69	1.68
Sales of space heating units - Fossil (%)	6.1	7.81	4.43	3.7	3.67	3.6	3.59
Sales of water heating units - Electric	0	12.1	64.1	75.7	76.2	76.2	76.1
Heat Pump (%)							
Sales of water heating units - Electric	67.7	70.5	30.6	21.7	21.3	21.3	21.3
Resistance (%)							
Sales of water heating units - Gas Furnace	28.2	14.7	2.78	0.118	0	0	0
(%)							
Sales of water heating units - Other (%)	4.1	2.65	2.54	2.53	2.55	2.56	2.57
Sales of cooking units - Electric	82.7	86.4	97.7	99.9	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	17.3	13.6	2.33	0.117	0	0	0
Residential HVAC investment in 2020s vs.		3.83	4.21				
REF - Cumulative 5-yr (billion \$2018)							

Table 8: E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	10.1	27.5	70.6	83.9	85.2	85.2	85.2
Heat Pump (%)							
Sales of space heating units - Electric	9.29	8.33	10.3	12.4	12.9	12.8	12.8
Resistance (%)							
Sales of space heating units - Gas (%)	78.5	60.3	18.3	3.66	1.98	1.94	1.94
Sales of space heating units - Fossil (%)	2.15	3.92	0.743	0.032	0	0	0
Sales of water heating units - Electric	0.316	10.5	54.5	64.3	64.7	64.8	64.8
Heat Pump (%)							
Sales of water heating units - Electric	7.81	11	28.4	32.3	32.5	32.5	32.5
Resistance (%)							
Sales of water heating units - Gas (%)	88	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	3.86	4.03	2.99	2.74	2.74	2.73	2.73
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s -		15,755	17,550				
Cumulative 5-yr (million \$2018)							

Table 9: E+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,499	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,450	8,600	11,247	11,752	9,484	6,600	6,693
Installed thermal - Nuclear (MW)	5,220	5,220	5,220	5,220	5,220	3,440	3,440
Installed renewables - Rooftop PV (MW)	353	569	805	1,146	1,626	2,248	3,044
Installed renewables - Solar - Base land	1,471	1,471	31,120	43,975	57,724	67,821	78,649
use assumptions (MW)							
Installed renewables - Offshore Wind -	0	0	0	0	2,121	11,769	11,769
Base land use assumptions (MW)							
Installed renewables - Solar -	1,239	1,239	30,205	46,067	57,155	66,560	74,890
Constrained land use assumptions (MW)							
Installed renewables - Offshore Wind -	0	0	0	0	2,531	12,529	12,529
Constrained land use assumptions (MW)							
Capital invested - Solar PV - Base (billion		0	35.5	14.2	14.3	9.91	10
\$2018)							
Capital invested - Offshore Wind - Base		0	0	0	3.68	14.2	0
(billion \$2018)							

Table 9: E+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion \$2018)		2.3	37.4	16.2	10.5	9.49	9.42
Capital invested - Offshore Wind - Constrained (billion \$2018)		0	0	0	4.4	14.7	0
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	0.01	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	4.36	5.17	0

Table 10: E+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,487	3,487	62,242	87,635	114,735	134,660	156,045
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use	0	0	0	0	7,713	42,161	42,161
assumptions (GWh)							
Solar - Constrained land use assumptions	2,906	2,906	60,261	91,569	113,397	132,008	148,392
(GWh)							
Wind - Constrained land use assumptions	0	0	0	0	0	0	0
(GWh)							
OffshoreWind - Constrained land use	0	0	0	0	7,713	42,161	42,161
assumptions (GWh)							
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	4,889	10,689	10,689
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	10.4	10.4

Table 11: E+ scenario - PILLAR 3: Clean fuels - Bioenergy

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	0	4	8	8
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	0	0	1	1
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	4	9
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment -		0	0	0	3,995	8,172	4,970
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	0	0	175	556	808

Table 12: E+ scenario - PILLAR 4: CCUS - CO2 capture

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	1.72	9.44	19.9	26.4
Annual - BECCS (MMT)		0	0	0	4.67	15.4	21.7
Annual - NGCC (MMT)		0	0	1.72	1.45	1.11	1.12
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	1.72	11.2	31	57.4
Cumulative - BECCS (MMT)		0	0	0	4.67	20	41.8
Cumulative - NGCC (MMT)		0	0	1.72	3.17	4.28	5.4
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

Table 13: E+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	159	159	159	159
Spur (km)		0	0	18.7	690	1,298	1,616
All (km)		0	0	178	849	1,457	1,776
Cumulative investment - Trunk (million \$2018)		0	0	951	951	951	951
Cumulative investment - Spur (million \$2018)		0	0	11.3	767	1,307	1,655
Cumulative investment - All (million \$2018)		0	0	962	1,718	2,258	2,606

Table 14: E+ scenario - PILLAR 4: CCUS - CO2 storage

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	2	2
Resource characterization, appraisal, permitting costs (million \$2020)		3.29	7.9	10.5	10.5	10.5	10.5
Wells and facilities construction costs (million \$2020)		0	4.11	16	28.5	47.7	59.2

Table 15: E+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-158
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-274
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,808
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-1,420
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-5,902
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-187
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-407
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-183
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-922
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-12,261
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-236
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-960
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-5,059
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-2,081
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-11,805
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-360
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-610
cropland (1000 tCO2e/y)							,,,

Table 15: E+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest						T	-1,303
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-1,829
productivity (1000 tCO2e/y)							0/ 0/0
Carbon sink potential - Mid - All (not							-24,243
counting overlap) (1000 tCO2e/y)							015
Carbon sink potential - High - Accelerate							-315
regeneration (1000 tCO2e/y)							1///
Carbon sink potential - High - Avoid							-1,646
deforestation (1000 tCO2e/y)							7.010
Carbon sink potential - High - Extend							-7,310
rotation length (1000 tC02e/y)							0.701
Carbon sink potential - High - Improve							-2,791
plantations (1000 tCO2e/y)							17707
Carbon sink potential - High - Increase							-17,707
retention of HWP (1000 tCO2e/y) Carbon sink potential - High - Increase							-534
							-554
trees outside forests (1000 tC02e/y) Carbon sink potential - High - Reforest							-813
cropland (1000 tCO2e/y)							-013
Carbon sink potential - High - Reforest							-2,422
pasture (1000 tC02e/y)							-2,422
Carbon sink potential - High - All (not							-36,273
							-30,213
counting overlap) (1000 tC02e/y) Carbon sink potential - High - Restore							-2,736
productivity (1000 tCO2e/y)							-2,130
Land impacted for carbon sink potential -							25.7
Low - Accelerate regeneration (1000							23.1
hectares)							
Land impacted for carbon sink potential -							209
Low - Avoid deforestation (over 30 years)							209
(1000 hectares)							
Land impacted for carbon sink potential -							1,428
Low - Extend rotation length (1000							1,420
hectares)							
Land impacted for carbon sink potential -							514
Low - Improve plantations (1000							014
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							·
hectares)							
Land impacted for carbon sink potential -							26.7
Low - Increase trees outside forests							20.1
(1000 hectares)							
Land impacted for carbon sink potential -							26.9
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11.9
Low - Reforest pasture (1000 hectares)							,
Land impacted for carbon sink potential -							549
Low - Restore productivity (1000							•
hectares)							
Land impacted for carbon sink potential -							2,791
Low - Total impacted (over 30 years)							_,. , ,
(1000 hectares)							
Land impacted for carbon sink potential -		+					38.6
Mid - Accelerate regeneration (1000							30.0
hectares)							
Land impacted for carbon sink potential -	+	+					216
Mid - Avoid deforestation (over 30 years)							2.0

Table 15: E+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							2,578
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							774
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 -							38.7
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							40.3
Mid - Reforest cropland (1000 hectares)							.0.0
Land impacted for carbon sink potential -							86.2
Mid - Reforest pasture (1000 hectares)							00.2
Land impacted for carbon sink potential -		+					1,105
Mid - Restore productivity (1000							1,100
hectares)							
Land impacted for carbon sink potential -							4,876
Mid - Total impacted (over 30 years) (1000							4,010
hectares)							
Land impacted for carbon sink potential -							51.5
High - Accelerate regeneration (1000							31.3
hectares)							
Land impacted for carbon sink potential -		-					223
High - Avoid deforestation (over 30 years)							223
(1000 hectares)							
Land impacted for carbon sink potential -							3,727
High - Extend rotation length (1000							3,121
hectares)							
-							1 000
Land impacted for carbon sink potential -							1,028
High - Improve plantations (1000							
hectares)							0
Land impacted for carbon sink potential -							U
High - Increase retention of HWP (1000							
hectares)							F0.7
Land impacted for carbon sink potential -							50.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							53.8
High - Reforest cropland (1000 hectares)							/ 0 0
Land impacted for carbon sink potential -							68.8
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							907
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,110
High - Total impacted (over 30 years)							
(1000 hectares)							

Table 16: E+ scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-81.8
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-677
deployment - Cropland measures (1000							
tCO2e/y)							

Table 16: E+ scenario - PILLAR 6: Land sinks - Agriculture (continued)

Table 16: E+ scenario - PILLAR 6: Land sink			nueaj				
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-19.4
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-778
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-81.8
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,291
deployment - Cropland measures (1000							•
tCO2e/y)							
Carbon sink potential - Aggressive							-38.7
deployment - Permanent conservation							00.1
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,411
deployment - Total (1000 tCO2e/y)							-1,-+11
Land impacted for carbon sink - Moderate							46.8
deployment - Corn-ethanol to energy							40.0
, ,							
grasses (1000 hectares)							074
Land impacted for carbon sink - Moderate							371
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							35.2
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							453
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							46.8
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -	<u> </u>						707
Aggressive deployment - Cropland							101
measures (1000 hectares)							
Land impacted for carbon sink -							70.4
							70.4
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							001
Land impacted for carbon sink -							824
Aggressive deployment - Total (1000							
hectares)							
Table 17: E- scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		30.4	0.049	0.046	0.036	0.025	0.002
Fuel Comb - Electric Generation - Coal		00.4	0.047	0.040	0.000	0.020	0.002
(deaths)							
Premature deaths from air pollution -		19.9	13.1	5.23	1.96	0.644	0.341
·		19.9	13.1	5.23	1.96	0.644	0.341
Fuel Comb - Electric Generation - Natural							
Gas (deaths)		440	404	110	100	0.4.0	
Premature deaths from air pollution -		119	121	119	108	86.8	60.1
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		15.7	16	15.5	14	11.2	7.83
Stations (deaths)							
Premature deaths from air pollution -		10.3	9.4	8.34	6.91	5.21	3.52
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		1.85	1.76	1.67	1.46	1.11	0.74
Fuel Comb - Residential - Oil (deaths)			1.10	1.01	1.70		5.14
. as some modulation of (additio)							

2.14

Premature deaths from air pollution -

Fuel Comb - Residential - Other (deaths)

2.15

2.14

1.98

1.62

1.2

Table 17: E- scenario - IMPACTS - Health (continued)

Table II. L Scenario Ini Acro Ticaltii (Continucaj						
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal		1.58	1.52	1.46	1.4	1.33	1.25
(deaths) Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural		8.43	8.39	8.1	7.2	5.81	4.32
Gas (deaths) Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.51	1.38	1.25	1.08	0.911	0.742
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.47	1.36	1.24	1.11	0.986	0.861
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.596	0.317	0.32	0.32	0.322	0.312
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		24.7	22.4	19.3	16.8	14.9	10.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		269	0.437	0.407	0.323	0.225	0.019
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		176	116	46.3	17.4	5.7	3.02
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,058	1,078	1,057	961	772	534
Monetary damages from air pollution - Gas Stations (million \$2019)		139	141	138	124	99.6	69.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		91.5	83.3	73.9	61.3	46.2	31.2
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		16.4	15.6	14.8	12.9	9.87	6.56
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		19	19.1	19	17.5	14.3	10.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14	13.5	12.9	12.4	11.7	11
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		74.6	74.3	71.7	63.7	51.4	38.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.4	12.2	11.1	9.6	8.06	6.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		13	12	11	9.86	8.73	7.62
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		5.26	2.8	2.82	2.82	2.84	2.75
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		219	199	172	150	132	94.3

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		222	284	109	462	989	942
By economic sector - Construction (jobs)		5,031	30,467	19,886	22,636	27,885	27,171

Table 18: E- scenario - IMPACTS - Jobs (continued)

Table 16: E- Scellullo - IMPAG 15 - Jubs (culit	лпиеиј						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing		3,134	5,562	4,876	5,125	8,075	7,034
(jobs)							
By economic sector - Mining (jobs)		1,867	1,295	961	690	474	270
By economic sector - Other (jobs)		448	6,057	3,586	4,511	5,414	6,143
By economic sector - Pipeline (jobs)		369	310	458	321	370	379
By economic sector - Professional (jobs)		2,995	11,931	7,995	10,062	13,146	13,035
By economic sector - Trade (jobs)		2,185	8,137	5,496	6,727	8,426	8,755
By economic sector - Utilities (jobs)		7,529	13,371	14,956	16,947	24,259	21,776
By resource sector - Biomass (jobs)		842	765	360	1,942	4,214	3,885
By resource sector - CO2 (jobs)		1.63	4.82	1,648	853	1,607	2,117
By resource sector - Coal (jobs)		1,332	299	0	0	0	0
By resource sector - Grid (jobs)		7,675	20,030	22,826	28,675	43,975	39,362
By resource sector - Natural Gas (jobs)		3,318	2,723	2,587	2,172	2,292	1,291
By resource sector - Nuclear (jobs)		2,635	2,593	2,552	2,160	1,629	1,604
By resource sector - Oil (jobs)		4,363	3,667	3,088	2,481	1,886	1,171
By resource sector - Solar (jobs)		3,599	47,112	25,116	28,669	31,394	34,836
By resource sector - Wind (jobs)		15.5	221	144	529	2,040	1,239
By education level - All sectors - High		9,808	33,577	25,007	28,944	38,250	36,681
school diploma or less (jobs)							
By education level - All sectors -		7,310	24,709	18,762	21,650	28,616	27,516
Associates degree or some college (jobs)							
By education level - All sectors -		5,212	14,809	11,320	13,084	17,196	16,489
Bachelors degree (jobs)							
By education level - All sectors - Masters		1,272	3,721	2,821	3,309	4,346	4,198
or professional degree (jobs)							
By education level - All sectors - Doctoral		179	598	414	495	630	620
degree (jobs)							
Related work experience - All sectors -		3,398	11,277	8,534	9,912	13,131	12,636
None (jobs)							
Related work experience - All sectors - Up		4,633	16,264	11,885	13,841	18,230	17,587
to 1 year (jobs)							
Related work experience - All sectors - 1		8,671	27,487	20,852	24,121	31,831	30,554
to 4 years (jobs)							
Related work experience - All sectors - 4		5,575	17,836	13,555	15,602	20,549	19,678
to 10 years (jobs)							
Related work experience - All sectors -		1,503	4,549	3,498	4,005	5,298	5,049
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		1,311	4,431	3,224	3,740	4,845	4,712
(jobs)							
On-the-Job Training - All sectors - Up to 1		15,803	49,858	37,652	43,709	57,904	55,580
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		4,933	16,580	12,600	14,465	19,047	18,244
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,511	5,738	4,275	4,922	6,415	6,173
years (jobs)							
On-the-Job Training - All sectors - Over 10		223	806	573	646	826	795
years (jobs)							
On-Site or In-Plant Training - All sectors -		3,851	12,800	9,458	10,955	14,352	13,852
None (jobs)							
On-Site or In-Plant Training - All sectors -		14,335	45,399	34,337	39,823	52,731	50,604
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		3,830	12,846	9,745	11,203	14,763	14,146
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		1,571	5,695	4,265	4,901	6,391	6,135
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		193	674	519	601	801	766
Over 10 years (jobs)							
Wage income - All (million \$2019)		1,239	3,785	2,945	3,440	4,605	4,461
	I.					1	

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	464	441	404	373	350	323	290
Final energy use - Residential (PJ)	158	151	147	142	135	128	122
Final energy use - Commercial (PJ)	114	115	113	112	109	107	107
Final energy use - Industry (PJ)	358	374	381	391	402	403	407

Table 20: E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.92	2.93	3.93	4.05	5.12	5.35
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	13.5	121	228	724	1,221	2,319	3,418
Vehicle stocks - LDV – All others (1000	4,468	4,468	4,468	4,238	4,008	3,089	2,169
units)							
Light-duty vehicle capital costs vs. REF -		0	138	291	982	3,094	4,506
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.1		0.496		2.66		7.45
units)							
Public EV charging plugs - L2 (1000 units)	0.476		11.9		63.9		179

Table 22: E- scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	37.5	46.3	49.6	59.1	73.7	83	86.3
Heat Pump (%)							
Sales of space heating units - Electric	25.8	28.1	26.5	21.5	14	9.4	7.8
Resistance (%)							
Sales of space heating units - Gas (%)	30.5	17.1	15.8	12.4	7.01	3.39	2.12
Sales of space heating units - Fossil (%)	6.1	8.46	8.09	7	5.31	4.17	3.78
Sales of water heating units - Electric	0	2.08	8	25	51.1	68.2	74.1
Heat Pump (%)							
Sales of water heating units - Electric	67.7	78.2	73.7	60.5	40.4	27.4	22.9
Resistance (%)							
Sales of water heating units - Gas Furnace	28.2	17	15.7	11.9	5.84	1.86	0.487
(%)							
Sales of water heating units - Other (%)	4.1	2.66	2.65	2.64	2.62	2.58	2.57
Sales of cooking units - Electric	82.6	83.1	84.7	88.9	94.7	98.3	99.5
Resistance (%)							
Sales of cooking units - Gas (%)	17.4	16.9	15.3	11.1	5.31	1.72	0.462
Residential HVAC investment in 2020s vs.		3.78	4.05				
REF - Cumulative 5-yr (billion \$2018)							

Table 23: E- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	10.1	19.3	24.3	38.5	60.9	76.8	82.9
Heat Pump (%)							
Sales of space heating units - Electric	9.29	8.02	8.23	8.98	10.4	11.8	12.5
Resistance (%)							
Sales of space heating units - Gas (%)	78.5	68.1	63.3	49.4	27.1	10.9	4.44
Sales of space heating units - Fossil (%)	2.15	4.53	4.19	3.17	1.56	0.496	0.13
Sales of water heating units - Electric	0.316	2.04	7.05	21.5	43.6	58	63
Heat Pump (%)							
Sales of water heating units - Electric	7.81	7.62	9.51	15.3	24.1	29.8	31.8
Resistance (%)							
Sales of water heating units - Gas (%)	88	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	3.86	4.23	4.21	3.8	3.27	2.9	2.77

Table 23: E- scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)

••	•		•	•			
Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric	32	36.2	40.9	53.4	71	81.7	85.5
Resistance (%)							
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s -		15,746	17,554				
Cumulative 5-yr (million \$2018)							

Table 24: E- scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,499	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,450	7,811	7,128	6,628	6,185	5,668	5,630
Installed thermal - Nuclear (MW)	5,220	5,220	5,220	5,220	3,440	3,440	3,440

Table 25: E- scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-158
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)							-274
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,808
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,420
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,902
Carbon sink potential - Low - Increase							-187
trees outside forests (1000 tC02e/y) Carbon sink potential - Low - Reforest							-407
cropland (1000 tC02e/y) Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)							-183
Carbon sink potential - Low - Restore							-922
productivity (1000 tC02e/y) Carbon sink potential - Low - All (not							-12,261
counting overlap) (1000 tC02e/y) Carbon sink potential - Mid - Accelerate							-236
regeneration (1000 tCO2e/y) Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-960
Carbon sink potential - Mid - Extend							-5,059
rotation length (1000 tC02e/y) Carbon sink potential - Mid - Improve							-2,081
plantations (1000 tC02e/y) Carbon sink potential - Mid - Increase							-11,805
retention of HWP (1000 tCO2e/y) Carbon sink potential - Mid - Increase							-360
trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest							-610
cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest							-1,303
pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore							-1,829
productivity (1000 tCO2e/y) Carbon sink potential - Mid - All (not							-24,243
counting overlap) (1000 tC02e/y) Carbon sink potential - High - Accelerate							-315
regeneration (1000 tCO2e/y) Carbon sink potential - High - Avoid							-1,646
deforestation (1000 tCO2e/y)							

Table 25: E- scenario - PILLAR 6: Land sinks - Forests (continued)

Item Carbon sink potential - High - Extend	2020	2025	2030	2035	2040	2045	2050 -7,310
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-17,707
Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)							-534
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-813
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,422
Carbon sink potential - High - All (not counting overlap) (1000 tC02e/y)							-36,273
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-2,736
Land impacted for carbon sink potential -							25.7
Low - Accelerate regeneration (1000 hectares)							
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years)							209
(1000 hectares) Land impacted for carbon sink potential - Low - Extend rotation length (1000							1,428
hectares) Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							514
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							26.7
Land impacted for carbon sink potential -							26.9
Low - Reforest cropland (1000 hectares) Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							11.9
Land impacted for carbon sink potential - Low - Restore productivity (1000							549
hectares) Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,791
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							38.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							216
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,578
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							774
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000							0
hectares) Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							38.7

Table 25: E- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							40.3
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							86.2
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,105
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,876
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							51.5
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							223
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,727
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,028
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 -							50.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							53.8
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							68.8
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							907
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,110
High - Total impacted (over 30 years)							

Table 26: E- scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-81.8
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-677
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-19.4
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-778
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-81.8
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,291
deployment - Cropland measures (1000							
tCO2e/y)							

Table 26: E- scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-38.7
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,411
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							46.8
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							371
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							35.2
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							453
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							46.8
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							707
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							70.4
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							824
Aggressive deployment - Total (1000							
hectares)							

Table 27: E+RE+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		30.4	0.049	0.046	0.036	0.025	0.002
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		20.4	16	9.08	5.46	1.39	0.425
Premature deaths from air pollution - Mobile - On-Road (deaths)		117	110	84.4	49.2	22.6	8.97
Premature deaths from air pollution - Gas Stations (deaths)		15.4	14.2	10.8	6.43	3.13	1.47
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		10.2	8.38	5.66	3.2	1.61	0.781
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.82	1.48	1.02	0.612	0.302	0.135
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.11	1.9	1.49	1.02	0.602	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.58	1.52	1.46	1.4	1.33	1.25
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.36	7.38	5.45	3.45	2.12	1.38
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.5	1.25	0.971	0.698	0.486	0.321
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.47	1.27	1.06	0.843	0.63	0.422

Table 27: E+RE+ scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.664	0.317	0.317	0.315	0.321	0.3
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		24.3	23	19.7	14.3	8.7	1.21
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		269	0.437	0.407	0.323	0.225	0.019
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		181	141	80.5	48.4	12.3	3.77
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,041	979	750	437	201	79.7
Monetary damages from air pollution - Gas Stations (million \$2019)		136	126	95.5	56.9	27.7	13
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		90.7	74.2	50.2	28.3	14.3	6.92
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		16.1	13.1	9.05	5.43	2.68	1.2
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		18.7	16.9	13.2	9.03	5.33	3.01
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14	13.5	12.9	12.4	11.7	11
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		74	65.3	48.2	30.5	18.8	12.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.3	11.1	8.59	6.18	4.31	2.84
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		13	11.2	9.36	7.46	5.58	3.74
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		5.86	2.8	2.8	2.78	2.83	2.64
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		215	204	175	127	77.3	10.8

Table 28: E+RE+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		183	380	141	288	633	938
By economic sector - Construction (jobs)		18,671	25,335	30,825	27,742	30,160	26,713
By economic sector - Manufacturing		3,987	5,641	8,423	7,278	7,560	10,924
(jobs)							
By economic sector - Mining (jobs)		1,713	1,207	734	391	168	18
By economic sector - Other (jobs)		3,146	4,742	5,950	5,447	6,477	5,524
By economic sector - Pipeline (jobs)		359	300	212	135	73.1	25.5
By economic sector - Professional (jobs)		7,480	10,231	12,528	11,808	13,627	12,713
By economic sector - Trade (jobs)		5,029	6,771	8,356	7,814	9,069	8,202
By economic sector - Utilities (jobs)		10,393	14,067	20,792	21,852	23,500	24,017
By resource sector - Biomass (jobs)		713	1,073	378	942	2,353	4,127
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		744	0	0	0	0	0
By resource sector - Grid (jobs)		13,274	22,043	37,316	40,823	45,639	48,477

Table 28: E+RE+ scenario - IMPACTS - Jobs (continued)

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		3,356	2,861	2,191	2,199	1,961	1,505
By resource sector - Nuclear (jobs)		2,635	2,593	2,194	1,452	673	0
By resource sector - Oil (jobs)		4,312	3,358	2,300	1,362	638	0.022
By resource sector - Solar (jobs)		25,915	36,461	42,583	34,327	37,671	33,709
By resource sector - Wind (jobs)		13.6	286	998	1,651	2,330	1,258
By education level - All sectors - High		21,883	29,685	37,911	35,576	39,243	38,406
school diploma or less (jobs)			27,000	0.,,,	33,5.3	07,2.0	00,.00
By education level - All sectors -		16,126	21,902	28,419	26,840	29,583	28,807
Associates degree or some college (jobs)		,	,,				
By education level - All sectors -		10,055	13,251	16,809	15,794	17,386	17,004
Bachelors degree (jobs)		.,	-,	-,	-,	,	,
By education level - All sectors - Masters		2,505	3,320	4,199	3,973	4,411	4,261
or professional degree (jobs)		,	·	,	,	,	,
By education level - All sectors - Doctoral		393	516	622	574	643	597
degree (jobs)							
Related work experience - All sectors -		7,379	10,005	12,868	12,169	13,473	13,146
None (jobs)							
Related work experience - All sectors - Up		10,526	14,294	18,134	16,925	18,737	18,323
to 1 year (jobs)							
Related work experience - All sectors - 1		18,188	24,451	31,347	29,559	32,596	31,788
to 4 years (jobs)							
Related work experience - All sectors - 4		11,821	15,851	20,356	19,168	21,064	20,485
to 10 years (jobs)							
Related work experience - All sectors -		3,048	4,074	5,255	4,935	5,397	5,331
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		2,895	3,872	4,862	4,515	4,990	4,792
(jobs)							
On-the-Job Training - All sectors - Up to 1		32,949	44,379	56,803	53,462	59,074	58,125
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		10,889	14,703	18,985	17,906	19,655	19,033
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		3,704	5,022	6,439	6,084	6,693	6,300
years (jobs)		505	(00	074	700	0.55	
On-the-Job Training - All sectors - Over 10		525	698	871	789	855	825
years (jobs)		0.000	11 070	1/ 000	10.050	1/ 7/1	1/ 000
On-Site or In-Plant Training - All sectors -		8,390	11,279	14,299	13,353	14,741	14,320
None (jobs)		00.000	(0 (05	F1 700	/ 0.7/1	50.075	F0.010
On-Site or In-Plant Training - All sectors -		29,993	40,405	51,782	48,761	53,845	52,910
Up to 1 year (jobs)		0 / 01	11 001	1/ /00	10.057	15.007	1/ 775
On-Site or In-Plant Training - All sectors -		8,431	11,391	14,698	13,857	15,224	14,775
1 to 4 years (jobs)		0.700	/ 000	/ 20F	/ 005	((00	/ 0/5
On-Site or In-Plant Training - All sectors -		3,709	4,999	6,395	6,035	6,629	6,265
4 to 10 years (jobs) On-Site or In-Plant Training - All sectors -		438	600	786	749	827	806
Over 10 years (jobs)		430	000	100	147	021	000
Wage income - All (million \$2019)		2,508	3,387	4,389	/. 100	4,676	4,629
vvage income - An (inillion \$2019)		2,508	3,387	4,389	4,198	4,010	4,029

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	463	438	386	323	267	233	218
Final energy use - Residential (PJ)	158	150	141	129	119	115	113
Final energy use - Commercial (PJ)	114	114	111	106	101	100	102
Final energy use - Industry (PJ)	358	374	380	387	398	399	404

Table 30: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.55	3.63	5.67	5.98	4.97	5.12
Cumulative 5-yr (billion \$2018)							

Table 31: E+RE+ scenario - PILLAR 1: Efficiency/Electrifica	ition - Transportatio	on
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Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	17.4	382	746	2,022	3,298	4,317	5,336
Vehicle stocks - LDV – All others (1000	4,450	4,237	4,024	2,933	1,841	1,042	242
units)							
Light-duty vehicle capital costs vs. REF -		856	2,191	3,557	5,385	5,864	5,589
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.1		1.63		7.19		11.6
units)							
Public EV charging plugs - L2 (1000 units)	0.476		39.1		173		280

Table 32: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	37.5	51.9	80.7	87.2	87.5	87.4	87.4
Heat Pump (%)							
Sales of space heating units - Electric	25.8	25.3	10.7	7.34	7.15	7.29	7.33
Resistance (%)							
Sales of space heating units - Gas (%)	30.5	15	4.16	1.77	1.69	1.69	1.68
Sales of space heating units - Fossil (%)	6.1	7.81	4.43	3.7	3.67	3.6	3.59
Sales of water heating units - Electric	0	12.1	64.1	75.7	76.2	76.2	76.1
Heat Pump (%)							
Sales of water heating units - Electric	67.7	70.5	30.6	21.7	21.3	21.3	21.3
Resistance (%)							
Sales of water heating units - Gas Furnace	28.2	14.7	2.78	0.118	0	0	0
(%)							
Sales of water heating units - Other (%)	4.1	2.65	2.54	2.53	2.55	2.56	2.57
Sales of cooking units - Electric	82.7	86.4	97.7	99.9	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	17.3	13.6	2.33	0.117	0	0	0
Residential HVAC investment in 2020s vs.		3.83	4.21				
REF - Cumulative 5-yr (billion \$2018)							

${\it Table~33:~E+RE+~scenario~-~PILLAR~1:~Efficiency/Electrification~-~Commercial}$

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	10.1	27.5	70.6	83.9	85.2	85.2	85.2
Heat Pump (%)							
Sales of space heating units - Electric	9.29	8.33	10.3	12.4	12.9	12.8	12.8
Resistance (%)							
Sales of space heating units - Gas (%)	78.5	60.3	18.3	3.66	1.98	1.94	1.94
Sales of space heating units - Fossil (%)	2.15	3.92	0.743	0.032	0	0	0
Sales of water heating units - Electric	0.316	10.5	54.5	64.3	64.7	64.8	64.8
Heat Pump (%)							
Sales of water heating units - Electric	7.81	11	28.4	32.3	32.5	32.5	32.5
Resistance (%)							
Sales of water heating units - Gas (%)	88	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	3.86	4.03	2.99	2.74	2.74	2.73	2.73
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s -		15,755	17,550				
Cumulative 5-yr (million \$2018)							

Table 34: E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,499	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,450	8,486	8,010	8,486	5,848	5,850	9,017

Table 34: E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	5,220	5,220	5,220	3,440	2,410	0	0
Installed renewables - Rooftop PV (MW)	353	569	805	1,146	1,626	2,248	3,044
Installed renewables - Solar - Base land	1,471	16,603	36,164	57,887	68,763	80,695	83,683
use assumptions (MW)							
Installed renewables - Offshore Wind -	0	0	0	7,318	14,654	20,148	26,685
Base land use assumptions (MW)							
Installed renewables - Solar -	1,486	15,313	35,726	57,139	66,870	75,841	79,620
Constrained land use assumptions (MW)							
Installed renewables - Wind - Constrained	0	0	0	0	0	0	0
land use assumptions (MW)							
Installed renewables - Offshore Wind -	0	0	0	8,233	16,298	16,298	28,328
Constrained land use assumptions (MW)							
Capital invested - Solar PV - Base (billion		20.3	23.4	24	11.3	11.7	2.77
\$2018)							
Capital invested - Offshore Wind - Base		0	0	15	12.7	8.1	8.19
(billion \$2018)							

Table 35: E+RE+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,487	33,536	72,250	115,091	136,552	160,100	165,969
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	26,149	52,616	73,446	98,879
Solar - Constrained land use assumptions (GWh)	6,973	61,832	142,590	227,013	265,410	300,816	315,651
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	58,835	117,828	117,828	210,354

Table 36: E+RE+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-158
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-274
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,808
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-1,420
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-5,902
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-187
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-407
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-183
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-922
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-12,261
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-236
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-960
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-5,059
rotation length (1000 tCO2e/y)							

Table 36: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve							-2,08
plantations (1000 tCO2e/y)							11 005
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)							-11,805
Carbon sink potential - Mid - Increase							-360
trees outside forests (1000 tCO2e/y)							-300
Carbon sink potential - Mid - Reforest	+						-610
cropland (1000 tCO2e/y)							-010
Carbon sink potential - Mid - Reforest							-1,303
pasture (1000 tC02e/y)							1,000
Carbon sink potential - Mid - Restore	+						-1,829
productivity (1000 tC02e/y)							1,02
Carbon sink potential - Mid - All (not							-24,243
counting overlap) (1000 tCO2e/y)							2 1,2 10
Carbon sink potential - High - Accelerate							-315
regeneration (1000 tCO2e/y)							0.0
Carbon sink potential - High - Avoid							-1,646
deforestation (1000 tCO2e/y)							.,
Carbon sink potential - High - Extend							-7,310
rotation length (1000 tCO2e/y)							1,010
Carbon sink potential - High - Improve							-2,79
plantations (1000 tCO2e/y)							_,,,
Carbon sink potential - High - Increase							-17,707
retention of HWP (1000 tCO2e/y)							11,10
Carbon sink potential - High - Increase	+						-534
trees outside forests (1000 tC02e/y)							00-
Carbon sink potential - High - Reforest							-813
cropland (1000 tCO2e/y)							010
Carbon sink potential - High - Reforest							-2,422
pasture (1000 tC02e/y)							_,
Carbon sink potential - High - All (not							-36,273
counting overlap) (1000 tCO2e/y)							00,2.0
Carbon sink potential - High - Restore							-2,736
productivity (1000 tCO2e/y)							_,
Land impacted for carbon sink potential -							25.
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							209
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,428
Low - Extend rotation length (1000							,
hectares)							
Land impacted for carbon sink potential -							514
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							(
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							26.
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -	+						26.9
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -	+						11.9
Low - Reforest pasture (1000 hectares)							•••
Land impacted for carbon sink potential -							549
Low - Restore productivity (1000							.
hectares)							

Table 36: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

Table 36: E+RE+ scenario - PILLAR 6: Land Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -	2020	2020	2000	2000	2040	2040	2,791
Low - Total impacted (over 30 years)							_,. , .
(1000 hectares)							
Land impacted for carbon sink potential -							38.6
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -			+				216
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -			+				2,578
Mid - Extend rotation length (1000							_,0.0
hectares)							
Land impacted for carbon sink potential -							774
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -			+				0
Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -			+				38.7
Mid - Increase trees outside forests (1000							00.1
hectares)							
Land impacted for carbon sink potential -			+				40.3
Mid - Reforest cropland (1000 hectares)							40.5
Land impacted for carbon sink potential -							86.2
Mid - Reforest pasture (1000 hectares)							80.2
Land impacted for carbon sink potential -							1,105
Mid - Restore productivity (1000							1,105
hectares)							4,876
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000							4,676
hectares)							
Land impacted for carbon sink potential -							51.5
							51.5
High - Accelerate regeneration (1000							
hectares) Land impacted for carbon sink potential -							223
· ·							223
High - Avoid deforestation (over 30 years)							
(1000 hectares)							0.707
Land impacted for carbon sink potential -							3,727
High - Extend rotation length (1000							
hectares)							1.000
Land impacted for carbon sink potential -							1,028
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							
hectares)							F0.7
Land impacted for carbon sink potential -							50.7
High - Increase trees outside forests							
(1000 hectares)							F0.0
Land impacted for carbon sink potential -							53.8
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							68.8
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							907
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -			T				6,110
High - Total impacted (over 30 years)							
(1000 hectares)							

Table 37: E+RE+ scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-81.8
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-677
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-19.4
deployment - Permanent conservation							
cover (1000 tC02e/y)							770
Carbon sink potential - Moderate							-778
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Aggressive							-81.8
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,291
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-38.7
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,411
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							46.8
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							371
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							35.2
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							453
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							46.8
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							707
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							70.4
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							824
Aggressive deployment - Total (1000							
hectares)							

Table 38: E+RE- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		30.4	0.049	0.046	0.036	0.025	0.002
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		22.8	18.9	18.1	13.9	4.5	1.45
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		117	110	84.4	49.2	22.6	8.97
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		15.4	14.2	10.8	6.43	3.13	1.47
Stations (deaths)							

Table 38: E+RE- scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas		10.2	8.38	5.66	3.2	1.61	0.781
(deaths) Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.82	1.48	1.02	0.612	0.302	0.135
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.11	1.9	1.49	1.02	0.602	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.58	1.52	1.46	1.4	1.33	1.25
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.36	7.38	5.45	3.45	2.12	1.38
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.5	1.25	0.971	0.698	0.486	0.321
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.47	1.27	1.06	0.843	0.63	0.422
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.567	0.316	0.317	0.315	0.322	0.299
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		25.1	24.4	24.1	20.8	17.6	13.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		269	0.437	0.407	0.323	0.225	0.019
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		202	168	161	123	39.9	12.9
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,041	979	750	437	201	79.7
Monetary damages from air pollution - Gas Stations (million \$2019)		136	126	95.5	56.9	27.7	13
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		90.7	74.2	50.2	28.3	14.3	6.92
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		16.1	13.1	9.05	5.43	2.68	1.2
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		18.7	16.9	13.2	9.03	5.33	3.01
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14	13.5	12.9	12.4	11.7	11
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		74	65.3	48.2	30.5	18.8	12.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.3	11.1	8.59	6.18	4.31	2.84
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		13	11.2	9.36	7.46	5.58	3.74
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		5	2.79	2.8	2.78	2.84	2.64

Table 38: E+RE- scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas		222	217	214	185	156	117
Production (million \$2019)							

Table 39: E+RE- scenario - IMPACTS - Jobs

Table 39: E+RE- Scenario - IMPACTS - Jobs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		208	298	99.8	397	818	944
By economic sector - Construction (jobs)		9,003	10,749	16,938	14,615	16,772	15,873
By economic sector - Manufacturing		2,713	2,925	2,947	3,220	3,664	3,325
(jobs)							
By economic sector - Mining (jobs)		1,740	1,258	847	539	340	222
By economic sector - Other (jobs)		1,261	1,692	3,029	2,465	3,062	2,826
By economic sector - Pipeline (jobs)		376	327	510	351	400	430
By economic sector - Professional (jobs)		4,160	4,706	6,719	7,504	8,904	8,721
By economic sector - Trade (jobs)		2,872	3,204	4,595	4,410	5,209	5,000
By economic sector - Utilities (jobs)		7,876	9,184	12,807	20,160	21,337	22,229
By resource sector - Biomass (jobs)		729	765	342	1,482	3,205	3,923
By resource sector - CO2 (jobs)		1.65	5.55	1,863	963	1,816	2,392
By resource sector - Coal (jobs)		744	0	0	0	0	0
By resource sector - Grid (jobs)		8,547	11,584	18,084	21,094	24,478	25,563
By resource sector - Natural Gas (jobs)		3,315	3,678	2,833	3,249	3,365	2,710
By resource sector - Nuclear (jobs)		2,635	2,593	2,555	10,720	9,394	9,957
By resource sector - Oil (jobs)		4,310	3,403	2,397	1,583	1,054	743
By resource sector - Solar (jobs)		9,864	12,233	20,409	14,544	17,131	14,254
By resource sector - Wind (jobs)		65	82.2	8	23.8	63.4	27
By education level - All sectors - High		12,698	14,604	20,749	22,174	25,251	24,823
school diploma or less (jobs)		12,070	1 1,00 1	20,117	22,	20,201	2 1,020
By education level - All sectors -		9,409	10,820	15,611	16,833	19,043	18,694
Associates degree or some college (jobs)		,,,,,,,	10,020	10,011	10,000	17,040	10,074
By education level - All sectors -		6,305	6,936	9,417	11,320	12,512	12,381
Bachelors degree (jobs)		0,000	0,700	2,411	11,020	12,012	12,001
By education level - All sectors - Masters		1,563	1,728	2,364	2,905	3,222	3,201
or professional degree (jobs)		1,505	1,120	2,004	2,700	0,222	3,201
By education level - All sectors - Doctoral		234	256	350	429	479	471
degree (jobs)		204	200	555	727	717	7
Related work experience - All sectors -		4,349	4,989	7,107	7,721	8,789	8,660
None (jobs)		7,047	4,707	1,101	1,121	0,107	0,000
Related work experience - All sectors - Up		6,050	6,943	9,842	10,671	12,156	11,944
to 1 year (jobs)		0,000	0,743	7,042	10,011	12,100	11,744
Related work experience - All sectors - 1		10,902	12,345	17,348	19,368	21,780	21,458
to 4 years (jobs)		10,702	12,040	11,540	17,500	21,100	21,430
Related work experience - All sectors - 4		7,055	7,985	11,299	12,564	14,084	13,860
to 10 years (jobs)		1,033	1,703	11,277	12,304	14,004	13,600
Related work experience - All sectors -		1,854	2,082	2,895	3,337	3,699	3,649
Over 10 years (jobs)		1,054	2,002	2,073	3,331	3,077	3,047
On-the-Job Training - All sectors - None		1,699	1,912	2,689	3,027	3,387	3,325
(jobs)		1,077	1,712	2,007	3,021	3,361	3,323
On-the-Job Training - All sectors - Up to 1		19,754	22,363	31,184	35,002	39,502	38,955
year (jobs)		17,134	22,303	31,104	33,002	37,302	30,933
On-the-Job Training - All sectors - 1 to 4		6,376	7,308	10,524	11,406	12,827	12,603
years (jobs)		0,310	1,300	10,524	11,406	12,021	12,003
On-the-Job Training - All sectors - 4 to 10		2,083	2,426	3,620	3,718	4,228	4,141
years (jobs)		2,003	2,420	3,620	3,110	4,220	4,141
On-the-Job Training - All sectors - Over 10		007	225	/75	F00	F(2)	F/F
<u> </u>		297	335	475	509	563	545
years (jobs)		4.04.0	E 500	70//	0.700	0.000	0700
On-Site or In-Plant Training - All sectors -		4,940	5,592	7,864	8,782	9,883	9,703
None (jobs)		17055	00.070	00 / / 0	01.077	05.007	05 / / 0
On-Site or In-Plant Training - All sectors -		17,955	20,349	28,460	31,864	35,936	35,442
Up to 1 year (jobs)							

Table 39: E+RE- scenario - IMPACTS - Jobs (continued)

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors -		4,939	5,659	8,126	8,795	9,905	9,732
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		2,122	2,449	3,608	3,770	4,268	4,186
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		253	295	433	449	516	507
Over 10 years (jobs)							
Wage income - All (million \$2019)		1,534	1,746	2,456	2,883	3,261	3,281

Table 40: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	463	438	386	323	267	233	218
Final energy use - Residential (PJ)	158	150	141	129	119	115	113
Final energy use - Commercial (PJ)	114	114	111	106	101	100	102
Final energy use - Industry (PJ)	358	374	380	387	398	399	404

Table 41: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.55	3.63	5.67	5.98	4.97	5.12
Cumulative 5-yr (billion \$2018)							

Table 42: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	17.4	382	746	2,022	3,298	4,317	5,336
Vehicle stocks - LDV - All others (1000	4,450	4,237	4,024	2,933	1,841	1,042	242
units)							
Light-duty vehicle capital costs vs. REF -		856	2,191	3,557	5,385	5,864	5,589
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.1		1.63		7.19		11.6
units)							
Public EV charging plugs - L2 (1000 units)	0.476		39.1		173		280

Table 43: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	37.5	51.9	80.7	87.2	87.5	87.4	87.4
Heat Pump (%)							
Sales of space heating units - Electric	25.8	25.3	10.7	7.34	7.15	7.29	7.33
Resistance (%)							
Sales of space heating units - Gas (%)	30.5	15	4.16	1.77	1.69	1.69	1.68
Sales of space heating units - Fossil (%)	6.1	7.81	4.43	3.7	3.67	3.6	3.59
Sales of water heating units - Electric	0	12.1	64.1	75.7	76.2	76.2	76.1
Heat Pump (%)							
Sales of water heating units - Electric	67.7	70.5	30.6	21.7	21.3	21.3	21.3
Resistance (%)							
Sales of water heating units - Gas Furnace	28.2	14.7	2.78	0.118	0	0	0
(%)							
Sales of water heating units - Other (%)	4.1	2.65	2.54	2.53	2.55	2.56	2.57
Sales of cooking units - Electric	82.7	86.4	97.7	99.9	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	17.3	13.6	2.33	0.117	0	0	0
Residential HVAC investment in 2020s vs.		3.83	4.21				
REF - Cumulative 5-yr (billion \$2018)							

Table 44: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	10.1	27.5	70.6	83.9	85.2	85.2	85.2
Heat Pump (%)							
Sales of space heating units - Electric	9.29	8.33	10.3	12.4	12.9	12.8	12.8
Resistance (%)							
Sales of space heating units - Gas (%)	78.5	60.3	18.3	3.66	1.98	1.94	1.94
Sales of space heating units - Fossil (%)	2.15	3.92	0.743	0.032	0	0	0
Sales of water heating units - Electric	0.316	10.5	54.5	64.3	64.7	64.8	64.8
Heat Pump (%)							
Sales of water heating units - Electric	7.81	11	28.4	32.3	32.5	32.5	32.5
Resistance (%)							
Sales of water heating units - Gas (%)	88	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	3.86	4.03	2.99	2.74	2.74	2.73	2.73
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s -		15,755	17,550				
Cumulative 5-yr (million \$2018)							

Table 45: E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,499	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,485	6,487	8,026	8,032	9,312	9,770	10,893
Installed thermal - Nuclear (MW)	5,220	5,220	5,220	5,222	7,094	9,709	12,099
Installed renewables - Rooftop PV (MW)	353	569	805	1,146	1,626	2,248	3,044
Installed renewables - Solar - Base land	1,471	7,495	14,451	26,864	32,648	40,459	41,102
use assumptions (MW)							
Installed renewables - Solar -	1,486	9,861	15,524	30,822	36,745	44,553	45,091
Constrained land use assumptions (MW)							
Installed renewables - Wind - Constrained	0	0	0	0	0	0	0
land use assumptions (MW)							
Installed renewables - Offshore Wind -	0	0	0	0	0	0	0
Constrained land use assumptions (MW)							
Capital invested - Solar PV - Base (billion		8.07	8.33	13.7	6.01	7.66	0.596
\$2018)							
Capital invested - Solar PV - Constrained		11.2	6.78	16.9	6.15	7.66	0.498
(billion \$2018)							

Table 46: E+RE- scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,487	15,460	29,258	53,860	65,319	80,718	81,989
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	3,487	20,088	31,297	61,561	73,246	88,648	89,707
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

Table 47: E+RE- scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-158
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-274
deforestation (1000 tCO2e/y)							

Table 47: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,808
Carbon sink potential - Low - Improve							-1,420
plantations (1000 tCO2e/y)							-1,420
Carbon sink potential - Low - Increase							-5,902
retention of HWP (1000 tCO2e/y)							0,702
Carbon sink potential - Low - Increase							-187
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-407
cropland (1000 tCO2e/y) Carbon sink potential - Low - Reforest							-183
pasture (1000 tCO2e/y)							-103
Carbon sink potential - Low - Restore		+					-922
productivity (1000 tC02e/y)							-722
Carbon sink potential - Low - All (not							-12,261
counting overlap) (1000 tCO2e/y)							-12,201
Carbon sink potential - Mid - Accelerate							-236
regeneration (1000 tC02e/y)							200
Carbon sink potential - Mid - Avoid							-960
deforestation (1000 tC02e/y)							, , ,
Carbon sink potential - Mid - Extend							-5,059
rotation length (1000 tCO2e/y)							-,
Carbon sink potential - Mid - Improve							-2,081
plantations (1000 tC02e/y)							
Carbon sink potential - Mid - Increase							-11,805
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-360
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-610
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,303
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-1,829
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-24,243
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-315
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,646
deforestation (1000 tCO2e/y)							7.040
Carbon sink potential - High - Extend							-7,310
rotation length (1000 tCO2e/y)							0.704
Carbon sink potential - High - Improve							-2,791
plantations (1000 tC02e/y)							17707
Carbon sink potential - High - Increase							-17,707
retention of HWP (1000 tC02e/y) Carbon sink potential - High - Increase							-534
							-534
trees outside forests (1000 tC02e/y) Carbon sink potential - High - Reforest							-813
cropland (1000 tCO2e/y)							-013
Carbon sink potential - High - Reforest							-2,422
pasture (1000 tCO2e/y)							-2,422
Carbon sink potential - High - All (not							-36,273
							-30,213
counting overlap) (1000 tC02e/y) Carbon sink potential - High - Restore							-2,736
productivity (1000 tCO2e/y)							-2,136
Land impacted for carbon sink potential -							25.7
Low - Accelerate regeneration (1000							20.1

Table 47: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

Table 47: E+RE- scenario - PILLAR 6: Land Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -	2020	2020	2000	2000	2040	2040	209
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,428
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							514
Low - Improve plantations (1000							
hectares)							0
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -	+						26.7
Low - Increase trees outside forests							20.1
(1000 hectares)							
Land impacted for carbon sink potential -							26.9
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11.9
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							549
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,791
Low - Total impacted (over 30 years)							
(1000 hectares)							20.7
Land impacted for carbon sink potential -							38.6
Mid - Accelerate regeneration (1000 hectares)							
Land impacted for carbon sink potential -							216
Mid - Avoid deforestation (over 30 years)							210
(1000 hectares)							
Land impacted for carbon sink potential -							2,578
Mid - Extend rotation length (1000							•
hectares)							
Land impacted for carbon sink potential -							774
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 -							38.7
Mid - Increase trees outside forests (1000 hectares)							
Land impacted for carbon sink potential -							40.3
Mid - Reforest cropland (1000 hectares)							40.3
Land impacted for carbon sink potential -							86.2
Mid - Reforest pasture (1000 hectares)							00.2
Land impacted for carbon sink potential -							1,105
Mid - Restore productivity (1000							,
hectares)							
Land impacted for carbon sink potential -							4,876
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							51.5
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							223
High - Avoid deforestation (over 30 years)							
(1000 hectares)							בחד ח
Land impacted for carbon sink potential - High - Extend rotation length (1000							3,727
riigii - Exteriu i Otatioii Ierigtii (1000		1	I		1		

Table 47: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,028
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 -							50.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							53.8
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							68.8
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							907
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,110
High - Total impacted (over 30 years)							
(1000 hectares)							

Table 48: E+RE- scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-81.8
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							(77
Carbon sink potential - Moderate							-677
deployment - Cropland measures (1000							
tCO2e/y) Carbon sink potential - Moderate							-19.4
deployment - Permanent conservation							-19.4
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-778
deployment - Total (1000 tC02e/y)							-110
Carbon sink potential - Aggressive		+					-81.8
deployment - Corn-ethanol to energy							01.0
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,291
deployment - Cropland measures (1000							.,
tCO2e/y)							
Carbon sink potential - Aggressive							-38.7
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,411
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							46.8
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							371
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							35.2
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							453
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							46.8
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							

Fuel Comb - Electric Generation - Natural

Monetary damages from air pollution -

Monetary damages from air pollution -

Fuel Comb - Residential - Natural Gas

Mobile - On-Road (million \$2019) Monetary damages from air pollution -

Gas Stations (million \$2019)

Gas (million \$2019)

(million \$2019)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Cropland							707
measures (1000 hectares)							
Land impacted for carbon sink -							70.4
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							824
Aggressive deployment - Total (1000 hectares)							
Table 49: E-B+ scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		30.4	0.049	0.046	0.036	0.025	0.002
Fuel Comb - Electric Generation - Coal (deaths)							
Premature deaths from air pollution -		21.8	14.4	6.94	4.27	2.24	0.928
Fuel Comb - Electric Generation - Natural Gas (deaths)							
Premature deaths from air pollution -		119	121	119	108	86.8	60.
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas Stations (deaths)		15.7	16	15.5	14	11.2	7.83
Premature deaths from air pollution -		10.3	9.4	8.34	6.91	5.21	3.5
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		1.85	1.76	1.67	1.46	1.11	0.74
Fuel Comb - Residential - Oil (deaths)		2.14	2.15	0.1/	1.00	1.40	1.5
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.14	2.15	2.14	1.98	1.62	1.4
Premature deaths from air pollution -		1.58	1.52	1.46	1.4	1.33	1.25
Fuel Comb - Comm/Institutional - Coal		1.50	1.02	1.40	1.4	1.55	1.20
(deaths)							
Premature deaths from air pollution -		8.43	8.39	8.1	7.2	5.81	4.32
Fuel Comb - Comm/Institutional - Natural		0.10	0.07	0		0.01	1.0.
Gas (deaths)							
Premature deaths from air pollution -		1.51	1.38	1.25	1.08	0.911	0.742
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		1.47	1.36	1.24	1.11	0.986	0.86
Fuel Comb - Comm/Institutional - Other							
(deaths)							
Premature deaths from air pollution -		0.613	0.317	0.32	0.32	0.327	0.324
Industrial Processes - Coal Mining							
(deaths)		0/7	00.7	10.0	1/ 0	1/ 0	10
Premature deaths from air pollution -		24.7	22.4	19.3	16.8	14.9	10.6
Industrial Processes - Oil & Gas							
Production (deaths) Monetary damages from air pollution -		269	0.437	0.407	0.323	0.225	0.019
Fuel Comb - Electric Generation - Coal		207	0.431	0.407	0.323	0.223	0.01
(million \$2019)							
Monetary damages from air pollution -		193	127	61.5	37.8	19.9	8.22
Fuel Comb. Flootnic Congretion, Natural		170	121	31.0	31.0	17.7	0.22

1,058

139

91.5

1,078

141

83.3

1,057

138

73.9

961

124

61.3

772

99.6

46.2

534

69.4

31.2

Table 49: E-B+ scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		16.4	15.6	14.8	12.9	9.87	6.56
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		19	19.1	19	17.5	14.3	10.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14	13.5	12.9	12.4	11.7	11
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		74.6	74.3	71.7	63.7	51.4	38.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.4	12.2	11.1	9.6	8.06	6.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		13	12	11	9.86	8.73	7.62
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		5.41	2.8	2.82	2.83	2.88	2.86
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		219	199	172	150	132	94.3

Table 50: E-B+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		203	284	106	350	620	1,001
By economic sector - Construction (jobs)		4,824	30,146	18,385	18,604	20,779	23,696
By economic sector - Manufacturing		3,035	5,536	4,409	4,009	5,544	6,204
(jobs)							
By economic sector - Mining (jobs)		1,739	1,294	964	721	474	254
By economic sector - Other (jobs)		433	5,979	3,239	3,579	3,993	5,396
By economic sector - Pipeline (jobs)		366	309	466	331	373	378
By economic sector - Professional (jobs)		2,826	11,768	7,378	8,247	9,709	11,923
By economic sector - Trade (jobs)		1,995	8,049	5,080	5,557	6,316	7,824
By economic sector - Utilities (jobs)		7,102	13,304	14,328	14,913	18,419	18,660
By resource sector - Biomass (jobs)		808	765	360	1,470	2,870	4,722
By resource sector - CO2 (jobs)		1.63	4.77	1,692	876	1,650	2,172
By resource sector - Coal (jobs)		744	0	0	0	0	0
By resource sector - Grid (jobs)		6,974	20,010	21,799	24,261	31,816	32,925
By resource sector - Natural Gas (jobs)		3,412	2,935	2,350	2,178	1,933	1,102
By resource sector - Nuclear (jobs)		2,635	2,593	2,552	2,336	1,879	1,604
By resource sector - Oil (jobs)		4,364	3,667	3,089	2,601	1,899	1,100
By resource sector - Solar (jobs)		3,570	46,468	22,392	22,314	22,979	30,895
By resource sector - Wind (jobs)		16.2	228	125	275	1,201	813
By education level - All sectors - High		9,258	33,265	23,291	24,088	28,365	32,274
school diploma or less (jobs)							
By education level - All sectors -		6,918	24,469	17,472	18,040	21,269	24,118
Associates degree or some college (jobs)							
By education level - All sectors -		4,963	14,664	10,575	10,992	12,867	14,640
Bachelors degree (jobs)							
By education level - All sectors - Masters		1,213	3,682	2,635	2,778	3,254	3,741
or professional degree (jobs)							
By education level - All sectors - Doctoral		171	591	384	412	472	562
degree (jobs)							
Related work experience - All sectors -		3,219	11,170	7,954	8,266	9,758	11,126
None (jobs)							

Table 50: E-B+ scenario - IMPACTS - Jobs (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Up		4,378	16,107	11,049	11,483	13,506	15,555
to 1 year (jobs)							
Related work experience - All sectors - 1		8,207	27,224	19,449	20,161	23,698	26,902
to 4 years (jobs)							
Related work experience - All sectors - 4		5,291	17,663	12,642	13,047	15,317	17,311
to 10 years (jobs)							
Related work experience - All sectors -		1,430	4,506	3,264	3,354	3,948	4,442
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		1,247	4,387	2,999	3,116	3,617	4,178
(jobs)							
On-the-Job Training - All sectors - Up to 1		14,955	49,384	35,095	36,469	43,023	49,094
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		4,677	16,421	11,747	12,083	14,185	15,969
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,431	5,681	3,984	4,107	4,787	5,393
years (jobs)							
On-the-Job Training - All sectors - Over 10		213	798	531	536	615	701
years (jobs)							
On-Site or In-Plant Training - All sectors -		3,661	12,673	8,800	9,120	10,674	12,244
None (jobs)							
On-Site or In-Plant Training - All sectors -		13,562	44,969	32,011	33,238	39,196	44,660
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		3,629	12,724	9,084	9,354	10,988	12,390
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		1,490	5,638	3,978	4,098	4,775	5,370
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		183	668	484	501	595	671
Over 10 years (jobs)							
Wage income - All (million \$2019)		1,176	3,749	2,752	2,888	3,438	3,934

Table 51: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	464	441	404	373	350	323	290
Final energy use - Residential (PJ)	158	151	147	142	135	128	122
Final energy use - Commercial (PJ)	114	115	113	112	109	107	107
Final energy use - Industry (PJ)	358	374	381	391	402	403	407

Table 52: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.92	2.93	3.93	4.05	5.12	5.35
Cumulative 5-yr (billion \$2018)							

${\it Table 53: E-B+scenario-PILLAR\,1: Efficiency/Electrification-Transportation}$

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	13.5	121	228	724	1,221	2,319	3,418
Vehicle stocks - LDV – All others (1000 units)	4,468	4,468	4,468	4,238	4,008	3,089	2,169
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	138	291	982	3,094	4,506
Public EV charging plugs - DC Fast (1000 units)	0.1		0.496		2.66		7.45
Public EV charging plugs - L2 (1000 units)	0.476		11.9		63.9		179

Table 54: E-B+ scenario	- PTI I AR 1. Efficiency	//Flectrification .	- Residential
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Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	37.5	46.3	49.6	59.1	73.7	83	86.3
Heat Pump (%)							
Sales of space heating units - Electric	25.8	28.1	26.5	21.5	14	9.4	7.8
Resistance (%)							
Sales of space heating units - Gas (%)	30.5	17.1	15.8	12.4	7.01	3.39	2.12
Sales of space heating units - Fossil (%)	6.1	8.46	8.09	7	5.31	4.17	3.78
Sales of water heating units - Electric	0	2.08	8	25	51.1	68.2	74.1
Heat Pump (%)							
Sales of water heating units - Electric	67.7	78.2	73.7	60.5	40.4	27.4	22.9
Resistance (%)							
Sales of water heating units - Gas Furnace	28.2	17	15.7	11.9	5.84	1.86	0.487
(%)							
Sales of water heating units - Other (%)	4.1	2.66	2.65	2.64	2.62	2.58	2.57
Sales of cooking units - Electric	82.6	83.1	84.7	88.9	94.7	98.3	99.5
Resistance (%)							
Sales of cooking units - Gas (%)	17.4	16.9	15.3	11.1	5.31	1.72	0.462
Residential HVAC investment in 2020s vs.		3.78	4.05				
REF - Cumulative 5-yr (billion \$2018)							

Table 55: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	10.1	19.3	24.3	38.5	60.9	76.8	82.9
Heat Pump (%)							
Sales of space heating units - Electric	9.29	8.02	8.23	8.98	10.4	11.8	12.5
Resistance (%)							
Sales of space heating units - Gas (%)	78.5	68.1	63.3	49.4	27.1	10.9	4.44
Sales of space heating units - Fossil (%)	2.15	4.53	4.19	3.17	1.56	0.496	0.13
Sales of water heating units - Electric	0.316	2.04	7.05	21.5	43.6	58	63
Heat Pump (%)							
Sales of water heating units - Electric	7.81	7.62	9.51	15.3	24.1	29.8	31.8
Resistance (%)							
Sales of water heating units - Gas (%)	88	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	3.86	4.23	4.21	3.8	3.27	2.9	2.77
Sales of cooking units - Electric	32	36.2	40.9	53.4	71	81.7	85.5
Resistance (%)							
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s -		15,746	17,554				
Cumulative 5-yr (million \$2018)							

Table 56: E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,499	2,251	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,450	8,486	7,413	7,268	5,747	3,513	3,996
Installed thermal - Nuclear (MW)	5,220	5,220	5,220	5,220	4,333	3,440	3,440
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	0.008	0	0.047
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	7.26	0	0

Table 57: 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 power plant (GWh)	0	0	0	0	8,149	8,149	8,149
Biomass w/ccu allam power plant (GWh)	0	0	0	0	7.93	7.93	55.2

Table 58: E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	0	7	7	7
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	0	1	1	2
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	5	12
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	2
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	1
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment -		0	0	0	6,674	4,475	6,984
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	0	0	463	822	1,376

Table 59: E-B+ scenario - PILLAR 4: CCUS - CO2 capture

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	11.4	17.2	27
Annual - BECCS (MMT)		0	0	0	8.07	13.8	23.5
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	0	11.4	28.6	55.6
Cumulative - BECCS (MMT)		0	0	0	8.07	21.9	45.4
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3

Table 60: E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	159	159	159	159
Spur (km)		0	0	0	773	1,018	1,489
All (km)		0	0	159	932	1,177	1,649
Cumulative investment - Trunk (million \$2018)		0	0	951	951	951	951
Cumulative investment - Spur (million \$2018)		0	0	0	993	1,199	1,755
Cumulative investment - All (million \$2018)		0	0	951	1,943	2,149	2,706

Table 61: E-B+ scenario - PILLAR 4: CCUS - CO2 storage

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	2	2
Resource characterization, appraisal, permitting costs (million \$2020)		3.29	7.9	10.5	10.5	10.5	10.5
Wells and facilities construction costs (million \$2020)		0	4.11	16	28.5	47.7	59.2

Table 62: E-B+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-158
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-274
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-2,808
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-1,420
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-5,902
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-187
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-407
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-183
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-922
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-12,261
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-236
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-960
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-5,059
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-2,081
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-11,805
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-360
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-610
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,303
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-1,829
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-24,243
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-315
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,646
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-7,310
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-2,791
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-17,707
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-534
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-813
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-2,422
pasture (1000 tC02e/y)							-,
Carbon sink potential - High - All (not							-36,273
counting overlap) (1000 tCO2e/y)							50,210
Carbon sink potential - High - Restore							-2,736
productivity (1000 tC02e/y)							2,100
productivity (1000 too26/y)							

Table 62: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000							25.7
hectares) Land impacted for carbon sink potential -							209
Low - Avoid deforestation (over 30 years)							209
(1000 hectares)							
Land impacted for carbon sink potential -							1,428
Low - Extend rotation length (1000							1,420
hectares)							
Land impacted for carbon sink potential -							514
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 -							26.7
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							26.9
Low - Reforest cropland (1000 hectares)							11.9
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							11.9
Land impacted for carbon sink potential -							549
Low - Restore productivity (1000							549
hectares)							
Land impacted for carbon sink potential -							2,791
Low - Total impacted (over 30 years)							_,,,,,
(1000 hectares)							
Land impacted for carbon sink potential -							38.6
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							216
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,578
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							774
Mid - Improve plantations (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							38.7
Mid - Increase trees outside forests (1000							30.1
hectares)							
Land impacted for carbon sink potential -							40.3
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							86.2
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,105
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,876
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							51.5
High - Accelerate regeneration (1000							
hectares)							000
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years)							223
	I .	I .					

Table 62: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							3,727
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,028
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 -							50.7
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							53.8
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							68.8
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							907
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,110
High - Total impacted (over 30 years)							
(1000 hectares)							

Table 63: E-B+ scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-218
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-600
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-16.9
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy							
crops (1000 tC02e/y)							
Carbon sink potential - Moderate							0
deployment - Pasture to energy crops							_
(1000 tC02e/y)							
Carbon sink potential - Moderate							-834
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Aggressive	+	+					-218
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive	+	+					-1,143
deployment - Cropland measures (1000							.,
tCO2e/y)							
Carbon sink potential - Aggressive							-33.8
deployment - Permanent conservation							00.0
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							Ū
crops (1000 tCO2e/y)							
Carbon sink potential - Aggressive	+	+		+			0
deployment - Pasture to energy crops							U
(1000 tC02e/y)							
Carbon sink potential - Aggressive					-		-1,395
deployment - Total (1000 tCO2e/y)							-1,375
uepioyment - Total (1000 to02e/y)							

		2025	2030	2035	2040	2045	2050
and impacted for carbon sink - Moderate deployment - Corn-ethanol to energy							132
grasses (1000 hectares)							
and impacted for carbon sink - Moderate							328
deployment - Cropland measures (1000							520
nectares)							
and impacted for carbon sink - Moderate							30.
deployment - Permanent conservation							
cover (1000 hectares)							
and impacted for carbon sink - Moderate							45.9
deployment - Cropland to woody energy							
crops (1000 hectares)							
and impacted for carbon sink - Moderate							85.4
deployment - Pasture to energy crops							
(1000 hectares)							
and impacted for carbon sink - Moderate							62
deployment - Total (1000 hectares)							
and impacted for carbon sink -							13
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
and impacted for carbon sink -							1,54
Aggressive deployment - Cropland							
measures (1000 hectares)							
and impacted for carbon sink -							61.
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							, ,
and impacted for carbon sink -							45.
Aggressive deployment - Cropland to							
woody energy crops (1000 hectares) and impacted for carbon sink -							85.4
Aggressive deployment - Pasture to							00.
energy crops (1000 hectares)							
and impacted for carbon sink -							1,87
Aggressive deployment - Total (1000							1,01
nectares)							
loctal coj							
able 64: REF scenario - IMPACTS - Health							
tem	2020	2025	2030	2035	2040	2045	205

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		114	75.8	63.5	57.8	55.6	54.2
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		19.6	20.9	22.8	22.8	26.3	27.6
Premature deaths from air pollution - Mobile - On-Road (deaths)		119	123	127	131	136	141
Premature deaths from air pollution - Gas Stations (deaths)		15.6	16.1	16.5	17.1	17.6	18
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		10.2	9.29	8.58	8.19	8.11	8.07
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.79	1.51	1.11	0.763	0.512	0.372
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.04	2.02	2.03	2.08	2.14	2.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.65	1.67	1.68	1.69	1.69	1.68

Table 64: REF scenario - IMPACTS - Health (continued)

Table 04. KEF Scellul 10 - IMPACIS - Heulth	(Continueu						
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		8.47	8.34	7.78	7.16	6.96	7.22
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							
Premature deaths from air pollution -		1.56	1.53	1.47	1.39	1.33	1.31
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		1.54	1.61	1.69	1.76	1.82	1.9
Fuel Comb - Comm/Institutional - Other							
(deaths)							
Premature deaths from air pollution -		1.18	0.862	0.73	0.704	0.694	0.663
Industrial Processes - Coal Mining							
(deaths)							
Premature deaths from air pollution -		24.8	26.6	27.6	26.7	26.9	25.6
Industrial Processes - Oil & Gas							
Production (deaths)							
Monetary damages from air pollution -		1,014	672	563	513	493	480
Fuel Comb - Electric Generation - Coal		.,0	0.2		0.0	.,,	100
(million \$2019)							
Monetary damages from air pollution -		173	185	202	202	233	244
Fuel Comb - Electric Generation - Natural		113	103	202	202	200	244
Gas (million \$2019)							
Monetary damages from air pollution -		1,057	1,092	1,127	1,167	1,208	1,251
		1,051	1,092	1,121	1,101	1,200	1,231
Mobile - On-Road (million \$2019)		100	1/ 0	1//	151	155	1/0
Monetary damages from air pollution -		138	143	146	151	155	160
Gas Stations (million \$2019)							
Monetary damages from air pollution -		90	82.3	76	72.6	71.9	71.5
Fuel Comb - Residential - Natural Gas							
(million \$2019)							
Monetary damages from air pollution -		15.9	13.4	9.85	6.76	4.53	3.29
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		18.1	17.9	18	18.5	19	19.5
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		14.6	14.8	14.9	14.9	14.9	14.9
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		75	73.8	68.9	63.4	61.6	64
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		13.8	13.5	13.1	12.3	11.8	11.6
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		13.6	14.3	14.9	15.5	16.2	16.8
Fuel Comb - Comm/Institutional - Other		.5.5				.5.2	.0.0
(million \$2019)							
Monetary damages from air pollution -		10.4	7.61	6.44	6.22	6.12	5.85
Industrial Processes - Coal Mining		10.4	1.01	0.44	0.22	0.12	5.05
(million \$2019)							
Monetary damages from air pollution -		220	236	245	237	239	227
Industrial Processes - Oil & Gas		220	230	240	231	237	221
Production (million \$2019)							

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		193	173	171	139	139	150
By economic sector - Construction (jobs)		4,151	5,153	5,941	5,628	6,064	7,402
By economic sector - Manufacturing		1,827	1,884	1,974	1,857	1,851	2,662
(jobs)							
By economic sector - Mining (jobs)		1,913	1,542	1,255	940	800	680

Table 65: REF scenario - IMPACTS - Jobs (continued)

Table 65. REF SCETION - IMPACTS - Jubs (C	untinaeaj						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		210	449	584	673	808	1,237
By economic sector - Pipeline (jobs)		376	384	386	368	373	374
By economic sector - Professional (jobs)		2,731	2,855	3,055	2,810	2,881	3,460
By economic sector - Trade (jobs)		2,013	2,045	2,101	1,900	2,003	2,464
By economic sector - Utilities (jobs)		8,143	7,870	8,639	7,366	7,282	7,868
By resource sector - Biomass (jobs)		743	696	646	577	591	601
By resource sector - CO2 (jobs)		0	0.001	0.001	0.001	0.001	0.001
By resource sector - Coal (jobs)		1,477	1,050	995	359	0	0
By resource sector - Grid (jobs)		8,782	8,533	10,229	7,889	8,375	10,145
By resource sector - Natural Gas (jobs)		3,505	3,600	3,570	4,047	4,553	4,041
By resource sector - Nuclear (jobs)		2,635	2,593	2,552	2,160	1,629	1,604
By resource sector - Oil (jobs)		4,388	3,744	3,292	3,054	2,914	2,819
By resource sector - Solar (jobs)			2,063	2,752	3,528	4,132	6,624
By resource sector - Wind (jobs)		26.3	77.5	70.2	66.5	6.73	463
By education level - All sectors - High		8,765	9,222	10,021	9,011	9,305	11,111
school diploma or less (jobs)							
By education level - All sectors -		6,625	6,930	7,553	6,824	7,043	8,375
Associates degree or some college (jobs)							
By education level - All sectors -		4,811	4,838	5,093	4,553	4,561	5,310
Bachelors degree (jobs)							
By education level - All sectors - Masters		1,192	1,198	1,265	1,132	1,132	1,316
or professional degree (jobs)							
By education level - All sectors - Doctoral		164	168	175	160	159	186
degree (jobs)							
Related work experience - All sectors -		3,090	3,217	3,488	3,149	3,247	3,851
None (jobs)							
Related work experience - All sectors - Up		4,080	4,308	4,667	4,204	4,325	5,208
to 1 year (jobs)							
Related work experience - All sectors - 1		7,926	8,167	8,779	7,877	8,050	9,497
to 4 years (jobs)							
Related work experience - All sectors - 4		5,100	5,268	5,675	5,107	5,219	6,137
to 10 years (jobs)							
Related work experience - All sectors -		1,361	1,397	1,497	1,343	1,360	1,604
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		1,173	1,221	1,304	1,179	1,198	1,427
(jobs)							
On-the-Job Training - All sectors - Up to 1		14,281	14,719	15,793	14,161	14,455	17,148
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		4,508	4,712	5,131	4,630	4,767	5,625
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,405	1,501	1,660	1,510	1,576	1,850
years (jobs)							
On-the-Job Training - All sectors - Over 10		188	202	218	201	205	246
years (jobs)							
On-Site or In-Plant Training - All sectors -		3,444	3,583	3,848	3,480	3,549	4,221
None (jobs)							
On-Site or In-Plant Training - All sectors -		12,981	13,390	14,384	12,893	13,171	15,617
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		3,490	3,647	3,968	3,577	3,683	4,355
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		1,464	1,548	1,699	1,543	1,602	1,872
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		177	187	207	187	196	232
Over 10 years (jobs)							
Wage income - All (million \$2019)		1,145	1,185	1,285	1,167	1,200	1,420

Table 66: REF scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	463	441	406	385	385	396	410

Table 66: REF scenario - PILLAR 1: Efficiency/Electrification - Overview (continued)

The state of the s							
Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	158	152	151	152	156	160	165
Final energy use - Commercial (PJ)	114	116	117	119	121	125	132
Final energy use - Industry (PJ)	358	383	402	413	428	438	452

Table 67: REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.94	4.06	5.79	6.1	5.26	5.44
Cumulative 5-yr (billion \$2018)							

Table 68: REF scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	36.1	57.9	58.6	59.8	60.9	62.4	64.6
Heat Pump (%)							
Sales of space heating units - Electric	26.4	22.4	22.2	21.4	20.5	19.2	16.9
Resistance (%)							
Sales of space heating units - Gas (%)	31.3	13.3	13.7	13.6	13.5	13.4	13.4
Sales of space heating units - Fossil (%)	6.23	6.42	5.5	5.15	5.08	5.05	5.09
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	67.7	79.8	79.8	79.6	79.5	79.5	79.4
Resistance (%)							
Sales of water heating units - Gas Furnace	28.2	17.5	17.5	17.7	17.8	17.8	17.9
(%)							
Sales of water heating units - Other (%)	4.1	2.67	2.66	2.69	2.72	2.72	2.73
Sales of cooking units - Electric	82.5	82.5	82.5	82.5	82.5	82.5	82.5
Resistance (%)							
Sales of cooking units - Gas (%)	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Residential HVAC investment in 2020s vs.		3.77	3.56				
REF - Cumulative 5-yr (billion \$2018)							

Table 69: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	10.1	29.8	65.1	72	72.3	72.3	72.4
Heat Pump (%)							
Sales of space heating units - Electric	9.29	9.59	14.9	20.3	25	25.7	25.7
Resistance (%)							
Sales of space heating units - Gas (%)	78.5	56.5	17.5	6.45	2.54	1.99	1.94
Sales of space heating units - Fossil (%)	2.15	4.14	2.51	1.22	0.185	0.016	0
Sales of water heating units - Electric	0.316	0.281	0.275	0.277	0.278	0.276	0.277
Heat Pump (%)							
Sales of water heating units - Electric	7.81	6.92	6.81	6.83	6.85	6.81	6.81
Resistance (%)							
Sales of water heating units - Gas (%)	88	88.5	88.5	88.6	88.5	88.5	88.5
Sales of water heating units - Other (%)	3.86	4.28	4.39	4.33	4.38	4.4	4.38
Sales of cooking units - Electric	32	34.3	34.3	34.3	34.4	34.3	34.3
Resistance (%)							
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Commercial HVAC investment in 2020s -		15,522	16,121				
Cumulative 5-yr (million \$2018)							

Table 70: REF scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,499	2,807	2,807	2,807	0	0	0
Installed thermal - Natural gas (MW)	6,450	8,486	8,010	8,486	7,328	10,349	13,941
Installed thermal - Nuclear (MW)	5,220	5,220	5,220	5,220	3,440	3,440	3,440
Installed renewables - Rooftop PV (MW)	353	569	805	1,146	1,626	2,248	3,044

Table 70: REF scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Base land use assumptions (MW)	1,464	1,464	1,464	1,464	1,464	1,464	1,464
Installed renewables - Solar - Constrained land use assumptions (MW)	7.69	7.69	7.69	7.69	7.69	7.69	7.69

Table 71: REF scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,487	3,487	3,487	3,487	3,487	3,487	3,487
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							

Table 72: 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)	-9.71		-9.95				-8.06
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-4.82		-8.04				-8.46
Business-as-usual carbon sink - Total (Mt CO2e/y)	-14.5		-18				-16.5

Table 73: REF scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-158
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-274
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,808
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,420
Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)							-5,902
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)							-187
Carbon sink potential - Low - Reforest cropland (1000 tC02e/y)							-407
Carbon sink potential - Low - Reforest pasture (1000 tC02e/y)							-183
Carbon sink potential - Low - Restore productivity (1000 tC02e/y)							-922
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-12,261
Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)							-236
Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y)							-960
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,059
Carbon sink potential - Mid - Improve plantations (1000 tC02e/y)							-2,081
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)							-11,805
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-360
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-610

Table 73: REF scenario - PILLAR 6: Land sinks - Forests (continued)

Iable 73: REF scenario - PILLAR 6: Land sir Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest							-1,303
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-1,829
productivity (1000 tCO2e/y)							•
Carbon sink potential - Mid - All (not							-24,243
counting overlap) (1000 tCO2e/y)							, -
Carbon sink potential - High - Accelerate						+	-315
regeneration (1000 tCO2e/y)							0.0
Carbon sink potential - High - Avoid							-1,646
deforestation (1000 tCO2e/y)							1,0 10
Carbon sink potential - High - Extend							-7,310
rotation length (1000 tC02e/y)							-1,010
Carbon sink potential - High - Improve							-2,791
plantations (1000 tCO2e/y)							-2,171
Carbon sink potential - High - Increase							-17,707
							-17,707
retention of HWP (1000 tC02e/y)							F0/
Carbon sink potential - High - Increase							-534
trees outside forests (1000 tCO2e/y)							040
Carbon sink potential - High - Reforest							-813
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-2,422
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-36,273
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-2,736
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							25.7
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							209
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,428
Low - Extend rotation length (1000							1, 120
hectares)							
Land impacted for carbon sink potential -							514
Low - Improve plantations (1000							314
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							U
7							
hectares)							0/7
Land impacted for carbon sink potential -							26.7
Low - Increase trees outside forests							
(1000 hectares)							2/0
Land impacted for carbon sink potential -							26.9
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11.9
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							549
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,791
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							38.6
Mid - Accelerate regeneration (1000							30.0
hectares)							
Land impacted for carbon sink potential -			-				216
Mid - Avoid deforestation (over 30 years)							210
(1000 hectares)							
(1000 Hectares)							

Table 73: REF scenario - PILLAR 6: Land sinks - Forests (continued)

iable 73: REF Scenario - Pillar 6: Lana sin							
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							2,578
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							774
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 -							38.7
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							40.3
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							86.2
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,105
Mid - Restore productivity (1000							,
hectares)							
Land impacted for carbon sink potential -			+				4,876
Mid - Total impacted (over 30 years) (1000							.,0.0
hectares)							
Land impacted for carbon sink potential -							51.5
High - Accelerate regeneration (1000							00
hectares)							
Land impacted for carbon sink potential -							223
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,727
High - Extend rotation length (1000							0,
hectares)							
Land impacted for carbon sink potential -							1,028
High - Improve plantations (1000							1,020
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							•
hectares)							
Land impacted for carbon sink potential -							50.7
High - Increase trees outside forests							00.1
(1000 hectares)							
Land impacted for carbon sink potential -							53.8
High - Reforest cropland (1000 hectares)							00.0
Land impacted for carbon sink potential -							68.8
High - Reforest pasture (1000 hectares)							55.6
Land impacted for carbon sink potential -	-			+			907
High - Restore productivity (1000							701
hectares)							
Land impacted for carbon sink potential -							6,110
High - Total impacted (over 30 years)							0,110
(1000 hectares)							
TOOO Heddares)							