

Net-Zero America - Illinois 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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Contents

1	E+ scenario - IMPACTS - Health	1
2	E+ scenario - IMPACTS - Jobs	2
3	E+ scenario - IMPACTS - Fossil fuel industries	3
4	E+ scenario - PILLAR 1: Efficiency/Electrification - Overview	3
5	E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	3
6	E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	3
7	E+ scenario - PILLAR 1: Efficiency/Electrification - Residential	4
8	E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	4
9	E+ scenario - PILLAR 2: Clean Electricity - Generating capacity	4
10	E+ scenario - PILLAR 2: Clean Electricity - Generation	5
11	E+ scenario - PILLAR 3: Clean fuels - Bioenergy	5
12	E+ scenario - PILLAR 4: CCUS - CO2 capture	5
13	E+ scenario - PILLAR 4: CCUS - CO2 pipelines	6
14	E+ scenario - PILLAR 4: CCUS - CO2 storage	6
15	E+ scenario - PILLAR 6: Land sinks - Forests	6
16	E+ scenario - PILLAR 6: Land sinks - Agriculture	8
17	E- scenario - IMPACTS - Health	9
18	E- scenario - IMPACTS - Jobs	10
19	E- scenario - PILLAR 1: Efficiency/Electrification - Overview	12
20	E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	12
21	E- scenario - PILLAR 1: Efficiency/Electrification - Transportation	12
22	E- scenario - PILLAR 1: Efficiency/Electrification - Residential	12
23	E- scenario - PILLAR 1: Efficiency/Electrification - Commercial	12
24	E- scenario - PILLAR 2: Clean Electricity - Generating capacity	13
25	E- scenario - PILLAR 6: Land sinks - Forests	13
26	E- scenario - PILLAR 6: Land sinks - Agriculture	15
27	E+RE+ scenario - IMPACTS - Health	16
28	E+RE+ scenario - IMPACTS - Jobs	17
29	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview	18
30	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand .	18
31	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	19
32	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential	19
33	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	19
34	E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity	19
35	E+RE+ scenario - PILLAR 2: Clean Electricity - Generation	20
36	E+RE+ scenario - PILLAR 6: Land sinks - Forests	20
37	E+RE+ scenario - PILLAR 6: Land sinks - Agriculture	23
38	E+RE- scenario - IMPACTS - Health	23
39	E+RE- scenario - IMPACTS - Jobs	25
40	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview	26
41	${\sf E+RE-scenario-PILLAR1:Efficiency/Electrification-Electricitydemand} \ \ . \ \ .$	26
42	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation	26
43	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential	26

44	E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial	27
45	E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity	27
46	E+RE- scenario - PILLAR 2: Clean Electricity - Generation	27
47	E+RE- scenario - PILLAR 6: Land sinks - Forests	28
48	E+RE- scenario - PILLAR 6: Land sinks - Agriculture	30
49	E-B+ scenario - IMPACTS - Health	31
50	E-B+ scenario - IMPACTS - Jobs	32
51	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview	33
52	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	33
53	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	33
54	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential	34
55	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial	34
56	E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity	34
57	E-B+ scenario - PILLAR 2: Clean Electricity - Generation	34
58	E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy	35
59	E-B+ scenario - PILLAR 4: CCUS - CO2 capture	35
60	E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines	35
61	E-B+ scenario - PILLAR 4: CCUS - CO2 storage	35
62	E-B+ scenario - PILLAR 6: Land sinks - Forests	36
63	E-B+ scenario - PILLAR 6: Land sinks - Agriculture	38
64	REF scenario - IMPACTS - Health	39
65	REF scenario - IMPACTS - Jobs	40
66	REF scenario - PILLAR 1: Efficiency/Electrification - Overview	41
67	REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand	42
68	REF scenario - PILLAR 1: Efficiency/Electrification - Residential	42
69	REF scenario - PILLAR 1: Efficiency/Electrification - Commercial	42
70	REF scenario - PILLAR 2: Clean Electricity - Generating capacity	42
71	REF scenario - PILLAR 2: Clean Electricity - Generation	43
72	REF scenario - PILLAR 6: Land sinks - Forests - REF only	43
73	REF scenario - PILLAR 6: Land sinks - Forests	43

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 -		109	0.092	0.089	0.078	0.055	0.004
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		45.8	32.2	24.1	20.6	11.8	5.09
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		551	516	394	230	108	46.5
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		36.3	33.4	25.3	15.1	7.48	3.68
Stations (deaths)							
Premature deaths from air pollution -		167	147	107	62.7	29.7	9.97
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		3.45	2.9	2.23	1.6	1.08	0.75
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		9.78	9.44	7.72	5.34	2.95	1.34
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution -		10.8	10.3	9.78	9.21	8.63	8.03
Fuel Comb - Comm/Institutional - Coal							
(deaths)							
Premature deaths from air pollution -		192	174	136	87.7	48	21.1
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							
Premature deaths from air pollution -		40.6	35.3	28.6	21	14.2	8.82
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		3.85	3.24	2.65	2.07	1.52	0.998
Fuel Comb - Comm/Institutional - Other							
(deaths)							
Premature deaths from air pollution -		1.83	0.616	0.592	0.562	0.551	0.534
Industrial Processes - Coal Mining							
(deaths)							
Premature deaths from air pollution -		120	113	103	80.4	59.8	37.1
Industrial Processes - Oil & Gas		0		.55	33	07.0	• • • • • • • • • • • • • • • • • • • •
Production (deaths)							
Monetary damages from air pollution -		962	0.816	0.793	0.689	0.484	0.033
Fuel Comb - Electric Generation - Coal		752	0.0.0	070	0.007	00.	0.000
(million \$2019)							
Monetary damages from air pollution -		406	285	214	182	104	45.1
Fuel Comb - Electric Generation - Natural		.00	200		102	.0.	10
Gas (million \$2019)							
Monetary damages from air pollution -		4,899	4,586	3,504	2,047	963	413
Mobile - On-Road (million \$2019)		4,077	4,000	0,004	2,041	700	710
Monetary damages from air pollution -		322	296	224	134	66.2	32.6
Gas Stations (million \$2019)		322	270	224	154	00.2	32.0
Monetary damages from air pollution -		1,480	1,305	950	556	263	88.3
Fuel Comb - Residential - Natural Gas		1,400	1,303	730	330	203	00.5
(million \$2019)							
Monetary damages from air pollution -		30.6	25.7	19.7	14.2	9.59	6.65
Fuel Comb - Residential - Oil (million		30.0	20.1	12.1	14.2	7.57	0.00
\$2019)							
Monetary damages from air pollution -		86.6	83.6	68.5	47.3	26.1	11.9
Fuel Comb - Residential - Other (million		0.00	03.0	00.0	41.3	20.1	11.7
\$2019)		95.6	91.3	0/ 5	01 5	7/ /	71.1
Monetary damages from air pollution -		95.6	91.3	86.5	81.5	76.4	71.1
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)		1/07	15/0	1.007	777	/.OF	187
Monetary damages from air pollution -		1,697	1,543	1,204	777	425	Ιδί
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 -		359	312	253	186	125	78.1
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		34.1	28.7	23.4	18.3	13.4	8.84
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		16.2	5.43	5.23	4.96	4.86	4.71
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		1,069	1,007	919	714	531	330
Industrial Processes - Oil & Gas							
Production (million \$2019)							

Table 2: E+ scenario - IMPACTS - Jobs

Table 2: E+ Scendrio - IMPACTS - Jobs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,969	3,017	7,140	7,221	5,039	3,630
By economic sector - Construction (jobs)		16,261	20,969	28,695	34,874	36,511	40,490
By economic sector - Manufacturing		9,924	10,786	14,423	14,457	12,678	13,757
(jobs)							
By economic sector - Mining (jobs)		7,211	4,726	3,490	2,423	1,769	1,288
By economic sector - Other (jobs)		1,256	1,547	2,803	4,153	4,370	4,858
By economic sector - Pipeline (jobs)		1,058	1,601	1,066	632	556	657
By economic sector - Professional (jobs)		9,934	11,685	20,819	26,808	28,937	31,576
By economic sector - Trade (jobs)		7,700	7,844	10,633	13,160	14,285	16,174
By economic sector - Utilities (jobs)		21,231	25,005	31,303	35,463	36,679	40,731
By resource sector - Biomass (jobs)		7,011	6,904	18,564	20,699	18,517	15,984
By resource sector - CO2 (jobs)		53.1	5,823	3,018	974	1,978	3,799
By resource sector - Coal (jobs)		4,620	1,584	1,162	1,004	900	796
By resource sector - Grid (jobs)		23,104	27,441	44,009	53,899	60,462	69,628
By resource sector - Natural Gas (jobs)		10,687	8,662	7,320	7,749	4,221	3,154
By resource sector - Nuclear (jobs)		6,266	6,166	5,834	5,179	3,987	2,816
By resource sector - Oil (jobs)		11,530	9,557	7,423	5,282	3,774	2,521
By resource sector - Solar (jobs)		4,359	4,359	9,177	14,146	11,945	11,019
By resource sector - Wind (jobs)		9,915	16,682	23,865	30,258	35,041	43,445
By education level - All sectors - High		33,614	37,468	52,112	59,345	58,765	63,145
school diploma or less (jobs)		.			,	,	,
By education level - All sectors -		23,205	26,715	36,293	42,461	43,610	48,170
Associates degree or some college (jobs)		.				.	
By education level - All sectors -		16,167	17,910	24,639	28,678	29,420	32,031
Bachelors degree (jobs)		.				,	•
By education level - All sectors - Masters		3,991	4,450	6,346	7,508	7,770	8,456
or professional degree (jobs)			-				•
By education level - All sectors - Doctoral		568	637	980	1,199	1,259	1,358
degree (jobs)						.	•
Related work experience - All sectors -		11,247	12,719	17,613	20,299	20,403	22,132
None (jobs)							
Related work experience - All sectors - Up		16,285	18,064	25,458	29,027	28,719	30,805
to 1 year (jobs)		.	,		·	.	•
Related work experience - All sectors - 1		27,710	31,040	42,917	49,860	50,677	55,158
to 4 years (jobs)		.					
Related work experience - All sectors - 4		17,575	20,027	27,227	31,750	32,592	35,807
to 10 years (jobs)			-				•
Related work experience - All sectors -		4,729	5,328	7,156	8,255	8,432	9,258
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		4,259	4,729	6,507	7,543	7,640	8,271
(jobs)		.					•
On-the-Job Training - All sectors - Up to 1		52,172	57,903	80,788	92,918	93,314	100,833
year (jobs)			•	,		·	•

Table 2: <i>E+</i>	cconario	_ TMDACTS .	_ Inhe	Irontiniiodl
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Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		15,592	17,985	24,251	28,304	29,061	32,064
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,811	5,745	7,747	9,192	9,570	10,639
On-the-Job Training - All sectors - Over 10 years (jobs)		711	817	1,079	1,234	1,238	1,352
On-Site or In-Plant Training - All sectors - None (jobs)		12,348	13,962	19,612	22,842	23,105	25,042
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		47,359	52,576	72,906	83,819	84,300	91,260
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		12,201	13,981	18,918	22,010	22,509	24,759
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		5,004	5,910	7,920	9,336	9,689	10,740
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		635	751	1,015	1,184	1,221	1,359
Wage income - All (million \$2019)		4,756	5,448	7,570	8,898	9,187	10,152

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		204	179	143	108	81.3	59.6
Oil consumption - Cumulative (million							4,405
bbls)							
Oil production - Annual (million bbls)		10.9	10.9	10.9	8.66	7.04	4.69
Natural gas consumption - Annual (tcf)		858	723	580	437	275	191
Natural gas consumption - Cumulative							17,474
(tcf)							
Natural gas production - Annual (tcf)		2.9	2.75	2.39	2.02	1.6	1.25

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,043	977	873	748	634	562	530
Final energy use - Residential (PJ)	591	551	512	443	367	307	269
Final energy use - Commercial (PJ)	441	434	415	383	346	319	305
Final energy use - Industry (PJ)	634	660	671	671	678	686	694

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		6.63	6.83	11.6	12.4	12.3	13
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)	113	974	1,835	4,848	7,861	10,269	12,676
Vehicle stocks - LDV – All others (1000	10,570	10,065	9,559	6,966	4,373	2,474	575
units)							
Light-duty vehicle capital costs vs. REF -		2,022	5,214	8,399	12,743	13,847	13,214
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.299		3.24		13.9		22.4
units)							
Public EV charging plugs - L2 (1000 units)	1.41		78		334		539

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.5	10.7	39.6	85.8	93.9	94.4	94.2
Heat Pump (%)							
Sales of space heating units - Electric	12.7	18.4	13.8	6.17	4.76	4.69	4.9
Resistance (%)							
Sales of space heating units - Gas (%)	81.4	66.5	43.4	6.93	0.605	0.212	0.217
Sales of space heating units - Fossil (%)	2.45	4.48	3.17	1.07	0.718	0.695	0.671
Sales of water heating units - Electric	0	1.85	15.9	37.3	41	41.2	41.2
Heat Pump (%)							
Sales of water heating units - Electric	22.7	38.5	43.9	56.3	58.6	58.7	58.6
Resistance (%)							
Sales of water heating units - Gas Furnace	77.3	59.6	40	6.28	0.367	0	0
(%)							
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.111	0.111	0.112
Sales of cooking units - Electric	50.8	61.3	93.4	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	49.2	38.7	6.63	0.334	0	0	0
Residential HVAC investment in 2020s vs.		10.8	14.4				
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	0.751	8.27	35.3	81	89	89.5	89.5
Heat Pump (%)							
Sales of space heating units - Electric	2.86	3.5	5.34	9.38	10.1	10.2	10.2
Resistance (%)							
Sales of space heating units - Gas (%)	96.4	86.2	59	9.63	0.906	0.363	0.363
Sales of space heating units - Fossil (%)	0	2.07	0.402	0.017	0	0	0
Sales of water heating units - Electric	0.271	2.48	19.4	46.1	50.7	51	51
Heat Pump (%)							
Sales of water heating units - Electric	2.65	4.62	18.3	44	48.5	48.8	48.8
Resistance (%)							
Sales of water heating units - Gas (%)	96.9	92.7	62.2	9.74	0.572	0	0
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric	41	54.2	82.9	88.6	88.9	88.9	88.9
Resistance (%)							
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s -		40,927	44,680				
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)	7,459	1,811	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,505	16,076	13,082	17,242	11,062	12,500	12,526
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	11,245	10,075	6,038	6,038
Installed renewables - Rooftop PV (MW)	62.5	110	164	248	368	523	724
Installed renewables - Solar - Base land use assumptions (MW)	305	2,274	3,715	8,534	16,621	21,701	24,228
Installed renewables - Wind - Base land use assumptions (MW)	4,504	13,063	34,871	55,544	81,007	105,985	135,080
Installed renewables - Solar - Constrained land use assumptions (MW)	383	1,402	3,736	8,461	15,541	21,926	23,608
Installed renewables - Wind - Constrained land use assumptions (MW)	6,324	8,682	13,605	17,187	19,590	19,734	19,769
Capital invested - Solar PV - Base (billion \$2018)		2.64	1.73	5.31	8.41	4.98	2.34
Capital invested - Wind - Base (billion \$2018)		10.1	29	25.6	30.1	28	30.8

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)		1.16	2.5	7.75	8.56	5.43	1.47
Capital invested - Wind - Constrained (billion \$2018)		3.55	6.59	4.41	2.68	0.201	66
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	0.024	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0.199	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	650	4,313	6,920	15,776	30,541	39,500	43,941
Wind - Base land use assumptions (GWh)	22,788	44,881	115,313	180,643	260,635	338,249	426,461
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Constrained land use assumptions	770	2,660	6,920	15,546	28,427	39,685	42,633
(GWh)							
Wind - Constrained land use assumptions	23,175	30,574	46,053	56,813	63,779	64,186	64,286
(GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	224	224	224	224	224
Biomass w/ccu allam power plant (GWh)	0	0	0	24.2	24.2	24.2	24.2

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	2	2	2	2	2
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	1	1	1	1
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	33	56	63	63
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	1	1	1	1
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	2	2	2	2	2
Conversion capital investment -		0	183	29,262	19,141	5,818	0
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	11.3	2,030	3,353	3,754	3,754

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.24	41.5	66.8	74.1	74.8
Annual - BECCS (MMT)		0	0.22	37.8	62.4	69.9	69.9
Annual - NGCC (MMT)		0	0.02	0.38	1.08	0.81	1.38
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	0.24	41.8	109	183	257
Cumulative - BECCS (MMT)		0	0.22	38	100	170	240
Cumulative - NGCC (MMT)		0	0.02	0.4	1.48	2.29	3.67
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	958	1,324	1,324	1,324	1,324
Spur (km)		0	507	1,842	3,122	4,454	5,297
All (km)		0	1,464	3,167	4,446	5,778	6,621
Cumulative investment - Trunk (million		0	5,900	8,150	8,150	8,150	8,150
\$2018)							
Cumulative investment - Spur (million		0	304	1,825	2,792	4,354	5,015
\$2018)							
Cumulative investment - All (million		0	6,204	9,975	10,943	12,504	13,165
\$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.1	3.52	7.23	11.2	14.9
Injection wells (wells)		0	2	9	15	26	32
Resource characterization, appraisal, permitting costs (million \$2020)		100	281	361	361	361	361
Wells and facilities construction costs (million \$2020)		0	66.8	260	464	776	963

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-47.9
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-449
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-932
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-55.1
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-455
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,217
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2,715
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-366
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-418
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,654
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-71.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,570
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-1,679
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-80.8
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-909
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-2,347
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-4,073
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							-2,599
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-828
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-14,157
counting overlap) (1000 tC02e/y)							
Carbon sink potential - High - Accelerate							-95.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,692
deforestation (1000 tC02e/y)							
Carbon sink potential - High - Extend							-2,426
rotation length (1000 tC02e/y)							100
Carbon sink potential - High - Improve							-108
plantations (1000 tC02e/y)							
Carbon sink potential - High - Increase							-1,364
retention of HWP (1000 tC02e/y)							0 (77
Carbon sink potential - High - Increase							-3,477
trees outside forests (1000 tC02e/y)							5 / 0.0
Carbon sink potential - High - Reforest							-5,430
cropland (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-4,831
pasture (1000 tC02e/y)							
Carbon sink potential - High - All (not							-21,662
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-1,239
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							7.82
Low - Accelerate regeneration (1000							
hectares)							0/0
Land impacted for carbon sink potential -							342
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							474
Land impacted for carbon sink potential -							474
Low - Extend rotation length (1000							
hectares) Land impacted for carbon sink potential -							20
Low - Improve plantations (1000							20
hectares)							
Land impacted for carbon sink potential -		-					0
Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							174
Low - Increase trees outside forests							114
(1000 hectares)							
Land impacted for carbon sink potential -		+					180
Low - Reforest cropland (1000 hectares)							100
Land impacted for carbon sink potential -		+					23.8
Low - Reforest pasture (1000 hectares)							20.0
Land impacted for carbon sink potential -		+					248
Low - Restore productivity (1000							240
hectares)							
Land impacted for carbon sink potential -							1,469
Low - Total impacted (over 30 years)							1,407
(1000 hectares)							
Land impacted for carbon sink potential -		+	-				11.7
Mid - Accelerate regeneration (1000							11.7
hectares)							
Land impacted for carbon sink potential -					-		353
Mid - Avoid deforestation (over 30 years)							333
(1000 hectares)							
11000 1166(81 63)	1						

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							855
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							30
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 -							252
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							269
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							172
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							500
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,444
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							15.6
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							364
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,237
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							39.9
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 -							330
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							359
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							137
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							411
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,894
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							-3,836
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-9,245
deployment - Cropland measures (1000							
tCO2e/y)							

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

Item Ide: E+ scenario - PILLAR 6: Land sink	s - Agriculti 2020	ure (contin 2025	ued) 2030	2035	2040	2045	2050
Carbon sink potential - Moderate				2000	20 10	20 10	-214
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-13,295
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,836
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-17,544
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-428
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-21,808
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							1,734
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							3,799
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							389
deployment - Permanent conservation							
cover (1000 hectares)							F 000
Land impacted for carbon sink - Moderate							5,922
deployment - Total (1000 hectares) Land impacted for carbon sink -							1,734
·							1,734
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares) Land impacted for carbon sink -							7,209
Aggressive deployment - Cropland							1,209
measures (1000 hectares)							
Land impacted for carbon sink -							779
Aggressive deployment - Permanent							117
conservation cover (1000 hectares)							
Land impacted for carbon sink -							9,721
Aggressive deployment - Total (1000							7,1 2 1
hectares)							
noctal coj							
Table 17: E- scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		109	0.092	0.089	0.078	0.055	0.004
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		49.7	33.9	14.4	6.27	2.09	1.52
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		561	569	558	506	405	281
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		37.1	37.6	36.4	32.7	26.1	18.2
Stations (deaths)							
Premature deaths from air pollution -		168	156	142	123	95	63.3
Fuel Comb - Residential - Natural Gas		-				-	
(deaths)							
Premature deaths from air pollution -		3.54	3.3	3.08	2.76	2.31	1.85
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		9.84	10.2	10.3	9.82	8.12	5.98
Fuel Comb - Pesidential - Other (deaths)		-	-		-	-	

Fuel Comb - Residential - Other (deaths)

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

Table II. L Scenario In Aoro Health	Continuou						
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal		10.8	10.3	9.78	9.21	8.63	8.03
(deaths)							
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	186	177	160	132	98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.7	39.5	37.8	33.6	27.5	21.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.47	3.11	2.74	2.38	2.03
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.76	0.619	0.603	0.581	0.553	0.499
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		120	110	95.9	84.4	74.8	52
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		440	300	127	55.5	18.5	13.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,985	5,062	4,958	4,497	3,605	2,497
Monetary damages from air pollution - Gas Stations (million \$2019)		329	333	322	290	231	161
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,485	1,381	1,258	1,086	842	561
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		31.4	29.2	27.3	24.5	20.4	16.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		87.2	90.1	91.7	87	71.9	53
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,700	1,645	1,569	1,417	1,173	868
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		361	350	335	298	244	190
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	30.7	27.5	24.2	21	18
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		15.5	5.46	5.32	5.12	4.88	4.4
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,067	972	852	749	664	461

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,976	3,048	10,821	11,837	6,984	3,629
By economic sector - Construction (jobs)		16,329	22,888	29,584	37,804	41,723	46,599

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

Table 16: E- Scellullo - IMPAG15 - Jubs (cul	ıtınueuj						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing		10,065	11,106	15,737	18,648	17,034	16,748
(jobs)							
By economic sector - Mining (jobs)		7,181	4,843	3,863	3,062	2,486	1,788
By economic sector - Other (jobs)		1,277	1,594	2,714	4,185	4,817	5,420
By economic sector - Pipeline (jobs)		1,062	2,076	1,313	769	842	1,070
By economic sector - Professional (jobs)		9,983	11,999	25,796	37,824	36,225	35,993
By economic sector - Trade (jobs)		7,732	8,068	12,200	17,081	17,409	18,746
By economic sector - Utilities (jobs)		20,987	26,949	31,804	38,204	41,533	46,442
By resource sector - Biomass (jobs)		7,022	6,981	32,817	46,911	29,740	15,456
By resource sector - CO2 (jobs)		53.7	9,941	5,184	1,706	3,392	6,468
By resource sector - Coal (jobs)		4,521	1,588	1,173	1,020	901	770
By resource sector - Grid (jobs)		22,549	27,684	43,392	58,849	68,465	76,996
By resource sector - Natural Gas (jobs)		10,685	8,230	6,255	6,791	3,770	3,472
By resource sector - Nuclear (jobs)		6,266	6,166	5,834	5,179	4,576	3,648
By resource sector - Oil (jobs)		11,626	10,042	8,700	7,294	5,907	3,953
By resource sector - Solar (jobs)		4,615	4,581	7,650	12,236	12,770	11,114
By resource sector - Wind (jobs)		10,256	17,359	22,830	29,426	39,533	54,560
By education level - All sectors - High		33,623	39,818	58,536	72,433	70,630	72,460
school diploma or less (jobs)							
By education level - All sectors -		23,210	28,552	39,191	49,813	51,604	55,633
Associates degree or some college (jobs)							
By education level - All sectors -		16,194	18,874	27,709	35,989	35,796	37,040
Bachelors degree (jobs)							
By education level - All sectors - Masters		3,996	4,668	7,228	9,555	9,461	9,742
or professional degree (jobs)							
By education level - All sectors - Doctoral		570	661	1,170	1,623	1,564	1,561
degree (jobs)							
Related work experience - All sectors -		11,251	13,541	19,699	24,762	24,486	25,439
None (jobs)							
Related work experience - All sectors - Up		16,303	19,082	28,907	36,248	34,852	35,300
to 1 year (jobs)							
Related work experience - All sectors - 1		27,720	32,963	47,650	60,479	60,721	63,588
to 4 years (jobs)							
Related work experience - All sectors - 4		17,586	21,336	29,790	38,030	38,890	41,384
to 10 years (jobs)							
Related work experience - All sectors -		4,734	5,651	7,789	9,894	10,105	10,725
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		4,268	4,993	7,319	9,421	9,275	9,524
(jobs)							
On-the-Job Training - All sectors - Up to 1		52,212	61,245	91,068	115,245	112,936	116,011
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		15,591	19,255	26,055	32,853	34,236	37,058
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		4,807	6,208	8,231	10,447	11,128	12,268
years (jobs)							
On-the-Job Training - All sectors - Over 10		714	871	1,160	1,447	1,479	1,575
years (jobs)							
On-Site or In-Plant Training - All sectors -		12,371	14,805	22,017	28,106	27,840	28,867
None (jobs)							
On-Site or In-Plant Training - All sectors -		47,386	55,646	81,809	103,427	101,829	105,015
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		12,201	14,944	20,441	25,739	26,601	28,591
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		5,001	6,370	8,475	10,754	11,341	12,396
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		634	807	1,092	1,388	1,443	1,567
Over 10 years (jobs)							
Wage income - All (million \$2019)		4,756	5,796	8,365	10,741	10,980	11,698
						l l	

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,044	984	908	847	798	740	672
Final energy use - Residential (PJ)	591	552	524	495	458	408	352
Final energy use - Commercial (PJ)	441	434	424	414	399	379	356
Final energy use - Industry (PJ)	634	660	674	680	693	701	708

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		5.41	5.46	7.27	7.54	10.4	11
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)	87.8	341	593	1,764	2,935	5,527	8,119
Vehicle stocks - LDV – All others (1000 units)	10,613	10,613	10,613	10,067	9,521	7,337	5,153
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	333	687	2,331	7,297	10,644
Public EV charging plugs - DC Fast (1000 units)	0.299		1.05		5.19		14.3
Public EV charging plugs - L2 (1000 units)	1.41		25.2		125		345

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.5	8.23	11.6	22.2	45.5	72.3	87.2
Heat Pump (%)							
Sales of space heating units - Electric	12.7	18.7	18.1	16.4	12.5	8.16	5.9
Resistance (%)							
Sales of space heating units - Gas (%)	81.4	68.5	65.9	57.4	39	17.8	5.87
Sales of space heating units - Fossil (%)	2.45	4.6	4.47	3.97	2.93	1.72	1.01
Sales of water heating units - Electric	0	0.582	2.2	7.34	18.4	30.9	37.9
Heat Pump (%)							
Sales of water heating units - Electric	22.7	38.3	38.8	40.9	46.2	52.8	56.7
Resistance (%)							
Sales of water heating units - Gas Furnace	77.3	61	58.9	51.7	35.3	16.1	5.22
(%)							
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.113	0.113	0.112
Sales of cooking units - Electric	50.6	51.9	56.4	68.3	84.9	95.1	98.7
Resistance (%)							
Sales of cooking units - Gas (%)	49.4	48.1	43.6	31.7	15.1	4.87	1.31
Residential HVAC investment in 2020s vs.		10.7	14.3				
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	0.751	6.2	9.31	19.3	41.6	67.6	82.4
Heat Pump (%)							
Sales of space heating units - Electric	2.86	3.43	3.64	4.33	6.04	8.25	9.53
Resistance (%)							
Sales of space heating units - Gas (%)	96.4	88	84.8	74.6	51.5	23.8	7.97
Sales of space heating units - Fossil (%)	0	2.4	2.27	1.73	0.88	0.287	0.075
Sales of water heating units - Electric	0.271	1.04	2.99	9.2	22.7	38.2	46.9
Heat Pump (%)							
Sales of water heating units - Electric	2.65	3.78	5.32	10.5	22.3	36.6	44.8
Resistance (%)							
Sales of water heating units - Gas (%)	96.9	95	91.5	80.1	54.8	25	8.1
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187

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

••	•		•	•			
Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric	41	45.8	49.8	60.5	75.4	84.5	87.7
Resistance (%)							
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Commercial HVAC investment in 2020s -		40,922	44,666				
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)	7,459	1,811	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,510	16,585	14,596	13,599	5,077	4,473	9,064
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	11,245	10,075	9,066	6,038

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)							-47.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-449
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-932
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-55.1
Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)							-455
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)							-1,217
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,715
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-366
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-418
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-6,654
Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)							-71.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,570
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,679
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-80.8
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)							-909
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-2,347
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,073
Carbon sink potential - Mid - Reforest							-2,599
pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore							-828
productivity (1000 tC02e/y) Carbon sink potential - Mid - All (not							-14,157
counting overlap) (1000 tC02e/y) Carbon sink potential - High - Accelerate							-95.6
regeneration (1000 tCO2e/y) Carbon sink potential - High - Avoid							-2,692
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 -2,426
							-2,426
rotation length (1000 tC02e/y)							-108
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-108
Carbon sink potential - High - Increase							-1,364
retention of HWP (1000 tC02e/y)							-1,304
Carbon sink potential - High - Increase							-3,477
trees outside forests (1000 tC02e/y)							-0,411
Carbon sink potential - High - Reforest							-5,430
cropland (1000 tCO2e/y)							0, .00
Carbon sink potential - High - Reforest							-4,831
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-21,662
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-1,239
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							7.82
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							342
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							171
Land impacted for carbon sink potential - Low - Extend rotation length (1000							474
hectares)							
Land impacted for carbon sink potential -							20
Low - Improve plantations (1000							20
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							174
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							180
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							23.8
Low - Reforest pasture (1000 hectares)							0/0
Land impacted for carbon sink potential -							248
Low - Restore productivity (1000 hectares)							
Land impacted for carbon sink potential -							1,469
Low - Total impacted (over 30 years)							1,407
(1000 hectares)							
Land impacted for carbon sink potential -							11.7
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							353
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							855
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							30
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 -							252
Land impacted for carbon sink hotential -							252
Mid - Increase trees outside forests (1000	l l	1	I			ı	

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							269
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							172
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							500
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,444
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							15.6
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							364
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,237
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							39.9
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 -							330
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							359
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							137
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							411
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,894
High - Total impacted (over 30 years)							
(1000 hectares)						1	

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-3,836
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-9,245
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-214
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-13,295
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,836
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-17,544
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							-428
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-21,808
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							1,734
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							3,799
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							389
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							5,922
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							1,734
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							7,209
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							779
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							9,721
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)		109	0.092	0.089	0.078	0.055	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		48.7	32.3	18.6	12.5	4.43	1.22
Premature deaths from air pollution - Mobile - On-Road (deaths)		551	516	394	230	108	46.5
Premature deaths from air pollution - Gas Stations (deaths)		36.3	33.4	25.3	15.1	7.48	3.68
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		167	147	107	62.7	29.7	9.97
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.45	2.9	2.23	1.6	1.08	0.75
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.78	9.44	7.72	5.34	2.95	1.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		10.8	10.3	9.78	9.21	8.63	8.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	174	136	87.7	48	21.1
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.6	35.3	28.6	21	14.2	8.82
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.24	2.65	2.07	1.52	0.998

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)		2.03	0.616	0.591	0.56	0.549	0.455
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		119	112	97.2	69.9	43.1	6.64
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		432	286	165	110	39.2	10.8
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,899	4,586	3,504	2,047	963	413
Monetary damages from air pollution - Gas Stations (million \$2019)		322	296	224	134	66.2	32.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,480	1,305	950	556	263	88.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		30.6	25.7	19.7	14.2	9.59	6.65
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		86.6	83.6	68.5	47.3	26.1	11.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,697	1,543	1,204	777	425	187
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		359	312	253	186	125	78.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	28.7	23.4	18.3	13.4	8.84
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		17.9	5.44	5.22	4.94	4.85	4.01
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,053	993	863	620	382	59

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

Tubic 20. ETRET occitation Infinition	,0						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,969	3,005	6,775	6,771	4,328	3,644
By economic sector - Construction (jobs)		15,962	22,760	34,900	42,737	51,980	65,285
By economic sector - Manufacturing		10,372	12,105	17,188	18,665	20,459	22,910
(jobs)							
By economic sector - Mining (jobs)		7,293	4,574	3,188	2,025	1,240	456
By economic sector - Other (jobs)		1,183	2,305	4,090	5,178	6,980	9,396
By economic sector - Pipeline (jobs)		1,031	868	623	415	248	88.6
By economic sector - Professional (jobs)		9,987	13,463	24,225	32,536	39,405	50,837
By economic sector - Trade (jobs)		7,712	8,893	12,681	16,147	20,345	27,107
By economic sector - Utilities (jobs)		21,148	23,944	33,357	40,447	46,614	57,825
By resource sector - Biomass (jobs)		6,999	6,873	16,910	20,680	16,202	16,514
By resource sector - CO2 (jobs)		0	0.001	0.001	0.001	0.002	0.001
By resource sector - Coal (jobs)		4,879	1,585	1,160	1,002	899	739
By resource sector - Grid (jobs)		23,000	30,866	52,008	66,770	83,053	105,721

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		10,466	8,288	6,199	6,434	3,463	4,728
By resource sector - Nuclear (jobs)		6,266	6,166	5,258	3,800	2,710	986
By resource sector - Oil (jobs)		11,532	9,477	7,198	4,768	2,838	181
By resource sector - Solar (jobs)		3,730	10,030	16,923	17,721	23,669	27,014
By resource sector - Wind (jobs)		10,785	18,631	31,370	43,746	58,765	81,664
By education level - All sectors - High school diploma or less (jobs)		33,662	39,435	59,009	69,653	79,228	96,957
By education level - All sectors - Associates degree or some college (jobs)		23,224	28,054	41,781	50,930	60,349	75,656
By education level - All sectors - Bachelors degree (jobs)		16,207	18,973	27,924	34,017	39,859	49,647
By education level - All sectors - Masters or professional degree (jobs)		3,996	4,750	7,191	8,894	10,470	13,149
By education level - All sectors - Doctoral degree (jobs)		569	703	1,121	1,427	1,692	2,140
Related work experience - All sectors - None (jobs)		11,247	13,329	19,953	23,928	27,602	34,186
Related work experience - All sectors - Up to 1 year (jobs)		16,322	19,236	28,908	34,150	38,816	47,608
Related work experience - All sectors - 1 to 4 years (jobs)		27,758	32,707	48,849	59,073	68,899	85,516
Related work experience - All sectors - 4 to 10 years (jobs)		17,589	21,029	31,135	37,906	44,687	55,831
Related work experience - All sectors - Over 10 years (jobs)		4,742	5,614	8,181	9,865	11,594	14,408
On-the-Job Training - All sectors - None (jobs)		4,260	5,056	7,438	8,931	10,395	12,891
On-the-Job Training - All sectors - Up to 1 year (jobs)		52,314	61,241	91,548	109,623	126,217	155,708
On-the-Job Training - All sectors - 1 to 4 years (jobs)		15,589	18,793	27,849	33,857	40,056	50,115
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,784	5,956	8,938	11,025	13,194	16,694
On-the-Job Training - All sectors - Over 10 years (jobs)		712	869	1,254	1,485	1,738	2,140
On-Site or In-Plant Training - All sectors - None (jobs)		12,364	14,832	22,396	27,090	31,512	39,081
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		47,479	55,543	82,676	98,966	114,147	140,943
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		12,203	14,641	21,698	26,276	30,956	38,625
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,979	6,121	9,093	11,165	13,297	16,772
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		634	780	1,164	1,424	1,686	2,128
Wage income - All (million \$2019)		4,757	5,709	8,594	10,528	12,436	15,664

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,043	977	873	748	634	562	530
Final energy use - Residential (PJ)	591	551	512	443	367	307	269
Final energy use - Commercial (PJ)	441	434	415	383	346	319	305
Final energy use - Industry (PJ)	634	660	671	671	678	686	694

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		6.63	6.83	11.6	12.4	12.3	13
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)	113	974	1,835	4,848	7,861	10,269	12,676
Vehicle stocks - LDV – All others (1000 units)	10,570	10,065	9,559	6,966	4,373	2,474	575
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		2,022	5,214	8,399	12,743	13,847	13,214
Public EV charging plugs - DC Fast (1000 units)	0.299		3.24		13.9		22.4
Public EV charging plugs - L2 (1000 units)	1.41		78		334		539

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.5	10.7	39.6	85.8	93.9	94.4	94.2
Heat Pump (%)							
Sales of space heating units - Electric	12.7	18.4	13.8	6.17	4.76	4.69	4.9
Resistance (%)							
Sales of space heating units - Gas (%)	81.4	66.5	43.4	6.93	0.605	0.212	0.217
Sales of space heating units - Fossil (%)	2.45	4.48	3.17	1.07	0.718	0.695	0.671
Sales of water heating units - Electric	0	1.85	15.9	37.3	41	41.2	41.2
Heat Pump (%)							
Sales of water heating units - Electric	22.7	38.5	43.9	56.3	58.6	58.7	58.6
Resistance (%)							
Sales of water heating units - Gas Furnace	77.3	59.6	40	6.28	0.367	0	0
(%)							
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.111	0.111	0.112
Sales of cooking units - Electric	50.8	61.3	93.4	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	49.2	38.7	6.63	0.334	0	0	0
Residential HVAC investment in 2020s vs.		10.8	14.4				
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	0.751	8.27	35.3	81	89	89.5	89.5
Heat Pump (%)							
Sales of space heating units - Electric	2.86	3.5	5.34	9.38	10.1	10.2	10.2
Resistance (%)							
Sales of space heating units - Gas (%)	96.4	86.2	59	9.63	0.906	0.363	0.363
Sales of space heating units - Fossil (%)	0	2.07	0.402	0.017	0	0	0
Sales of water heating units - Electric	0.271	2.48	19.4	46.1	50.7	51	51
Heat Pump (%)							
Sales of water heating units - Electric	2.65	4.62	18.3	44	48.5	48.8	48.8
Resistance (%)							
Sales of water heating units - Gas (%)	96.9	92.7	62.2	9.74	0.572	0	0
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric	41	54.2	82.9	88.6	88.9	88.9	88.9
Resistance (%)							
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s -		40,927	44,680				
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)	7,459	1,811	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,510	16,492	14,814	15,571	9,527	12,323	26,153

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	8,378	7,208	3,588	0
Installed renewables - Rooftop PV (MW)	62.5	110	164	248	368	523	724
Installed renewables - Solar - Base land	305	1,746	6,941	16,607	24,091	33,662	48,380
use assumptions (MW)							
Installed renewables - Wind - Base land	6,208	13,339	35,822	67,091	103,262	137,735	155,340
use assumptions (MW)							
Installed renewables - Solar -	305	2,430	6,929	16,469	23,661	33,449	49,936
Constrained land use assumptions (MW)							
Installed renewables - Wind - Constrained	6,967	9,325	14,280	20,182	20,377	20,412	141,500
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		1.93	6.22	10.7	7.78	9.39	13.6
\$2018)							
Capital invested - Wind - Base (billion		10.5	29.9	38.8	42.7	38.7	18.6
\$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)	650	3,335	12,940	30,355	44,122	61,587	88,304
Wind - Base land use assumptions (GWh)	22,788	45,757	118,224	217,032	329,845	434,349	485,306
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	1,300	9,037	25,367	59,858	85,959	121,832	181,695
Wind - Constrained land use assumptions (GWh)	46,350	61,148	92,321	127,299	128,372	128,572	889,474
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-47.9
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)							-449
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-932
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-55.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-455
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)							-1,217
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,715
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-366
Carbon sink potential - Low - Restore productivity (1000 tC02e/y)							-418
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-6,654
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-71.7
Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y)							-1,570
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,679

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve							-80.8
plantations (1000 tCO2e/y)							000
Carbon sink potential - Mid - Increase							-909
retention of HWP (1000 tCO2e/y)							-2,347
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,347
Carbon sink potential - Mid - Reforest							-4,073
cropland (1000 tCO2e/y)							-4,073
Carbon sink potential - Mid - Reforest							-2,599
pasture (1000 tCO2e/y)							-2,399
Carbon sink potential - Mid - Restore							-828
productivity (1000 tC02e/y)							-020
Carbon sink potential - Mid - All (not							-14,157
counting overlap) (1000 tC02e/y)							-14,131
Carbon sink potential - High - Accelerate						+	-95.6
regeneration (1000 tCO2e/y)							-90.0
Carbon sink potential - High - Avoid							-2,692
deforestation (1000 tC02e/y)							-2,092
							0 / 0 /
Carbon sink potential - High - Extend							-2,426
rotation length (1000 tC02e/y)							-108
Carbon sink potential - High - Improve							-108
plantations (1000 tC02e/y)							10//
Carbon sink potential - High - Increase							-1,364
retention of HWP (1000 tC02e/y)							0.777
Carbon sink potential - High - Increase							-3,477
trees outside forests (1000 tC02e/y)							F / 00
Carbon sink potential - High - Reforest							-5,430
cropland (1000 tCO2e/y)							/ 001
Carbon sink potential - High - Reforest							-4,831
pasture (1000 tC02e/y)							01 / / 0
Carbon sink potential - High - All (not							-21,662
counting overlap) (1000 tC02e/y)							1 000
Carbon sink potential - High - Restore							-1,239
productivity (1000 tCO2e/y)							7.00
Land impacted for carbon sink potential -							7.82
Low - Accelerate regeneration (1000							
hectares)							0/0
Land impacted for carbon sink potential -							342
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							, , ,
Land impacted for carbon sink potential -							474
Low - Extend rotation length (1000							
hectares)							00
Land impacted for carbon sink potential -							20
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 -							174
Low - Increase trees outside forests							
(1000 hectares)							100
Land impacted for carbon sink potential -							180
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							23.8
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							248
Low - Restore productivity (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,469
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							11.7
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							353
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							855
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							30
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							C
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							252
Mid - Increase trees outside forests (1000							232
-							
hectares) Land impacted for carbon sink potential -							0/0
·							269
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							172
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							500
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,444
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							15.6
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							364
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,237
High - Extend rotation length (1000							1,201
hectares)							
Land impacted for carbon sink potential -							39.9
High - Improve plantations (1000							39.9
hectares)							
Land impacted for carbon sink potential -							C
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							330
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							359
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							137
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							41
High - Restore productivity (1000							•••
hectares)							
Land impacted for carbon sink potential -						+	2,894
High - Total impacted (over 30 years)							2,074
riigii - rutai iiripacteu (UVEL 3U YEal 3)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-3,836
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-9,245
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-214
deployment - Permanent conservation							
cover (1000 tC02e/y)							40.005
Carbon sink potential - Moderate							-13,295
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Aggressive							-3,836
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-17,544
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-428
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-21,808
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							1,734
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							3,799
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							389
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							5,922
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							1,734
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							7,209
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							779
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							9,721
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 -		109	0.092	0.089	0.078	0.055	0.004
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		41.6	22.4	35.8	25.6	10.3	3.32
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		551	516	394	230	108	46.5
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		36.3	33.4	25.3	15.1	7.48	3.68
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 (deaths)		167	147	107	62.7	29.7	9.97
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.45	2.9	2.23	1.6	1.08	0.75
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.78	9.44	7.72	5.34	2.95	1.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		10.8	10.3	9.78	9.21	8.63	8.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	174	136	87.7	48	21.1
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.6	35.3	28.6	21	14.2	8.82
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.24	2.65	2.07	1.52	0.998
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.64	0.614	0.592	0.561	0.551	0.455
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		122	118	115	96.4	80	59.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		369	199	317	227	91	29.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,899	4,586	3,504	2,047	963	413
Monetary damages from air pollution - Gas Stations (million \$2019)		322	296	224	134	66.2	32.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,480	1,305	950	556	263	88.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		30.6	25.7	19.7	14.2	9.59	6.65
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		86.6	83.6	68.5	47.3	26.1	11.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,697	1,543	1,204	777	425	187
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		359	312	253	186	125	78.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	28.7	23.4	18.3	13.4	8.84
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		14.4	5.42	5.22	4.95	4.86	4.01

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		1,081	1,045	1,021	856	711	525
Industrial Processes - Oil & Gas Production (million \$2019)							
Ρι υμμετιστί (πιπιστί φ2σ17)							

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

Table 39: <i>E+RE- scenario - IMPACTS - Jobs</i> Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	2020	2,974	3,055	10,940	9,798	5,649	3,619
By economic sector - Agriculture (jobs)		15,081	22,454	25,851	26,545	26,116	26,648
By economic sector - Manufacturing		9,075	8,320	12,161	12,469	9,954	8,300
(jobs)		7,010	0,020	12,101	12, 107	,,,,,,,,,,	0,000
By economic sector - Mining (jobs)		7,101	4,902	3,829	2,804	2,217	1,709
By economic sector - Other (jobs)		1,116	1,831	2,269	2,657	2,583	2,531
By economic sector - Pipeline (jobs)		1,086	2,305	1,525	908	960	1,255
By economic sector - Professional (jobs)		9,258	10,528	22,506	25,542	22,499	19,959
By economic sector - Trade (jobs)		7,336	7,519	10,396	11,315	10,267	9,560
By economic sector - Utilities (jobs)		20,014	25,463	30,549	31,348	34,498	35,604
By resource sector - Biomass (jobs)		7,002	6,986	34,088	34,474	22,198	15,521
By resource sector - CO2 (jobs)		54.3	11,258	5,883	1,907	3,805	7,295
By resource sector - Coal (jobs)		4,365	1,796	1,474	1,301	1,184	847
By resource sector - Grid (jobs)		20,889	22,422	39,358	44,834	45,218	45,700
By resource sector - Natural Gas (jobs)		10,575	9,744	8,395	9,096	6,988	5,590
By resource sector - Nuclear (jobs)		6,266	6,166	5,834	5,179	9,491	9,553
By resource sector - Oil (jobs)		11,528	9,557	7,422	5,282	3,884	2,883
By resource sector - Solar (jobs)		3,609	8,033	6,781	7,235	5,990	4,956
By resource sector - Wind (jobs)		8,752	10,415	10,791	14,078	15,985	16,840
By education level - All sectors - High		31,693	37,454	53,083	53,463	48,188	45,425
school diploma or less (jobs)							
By education level - All sectors -		21,745	26,645	34,832	36,146	34,647	33,746
Associates degree or some college (jobs)							
By education level - All sectors -		15,289	17,380	24,636	25,823	24,436	23,043
Bachelors degree (jobs)							
By education level - All sectors - Masters		3,775	4,293	6,442	6,830	6,439	6,034
or professional degree (jobs)				1.000	1.10=	1001	
By education level - All sectors - Doctoral		537	604	1,033	1,125	1,034	939
degree (jobs)		10 (00	10.707	17.005	10.100	1/ /70	15.07.7
Related work experience - All sectors -		10,603	12,724	17,825	18,182	16,673	15,844
None (jobs)		15.075	17.07.0	07 111	07.770	00.507	010//
Related work experience - All sectors - Up to 1 year (jobs)		15,365	17,862	26,111	26,460	23,586	21,966
Related work experience - All sectors - 1		26,093	30,712	42,679	44,051	41,295	39,353
to 4 years (jobs)		20,093	30,112	42,019	44,031	41,290	37,333
Related work experience - All sectors - 4		16,528	19,866	26,516	27,537	26,306	25,392
to 10 years (jobs)		10,520	17,000	20,310	21,001	20,300	20,072
Related work experience - All sectors -		4,450	5,213	6,895	7,157	6,883	6,631
Over 10 years (jobs)		4,400	0,210	0,070	1,101	0,000	0,001
On-the-Job Training - All sectors - None		4,026	4,677	6,548	6,769	6,286	5,921
(jobs)		.,020	.,	3,5 .5	3,.37	3,233	0,7=
On-the-Job Training - All sectors - Up to 1		49,211	56,923	81,874	83,988	76,842	72,189
year (jobs)		.	.		,	,	•
On-the-Job Training - All sectors - 1 to 4		14,628	18,041	23,211	23,965	23,168	22,684
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		4,506	5,923	7,381	7,632	7,459	7,437
years (jobs)							
On-the-Job Training - All sectors - Over 10		668	813	1,012	1,033	989	956
years (jobs)							
On-Site or In-Plant Training - All sectors -		11,627	13,774	19,654	20,307	18,822	17,771
None (jobs)							
On-Site or In-Plant Training - All sectors -		44,666	51,788	73,548	75,426	69,317	65,365
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 -		11,454	13,995	18,239	18,788	18,003	17,535
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		4,698	6,063	7,607	7,854	7,641	7,572
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		595	757	978	1,011	960	943
Over 10 years (jobs)							
Wage income - All (million \$2019)		4,482	5,425	7,521	7,853	7,509	7,303

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,043	977	873	748	634	562	530
Final energy use - Residential (PJ)	591	551	512	443	367	307	269
Final energy use - Commercial (PJ)	441	434	415	383	346	319	305
Final energy use - Industry (PJ)	634	660	671	671	678	686	694

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		6.63	6.83	11.6	12.4	12.3	13
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)	113	974	1,835	4,848	7,861	10,269	12,676
Vehicle stocks - LDV – All others (1000	10,570	10,065	9,559	6,966	4,373	2,474	575
units)							
Light-duty vehicle capital costs vs. REF -		2,022	5,214	8,399	12,743	13,847	13,214
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.299		3.24		13.9		22.4
units)							
Public EV charging plugs - L2 (1000 units)	1.41		78		334		539

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.5	10.7	39.6	85.8	93.9	94.4	94.2
Heat Pump (%)							
Sales of space heating units - Electric	12.7	18.4	13.8	6.17	4.76	4.69	4.9
Resistance (%)							
Sales of space heating units - Gas (%)	81.4	66.5	43.4	6.93	0.605	0.212	0.217
Sales of space heating units - Fossil (%)	2.45	4.48	3.17	1.07	0.718	0.695	0.671
Sales of water heating units - Electric	0	1.85	15.9	37.3	41	41.2	41.2
Heat Pump (%)							
Sales of water heating units - Electric	22.7	38.5	43.9	56.3	58.6	58.7	58.6
Resistance (%)							
Sales of water heating units - Gas Furnace	77.3	59.6	40	6.28	0.367	0	0
(%)							
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.111	0.111	0.112
Sales of cooking units - Electric	50.8	61.3	93.4	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	49.2	38.7	6.63	0.334	0	0	0
Residential HVAC investment in 2020s vs.		10.8	14.4				
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	0.751	8.27	35.3	81	89	89.5	89.5
Heat Pump (%)							
Sales of space heating units - Electric	2.86	3.5	5.34	9.38	10.1	10.2	10.2
Resistance (%)							
Sales of space heating units - Gas (%)	96.4	86.2	59	9.63	0.906	0.363	0.363
Sales of space heating units - Fossil (%)	0	2.07	0.402	0.017	0	0	0
Sales of water heating units - Electric	0.271	2.48	19.4	46.1	50.7	51	51
Heat Pump (%)							
Sales of water heating units - Electric	2.65	4.62	18.3	44	48.5	48.8	48.8
Resistance (%)							
Sales of water heating units - Gas (%)	96.9	92.7	62.2	9.74	0.572	0	0
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric	41	54.2	82.9	88.6	88.9	88.9	88.9
Resistance (%)							
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s -		40,927	44,680				
Cumulative 5-yr (million \$2018)							

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

		,	0 ,	,			
Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,459	1,811	883	883	883	883	0
Installed thermal - Natural gas (MW)	16,535	13,854	8,655	14,004	12,075	15,427	15,033
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	11,245	10,075	11,078	10,236
Installed renewables - Rooftop PV (MW)	62.5	110	164	248	368	523	724
Installed renewables - Solar - Base land use assumptions (MW)	305	2,361	8,116	11,459	15,437	17,336	17,336
Installed renewables - Wind - Base land use assumptions (MW)	6,208	11,406	18,840	18,840	25,146	36,016	58,717
Installed renewables - Solar - Constrained land use assumptions (MW)	305	2,170	6,603	10,420	14,526	15,692	15,692
Installed renewables - Wind - Constrained	/ 000	0.000	11 000	11.07.0	10 / /1	1/ / 00	10.000
land use assumptions (MW)	6,208	8,399	11,028	11,060	12,661	14,688	19,009
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		2.75	6.89	3.69	4.13	1.86	0
Capital invested - Wind - Base (billion \$2018)		7.65	9.8	0	7.4	12.2	24
Capital invested - Solar PV - Constrained (billion \$2018)		2.5	5.3	4.21	4.26	1.14	0
Capital invested - Wind - Constrained (billion \$2018)		3.22	3.5	0.04	1.89	2.27	4.57

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	650	4,484	15,207	21,416	28,778	32,247	32,247
Wind - Base land use assumptions (GWh)	22,788	39,611	63,820	63,820	83,778	118,245	190,130
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Constrained land use assumptions	650	4,120	12,364	19,414	27,032	29,170	29,170
(GWh)							
Wind - Constrained land use assumptions	22,788	29,699	38,214	38,321	43,298	49,489	62,135
(GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							

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

Iable 47: E+RE- scenario - PILLAR 6: Land Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate	2020	2020	2000	2000	2040	2040	-47.9
regeneration (1000 tC02e/y)							1117
Carbon sink potential - Low - Avoid							-449
deforestation (1000 tCO2e/y)							777
Carbon sink potential - Low - Extend							-932
rotation length (1000 tC02e/y)							702
Carbon sink potential - Low - Improve						+	-55.1
plantations (1000 tCO2e/y)							-33.1
Carbon sink potential - Low - Increase							-455
							-455
retention of HWP (1000 tC02e/y)							4.047
Carbon sink potential - Low - Increase							-1,217
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2,715
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-366
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-418
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,654
counting overlap) (1000 tCO2e/y)							-,
Carbon sink potential - Mid - Accelerate							-71.7
regeneration (1000 tC02e/y)							
Carbon sink potential - Mid - Avoid						+	-1,570
·							-1,570
deforestation (1000 tC02e/y)							1 (70
Carbon sink potential - Mid - Extend							-1,679
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-80.8
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-909
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-2,347
trees outside forests (1000 tCO2e/y)							,
Carbon sink potential - Mid - Reforest							-4,073
cropland (1000 tCO2e/y)							.,0.0
Carbon sink potential - Mid - Reforest							-2,599
pasture (1000 tC02e/y)							-2,377
							000
Carbon sink potential - Mid - Restore							-828
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-14,157
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-95.6
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-2,692
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-2,426
rotation length (1000 tCO2e/y)							,
Carbon sink potential - High - Improve							-108
plantations (1000 tCO2e/y)							100
Carbon sink potential - High - Increase						+	-1,364
retention of HWP (1000 tCO2e/y)							-1,504
							0 /77
Carbon sink potential - High - Increase							-3,477
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-5,430
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-4,831
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-21,662
counting overlap) (1000 tCO2e/y)							-
Carbon sink potential - High - Restore	+		+	+	+		-1,239
productivity (1000 tCO2e/y)							.,,
p. 3333(171) (1000 10020/ y)							

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

Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050 7.82
Low - Accelerate regeneration (1000							7.82
hectares) Land impacted for carbon sink potential -							342
Low - Avoid deforestation (over 30 years)							042
(1000 hectares)							
Land impacted for carbon sink potential -							474
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							20
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							17/
Land impacted for carbon sink potential - Low - Increase trees outside forests							174
(1000 hectares)							
Land impacted for carbon sink potential -							180
Low - Reforest cropland (1000 hectares)							100
Land impacted for carbon sink potential -							23.8
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							248
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,469
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							11.7
Mid - Accelerate regeneration (1000							
hectares)							٥٢٥
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years)							353
(1000 hectares)							
Land impacted for carbon sink potential -							855
Mid - Extend rotation length (1000							000
hectares)							
Land impacted for carbon sink potential -							30
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 -							252
Mid - Increase trees outside forests (1000							
hectares)							0.40
Land impacted for carbon sink potential -							269
Mid - Reforest cropland (1000 hectares)							172
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							172
Land impacted for carbon sink potential -							500
Mid - Restore productivity (1000							300
hectares)							
Land impacted for carbon sink potential -							2,444
Mid - Total impacted (over 30 years) (1000							_,
hectares)							
Land impacted for carbon sink potential -							15.6
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							364
High - Avoid deforestation (over 30 years)							
(1000 hectares)							

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 -							1,237
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							39.9
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 -							330
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							359
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							137
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							411
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,894
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							-3,836
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-9,245
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-214
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-13,295
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-3,836
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-17,544
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-428
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-21,808
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							1,734
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							3,799
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							389
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							5,922
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							1,734
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							7,209
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							779
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							9,721
Aggressive deployment - Total (1000							
hectares)							

Table 49: E-B+ scenario - IMPACTS - Health

Table 49: E-B+ scenario - IMPACTS - Healti							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal		109	0.092	0.089	0.078	0.055	0.004
(deaths) Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		52	30.4	18.4	11.8	5.93	1.97
Premature deaths from air pollution - Mobile - On-Road (deaths)		561	569	558	506	405	281
Premature deaths from air pollution - Gas Stations (deaths)		37.1	37.6	36.4	32.7	26.1	18.2
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		168	156	142	123	95	63.3
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.54	3.3	3.08	2.76	2.31	1.85
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.84	10.2	10.3	9.82	8.12	5.98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		10.8	10.3	9.78	9.21	8.63	8.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	186	177	160	132	98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.7	39.5	37.8	33.6	27.5	21.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.47	3.11	2.74	2.38	2.03
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.82	0.618	0.603	0.582	0.57	0.544
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		120	110	95.9	84.4	74.8	52
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		461	269	163	105	52.6	17.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,985	5,062	4,958	4,497	3,605	2,497
Monetary damages from air pollution - Gas Stations (million \$2019)		329	333	322	290	231	161

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,485	1,381	1,258	1,086	842	561
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		31.4	29.2	27.3	24.5	20.4	16.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		87.2	90.1	91.7	87	71.9	53
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,700	1,645	1,569	1,417	1,173	868
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		361	350	335	298	244	190
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	30.7	27.5	24.2	21	18
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		16.1	5.46	5.32	5.13	5.03	4.8
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,067	972	852	749	664	461

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

By economic sector - Agriculture (jobs) By economic sector - Construction (jobs) By economic sector - Manufacturing (jobs) By economic sector - Mining (jobs) By economic sector - Other (jobs) By economic sector - Pipeline (jobs) By economic sector - Professional (jobs) By economic sector - Trade (jobs) 7,770	3,193 23,208 11,248 4,836 1,611 2,106 12,314 8,162 27,213 7,370	9,993 28,284 14,638 3,880 2,531 1,338 24,268 11,736 30,794	10,944 31,591 15,456 3,151 3,350 789 33,167 15,044	8,081 34,640 15,172 2,520 3,761 840 34,342 15,654	6,996 40,693 16,970 1,731 4,516 1,068 36,922 17,259
By economic sector - Manufacturing (jobs) By economic sector - Mining (jobs) 7,218 By economic sector - Other (jobs) 1,279 By economic sector - Pipeline (jobs) 1,052 By economic sector - Professional (jobs) 10,051	11,248 4,836 1,611 2,106 12,314 8,162 27,213	14,638 3,880 2,531 1,338 24,268 11,736	15,456 3,151 3,350 789 33,167 15,044	2,520 3,761 840 34,342	16,970 1,731 4,516 1,068 36,922
(jobs)7,218By economic sector - Mining (jobs)7,218By economic sector - Other (jobs)1,279By economic sector - Pipeline (jobs)1,052By economic sector - Professional (jobs)10,051	4,836 1,611 2,106 12,314 8,162 27,213	3,880 2,531 1,338 24,268 11,736	3,151 3,350 789 33,167 15,044	2,520 3,761 840 34,342	1,731 4,516 1,068 36,922
By economic sector - Mining (jobs) 7,218 By economic sector - Other (jobs) 1,279 By economic sector - Pipeline (jobs) 1,052 By economic sector - Professional (jobs) 10,051	1,611 2,106 12,314 8,162 27,213	2,531 1,338 24,268 11,736	3,350 789 33,167 15,044	3,761 840 34,342	4,516 1,068 36,922
By economic sector - Other (jobs) 1,279 By economic sector - Pipeline (jobs) 1,052 By economic sector - Professional (jobs) 10,051	1,611 2,106 12,314 8,162 27,213	2,531 1,338 24,268 11,736	3,350 789 33,167 15,044	3,761 840 34,342	4,516 1,068 36,922
By economic sector - Pipeline (jobs) 1,052 By economic sector - Professional (jobs) 10,051	2,106 12,314 8,162 27,213	1,338 24,268 11,736	789 33,167 15,044	840 34,342	1,068 36,922
By economic sector - Professional (jobs) 10,051	12,314 8,162 27,213	24,268 11,736	33,167 15,044	34,342	36,922
,	8,162 27,213	11,736	15,044	-	•
By economic sector - Trade (jobs) 7770	27,213		-	15,654	17.259
By economic sector in ade (jobs)		30,794	00 / 50		,,
By economic sector - Utilities (jobs) 21,018	7.370		33,452	35,767	41,603
By resource sector - Biomass (jobs) 7,016	.,	30,532	43,076	37,302	33,470
By resource sector - CO2 (jobs) 53.6	10,191	5,319	1,790	3,512	6,568
By resource sector - Coal (jobs) 4,608	1,587	1,173	1,021	915	804
By resource sector - Grid (jobs) 22,588	28,018	41,265	49,367	57,646	69,001
By resource sector - Natural Gas (jobs) 10,648	8,131	6,366	7,334	3,832	2,787
By resource sector - Nuclear (jobs) 6,266	6,166	5,834	5,179	4,183	3,093
By resource sector - Oil (jobs) 11,626	10,042	8,700	7,507	5,939	3,790
By resource sector - Solar (jobs) 4,547	4,522	6,669	8,922	8,875	9,870
By resource sector - Wind (jobs) 10,517	17,862	21,604	22,747	28,572	38,374
By education level - All sectors - High 33,740	40,394	55,682	62,915	63,289	69,922
school diploma or less (jobs)					
By education level - All sectors - 23,295	28,939	37,383	42,821	45,030	51,268
Associates degree or some college (jobs)					
By education level - All sectors - 16,252	19,143	26,410	31,420	32,375	35,564
Bachelors degree (jobs)					
By education level - All sectors - Masters 4,010	4,741	6,878	8,361	8,620	9,436
or professional degree (jobs)					
By education level - All sectors - Doctoral 573	673	1,109	1,428	1,463	1,568
degree (jobs)					

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - None (jobs)		11,287	13,735	18,762	21,518	21,905	24,341
Related work experience - All sectors - Up to 1 year (jobs)		16,363	19,365	27,475	31,554	31,584	34,633
Related work experience - All sectors - 1 to 4 years (jobs)		27,822	33,435	45,372	52,446	54,034	60,147
Related work experience - All sectors - 4 to 10 years (jobs)		17,648	21,630	28,420	32,876	34,332	38,616
Related work experience - All sectors - Over 10 years (jobs)		4,751	5,725	7,433	8,550	8,922	10,020
On-the-Job Training - All sectors - None (jobs)		4,283	5,063	6,978	8,206	8,374	9,192
On-the-Job Training - All sectors - Up to 1 year (jobs)		52,404	62,138	86,629	100,313	101,808	112,143
On-the-Job Training - All sectors - 1 to 4 years (jobs)		15,645	19,514	24,873	28,233	29,740	33,914
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,821	6,292	7,876	8,952	9,568	11,056
On-the-Job Training - All sectors - Over 10 years (jobs)		717	883	1,106	1,239	1,287	1,452
On-Site or In-Plant Training - All sectors - None (jobs)		12,415	15,028	20,929	24,371	24,921	27,586
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		47,560	56,443	77,873	89,975	91,562	101,109
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		12,243	15,146	19,504	22,152	23,206	26,344
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		5,016	6,455	8,113	9,251	9,827	11,272
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		636	818	1,044	1,194	1,261	1,448
Wage income - All (million \$2019)		4,772	5,878	7,978	9,325	9,764	11,040

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,044	984	908	847	798	740	672
Final energy use - Residential (PJ)	591	552	524	495	458	408	352
Final energy use - Commercial (PJ)	441	434	424	414	399	379	356
Final energy use - Industry (PJ)	634	660	674	680	693	701	708

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		5.41	5.46	7.27	7.54	10.4	11
Cumulative 5-yr (billion \$2018)							

Table 53: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	87.8	341	593	1,764	2,935	5,527	8,119
Vehicle stocks - LDV – All others (1000 units)	10,613	10,613	10,613	10,067	9,521	7,337	5,153
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	333	687	2,331	7,297	10,644
Public EV charging plugs - DC Fast (1000 units)	0.299		1.05		5.19		14.3
Public EV charging plugs - L2 (1000 units)	1.41		25.2		125		345

Table 54: E-B+ scenario -	DTI I AR 1. Efficiency/	Electrification.	. Residential
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Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.5	8.23	11.6	22.2	45.5	72.3	87.2
Heat Pump (%)							
Sales of space heating units - Electric	12.7	18.7	18.1	16.4	12.5	8.16	5.9
Resistance (%)							
Sales of space heating units - Gas (%)	81.4	68.5	65.9	57.4	39	17.8	5.87
Sales of space heating units - Fossil (%)	2.45	4.6	4.47	3.97	2.93	1.72	1.01
Sales of water heating units - Electric	0	0.582	2.2	7.34	18.4	30.9	37.9
Heat Pump (%)							
Sales of water heating units - Electric	22.7	38.3	38.8	40.9	46.2	52.8	56.7
Resistance (%)							
Sales of water heating units - Gas Furnace	77.3	61	58.9	51.7	35.3	16.1	5.22
(%)							
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.113	0.113	0.112
Sales of cooking units - Electric	50.6	51.9	56.4	68.3	84.9	95.1	98.7
Resistance (%)							
Sales of cooking units - Gas (%)	49.4	48.1	43.6	31.7	15.1	4.87	1.31
Residential HVAC investment in 2020s vs.		10.7	14.3				
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	0.751	6.2	9.31	19.3	41.6	67.6	82.4
Heat Pump (%)							
Sales of space heating units - Electric	2.86	3.43	3.64	4.33	6.04	8.25	9.53
Resistance (%)							
Sales of space heating units - Gas (%)	96.4	88	84.8	74.6	51.5	23.8	7.97
Sales of space heating units - Fossil (%)	0	2.4	2.27	1.73	0.88	0.287	0.075
Sales of water heating units - Electric	0.271	1.04	2.99	9.2	22.7	38.2	46.9
Heat Pump (%)							
Sales of water heating units - Electric	2.65	3.78	5.32	10.5	22.3	36.6	44.8
Resistance (%)							
Sales of water heating units - Gas (%)	96.9	95	91.5	80.1	54.8	25	8.1
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric	41	45.8	49.8	60.5	75.4	84.5	87.7
Resistance (%)							
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Commercial HVAC investment in 2020s -		40,922	44,666				
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)	7,459	1,811	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,510	16,460	14,656	13,659	7,729	6,481	6,619
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	11,245	10,075	7,047	6,038
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	0.075	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	1.9	1.4	0	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	2,136	3,710	3,710	3,710	3,710
Biomass w/ccu allam power plant (GWh)	0	0	0	74.6	74.6	74.6	74.6

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	2	4	4	4	4
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	2	2	2	2
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	70	124	124	124
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	2	2	2	2
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	2	2	2	2
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	2	2	2	2	2
Conversion capital investment -		0	1,746	60,802	45,876	0	0
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	151	6,164	10,720	10,720	10,720

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	2.13	83.5	142	142	143
Annual - BECCS (MMT)		0	2.12	80	139	139	139
Annual - NGCC (MMT)		0	0.01	0.09	0.11	0.08	0.03
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	2.13	85.6	228	371	513
Cumulative - BECCS (MMT)		0	2.12	82.2	221	360	499
Cumulative - NGCC (MMT)		0	0.01	0.1	0.21	0.29	0.32
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	958	1,324	2,045	2,045	2,045
Spur (km)		0	354	4,280	6,716	6,837	6,849
All (km)		0	1,311	5,604	8,760	8,881	8,894
Cumulative investment - Trunk (million \$2018)		0	6,269	8,888	13,401	13,401	13,401
Cumulative investment - Spur (million \$2018)		0	240	4,152	6,968	8,152	8,277
Cumulative investment - All (million \$2018)		0	6,509	13,041	20,368	21,553	21,678

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	2.77	13.9	27.3	38.4	40.1
Injection wells (wells)		0	7	26	46	78	96
Resource characterization, appraisal, permitting costs (million \$2020)		100	441	682	682	682	682
Wells and facilities construction costs (million \$2020)		0	200	781	1,392	2,327	2,890

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-47.9
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-449
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-932
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-55.1
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-455
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,217
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-2,715
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-366
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-418
productivity (1000 tC02e/y)							
Carbon sink potential - Low - All (not							-6,654
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-71.7
regeneration (1000 tC02e/y)							4.570
Carbon sink potential - Mid - Avoid							-1,570
deforestation (1000 tC02e/y)							4 (70
Carbon sink potential - Mid - Extend							-1,679
rotation length (1000 tCO2e/y)							00.0
Carbon sink potential - Mid - Improve							-80.8
plantations (1000 tC02e/y)							000
Carbon sink potential - Mid - Increase							-909
retention of HWP (1000 tC02e/y)							0.07
Carbon sink potential - Mid - Increase							-2,347
trees outside forests (1000 tC02e/y)							-4,073
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,073
Carbon sink potential - Mid - Reforest							-2,599
pasture (1000 tCO2e/y)							-2,599
Carbon sink potential - Mid - Restore							-828
productivity (1000 tCO2e/y)							-020
Carbon sink potential - Mid - All (not							-14,157
counting overlap) (1000 tC02e/y)							-14,157
Carbon sink potential - High - Accelerate							-95.6
regeneration (1000 tCO2e/y)							-73.0
Carbon sink potential - High - Avoid							-2,692
deforestation (1000 tC02e/y)							-2,072
Carbon sink potential - High - Extend							-2,426
rotation length (1000 tCO2e/y)							-2,420
Carbon sink potential - High - Improve							-108
plantations (1000 tCO2e/y)							-100
Carbon sink potential - High - Increase							-1,364
retention of HWP (1000 tC02e/y)							-1,504
Carbon sink potential - High - Increase							-3,477
trees outside forests (1000 tC02e/y)							-0,411
Carbon sink potential - High - Reforest							-5,430
cropland (1000 tCO2e/y)							-0,400
Carbon sink potential - High - Reforest							-4,831
pasture (1000 tCO2e/y)							-4,031
Carbon sink potential - High - All (not							-21,662
counting overlap) (1000 tC02e/y)							21,002
Carbon sink potential - High - Restore							-1,239
productivity (1000 tC02e/y)							-1,207
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							7.82
hectares) Land impacted for carbon sink potential -							342
Low - Avoid deforestation (over 30 years) (1000 hectares)							342
Land impacted for carbon sink potential - Low - Extend rotation length (1000							474
hectares)							
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							20
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential -							174
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.8
Land impacted for carbon sink potential -							248
Low - Restore productivity (1000 hectares)							
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,469
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years)							353
(1000 hectares) Land impacted for carbon sink potential - Mid - Extend rotation length (1000							855
hectares) Land impacted for carbon sink potential -							30
Mid - Improve plantations (1000 hectares) 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							252
hectares) Land impacted for carbon sink potential -							269
Mid - Reforest cropland (1000 hectares) Land impacted for carbon sink potential -							172
Mid - Reforest pasture (1000 hectares) Land impacted for carbon sink potential - Mid - Restore productivity (1000							500
hectares) Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000							2,444
hectares) Land impacted for carbon sink potential - High - Accelerate regeneration (1000							15.6
hectares) Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							364

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 -							1,237
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							39.9
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 -							330
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							359
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							137
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							411
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,894
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							-4,993
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-8,380
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-193
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Moderate							-13,567
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Aggressive							-4,993
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-15,905
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-387
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Aggressive							-21,285
deployment - Total (1000 tC02e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate							2,460
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							3,442
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							352
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							822
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							113
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							7,189
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							2,460
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							16,127
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							703
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							822
Aggressive deployment - Cropland to							
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							113
Aggressive deployment - Pasture to							
energy crops (1000 hectares)							
Land impacted for carbon sink -							20,227
Aggressive deployment - Total (1000							•
hectares)							

Table 64: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
	2020						
Premature deaths from air pollution -		432	268	187	151	137	135
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		46.3	53.8	66.9	67	71.1	63.5
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		560	577	595	615	636	656
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		37	37.9	38.7	39.7	40.7	41.5
Stations (deaths)							
Premature deaths from air pollution -		166	155	146	139	134	130
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		3.62	3.29	2.81	2.35	1.97	1.73
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		9.48	9.73	10.1	10.5	10.4	10.3
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution -		11.3	11.3	11.2	11.1	11	10.8
Fuel Comb - Comm/Institutional - Coal							
(deaths)							

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

Table 64. NET beenand Inn Note Treatm (ee	-					
Item	2020 2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -	194	190	173	153	140	137
Fuel Comb - Comm/Institutional - Natural						
Gas (deaths)						
Premature deaths from air pollution -	42.3	44.4	44.5	42.6	40.5	39.5
Fuel Comb - Comm/Institutional - Oil						
(deaths)						
Premature deaths from air pollution -	4.02	4.12	4.22	4.31	4.4	4.49
Fuel Comb - Comm/Institutional - Other						
(deaths)						
Premature deaths from air pollution -	4.12	2.78	2.19	2.04	1.93	1.77
Industrial Processes - Coal Mining						
(deaths)						
Premature deaths from air pollution -	121	126	129	123	121	113
Industrial Processes - Oil & Gas						
Production (deaths)						
Monetary damages from air pollution -	3,827	2,375	1,655	1,335	1,213	1,195
Fuel Comb - Electric Generation - Coal						
(million \$2019)						
Monetary damages from air pollution -	410	476	592	594	630	563
Fuel Comb - Electric Generation - Natural						
Gas (million \$2019)						
Monetary damages from air pollution -	4,980	5,129	5,287	5,472	5,655	5,836
Mobile - On-Road (million \$2019)	,	-,	-, -	-,	,	.,
Monetary damages from air pollution -	327	335	342	352	360	367
Gas Stations (million \$2019)						
Monetary damages from air pollution -	1,473	1,377	1,290	1,230	1,191	1,152
Fuel Comb - Residential - Natural Gas	,		,		.	,
(million \$2019)						
Monetary damages from air pollution -	32.1	29.2	24.9	20.8	17.4	15.3
Fuel Comb - Residential - Oil (million						
\$2019)						
Monetary damages from air pollution -	84	86.2	89.7	92.7	92.5	91.1
Fuel Comb - Residential - Other (million						
\$2019)						
Monetary damages from air pollution -	99.9	99.9	99.4	98.4	97.3	95.8
Fuel Comb - Comm/Institutional - Coal						
(million \$2019)						
Monetary damages from air pollution -	1,716	1,679	1,534	1,353	1,242	1,214
Fuel Comb - Comm/Institutional - Natural	""	,,,,,,	,,,,,,	1,222	,,	.,
Gas (million \$2019)						
Monetary damages from air pollution -	374	393	394	377	358	349
Fuel Comb - Comm/Institutional - Oil						
(million \$2019)						
Monetary damages from air pollution -	35.6	36.5	37.4	38.2	38.9	39.7
Fuel Comb - Comm/Institutional - Other		00.0		33.2	00.7	• • • • • • • • • • • • • • • • • • • •
(million \$2019)						
Monetary damages from air pollution -	36.4	24.5	19.3	18	17	15.6
Industrial Processes - Coal Mining			. ,	.5		10.0
(million \$2019)						
Monetary damages from air pollution -	1,072	1,122	1,143	1,092	1,079	1,001
Industrial Processes - Oil & Gas	1,012	1,122	1,1-10	.,5 /2	.,517	.,001
Production (million \$2019)						
11 00000001 (111111011 42017)						

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,972	2,968	2,968	2,962	2,962	2,964
By economic sector - Construction (jobs)		12,038	12,353	14,035	14,580	16,156	18,035
By economic sector - Manufacturing		7,249	7,335	7,390	7,779	7,607	7,640
(jobs)							
By economic sector - Mining (jobs)		9,213	6,688	5,237	4,170	3,485	2,844

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

Table 65. KEF SCEITUTTO - IMPACTS - JUDS (Continueuj						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		661	714	1,083	1,129	1,299	1,716
By economic sector - Pipeline (jobs)		1,084	1,132	1,150	1,090	1,104	1,096
By economic sector - Professional (jobs)		8,052	7,621	7,988	8,568	9,117	9,999
By economic sector - Trade (jobs)		7,183	6,314	6,258	6,240	6,457	6,972
By economic sector - Utilities (jobs)		19,583	18,762	18,728	18,809	20,062	20,935
By resource sector - Biomass (jobs)		7,006	6,807	6,626	6,460	6,323	6,198
By resource sector - CO2 (jobs)		0	0.079	0.1	0.108	0.119	0.127
By resource sector - Coal (jobs)		8,175	4,933	3,633	2,646	2,022	1,704
By resource sector - Grid (jobs)		19,787	19,227	20,069	20,279	25,338	28,914
By resource sector - Natural Gas (jobs)		10,934	10,657	11,192	12,670	11,442	10,706
By resource sector - Nuclear (jobs)		6,266	6,166	5,258	4,031	3,513	2,816
By resource sector - Oil (jobs)		11,725	10,286	9,223	8,536	8,075	7,584
By resource sector - Solar (jobs)			640	3,081	2,122	2,262	4,055
By resource sector - Wind (jobs)		4,142	5,173	5,756	8,582	9,273	10,224
By education level - All sectors - High		29,977	28,047	28,463	28,524	29,833	31,532
school diploma or less (jobs)							
By education level - All sectors -		19,989	18,881	19,406	19,772	20,815	22,203
Associates degree or some college (jobs)							
By education level - All sectors -		14,111	13,237	13,234	13,264	13,695	14,346
Bachelors degree (jobs)							
By education level - All sectors - Masters		3,476	3,267	3,276	3,301	3,425	3,608
or professional degree (jobs)							
By education level - All sectors - Doctoral		482	455	459	466	482	510
degree (jobs)							
Related work experience - All sectors -		9,849	9,305	9,501	9,604	10,060	10,668
None (jobs)							
Related work experience - All sectors - Up		14,434	13,533	13,722	13,746	14,326	15,131
to 1 year (jobs)					22.222	21.271	
Related work experience - All sectors - 1		24,453	22,833	23,088	23,228	24,256	25,644
to 4 years (jobs)		45.007	4/ 050	1/ /01	4/ 04/	45.500	
Related work experience - All sectors - 4		15,206	14,350	14,621	14,814	15,509	16,438
to 10 years (jobs)		4 000	0.075	0.007	0.005	4.000	
Related work experience - All sectors -		4,093	3,865	3,906	3,935	4,099	4,318
Over 10 years (jobs)		0.700	0.700	0.500	0.515	0.775	0.07
On-the-Job Training - All sectors - None		3,702	3,483	3,523	3,515	3,645	3,847
(jobs)		/ / 101	/ 0 100	/ 0 551	/070/	/ 5 / 75	/7000
On-the-Job Training - All sectors - Up to 1		46,181	43,189	43,551	43,706	45,475	47,922
year (jobs)		10 / 71	10.700	10.071	10.005	10.000	1/ 010
On-the-Job Training - All sectors - 1 to 4		13,471	12,733	13,071	13,285	13,998	14,910
years (jobs)		/ 001	0.015	/ 110	/ 000	/ 510	/ 07/
On-the-Job Training - All sectors - 4 to 10		4,091	3,915	4,110	4,229	4,519	4,876
years (jobs) On-the-Job Training - All sectors - Over 10		590	568	585	591	/10	646
<u> </u>		590	566	565	591	612	646
years (jobs) On-Site or In-Plant Training - All sectors -		10,609	10,035	10.010	10,316	10,741	11,368
None (jobs)		10,609	10,035	10,218	10,316	10,741	11,300
On-Site or In-Plant Training - All sectors -		42,014	39,252	39,582	39,707	41,349	43,591
		42,014	39,232	39,362	39,101	41,349	43,391
Up to 1 year (jobs) On-Site or In-Plant Training - All sectors -		10,593	9,991	10,232	10,373	10,917	11,616
1 to 4 years (jobs)		10,593	9,991	10,232	10,373	10,917	11,010
On-Site or In-Plant Training - All sectors -		4,282	4,090	4,263	4,368	4,643	4,982
4 to 10 years (jobs)		4,202	4,070	4,203	4,300	4,043	4,702
On-Site or In-Plant Training - All sectors -		538	519	543	562	599	643
Over 10 years (jobs)		550	לוט	545	502	מלכנ	043
Wage income - All (million \$2019)		4,180	3,983	4,100	4,191	4,454	4,779
vvage income - An (infillion \$2017)		4,100	5,765	4,100	4,171	4,404	4,117

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

••							
Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,044	993	935	904	914	947	988

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	591	553	532	516	507	501	496
Final energy use - Commercial (PJ)	441	441	437	426	415	414	426
Final energy use - Industry (PJ)	634	673	695	715	742	766	795

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		5.74	5.83	7.97	8.31	10.3	10.9
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	2.39	12.9	13.5	14.3	15	15.6	16.5
Heat Pump (%)							
Sales of space heating units - Electric	12.9	17.8	17.6	17.4	16.8	16	15.2
Resistance (%)							
Sales of space heating units - Gas (%)	82.1	65.2	64.8	64.2	64.1	64.2	64
Sales of space heating units - Fossil (%)	2.6	4.13	4.15	4.15	4.16	4.19	4.17
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	22.7	38.1	37.9	37.8	37.8	37.7	37.7
Resistance (%)							
Sales of water heating units - Gas Furnace	77.3	61.8	62	62.1	62.1	62.2	62.2
(%)							
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.113	0.114	0.114
Sales of cooking units - Electric	50.2	50.2	50.2	50.2	50.2	50.2	50.2
Resistance (%)							
Sales of cooking units - Gas (%)	49.8	49.8	49.8	49.8	49.8	49.8	49.8
Residential HVAC investment in 2020s vs.	•	10.3	11.1				
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	0.751	12.5	44.7	71.1	75.5	75.9	75.9
Heat Pump (%)							
Sales of space heating units - Electric	2.86	4.31	8.93	17.1	22.7	23.6	23.7
Resistance (%)							
Sales of space heating units - Gas (%)	96.4	81	45.2	11.6	1.78	0.443	0.362
Sales of space heating units - Fossil (%)	0	2.21	1.15	0.205	0.023	0	0
Sales of water heating units - Electric	0.271	0.342	0.346	0.345	0.34	0.342	0.342
Heat Pump (%)							
Sales of water heating units - Electric	2.65	3.2	3.17	3.18	3.17	3.15	3.16
Resistance (%)							
Sales of water heating units - Gas (%)	96.9	96.3	96.3	96.3	96.3	96.3	96.3
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric	41	44.2	44.3	44.3	44.3	44.4	44.5
Resistance (%)							
Sales of cooking units - Gas (%)	59	55.8	55.7	55.7	55.7	55.6	55.5
Commercial HVAC investment in 2020s -		40,483	41,990				
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)	7,459	4,077	2,444	2,444	45	45	0
Installed thermal - Natural gas (MW)	16,504	16,977	16,077	16,971	13,442	22,579	26,270
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	8,378	8,378	6,038	6,038
Installed renewables - Rooftop PV (MW)	62.5	110	164	248	368	523	724

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)	305	305	305	1,496	2,649	3,485	5,272
Installed renewables - Wind - Base land use assumptions (MW)	6,784	6,948	8,722	9,430	15,304	19,114	25,260
Installed renewables - Wind - Constrained land use assumptions (MW)	65	65	65	65	65	65	65

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	650	650	650	2,871	5,021	6,577	9,900
Wind - Base land use assumptions (GWh)	24,893	25,438	31,451	33,851	52,673	64,877	84,316
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)	-11.1		-4.33				-3.87
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.371		-0.667				-0.694
Business-as-usual carbon sink - Total (Mt CO2e/y)	-11.5		-5				-4.57

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-47.9
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-449
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-932
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-55.1
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-455
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,217
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2,715
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-366
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-418
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-6,654
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-71.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,570
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-1,679
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-80.8
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-909
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-2,347
trees outside forests (1000 tC02e/y)							

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

			-4,073
			•
			0.500
			-2,599
			-828
			-020
			-14,157
			-14,131
			-95.6
			70.0
			-2,692
			-2,072
			-2,426
			-2,420
			-108
			-100
			-1,364
			-1,304
			-3,477
			-5,411
			-5,430
			-3,430
			-4,831
			-4,031
			-21,662
			-21,002
			-1,239
			-1,239
			7.82
			1.02
			342
			342
			474
			414
			20
			20
			0
			· ·
			174
			114
			180
			100
			23.8
			20.0
			248
			240
			1,469
			1,409
			11.7
			11.7

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

Table 73: REF Scenario - PILLAR 6: Lana Si				2225	2212	00/5	2252
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							353
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							855
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							30
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 -							252
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							269
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							172
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							500
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,444
Mid - Total impacted (over 30 years) (1000							_,
hectares)							
Land impacted for carbon sink potential -							15.6
High - Accelerate regeneration (1000							10.0
hectares)							
Land impacted for carbon sink potential -							364
High - Avoid deforestation (over 30 years)							304
(1000 hectares)							
Land impacted for carbon sink potential -							1,237
High - Extend rotation length (1000							1,231
hectares)							
Land impacted for carbon sink potential -							39.9
High - Improve plantations (1000							37.7
•							
hectares) Land impacted for carbon sink potential -							0
·							U
High - Increase retention of HWP (1000							
hectares)							000
Land impacted for carbon sink potential -							330
High - Increase trees outside forests							
(1000 hectares)							0.50
Land impacted for carbon sink potential -							359
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							137
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							411
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							2,894
High - Total impacted (over 30 years)							
(1000 hectares)							