

Net-Zero America - New Jersey 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	9
17	E- scenario - IMPACTS - Health	9
18	E- scenario - IMPACTS - Jobs	11
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	13
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	18
29	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview	19
30	E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand .	19
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	20
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	24
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	${\sf E+RE-scenario-PILLAR1:Efficiency/Electrification-Transportation...}$	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	28
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	34
53	E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation	34
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	35
57	E-B+ scenario - PILLAR 2: Clean Electricity - Generation	35
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	36
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	41
66	REF scenario - PILLAR 1: Efficiency/Electrification - Overview	42
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	43
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 -		110	0.076	0.076	0.071	0.046	0.003
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		81.4	60.8	41.4	40.6	27.6	11.3
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		442	421	327	193	88.7	33.7
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		32.3	30.2	23.1	13.7	6.38	2.62
Stations (deaths)							
Premature deaths from air pollution -		115	98.9	69.7	40.2	19.5	7.45
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		45.8	37.9	26.3	15.5	6.86	2.01
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		8.17	7.55	6.06	4.25	2.55	1.44
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution -		2.42	2.37	2.31	2.24	2.16	2.06
Fuel Comb - Comm/Institutional - Coal							
(deaths)							
Premature deaths from air pollution -		98.8	91.7	73.3	51	32.7	18.1
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							
Premature deaths from air pollution -		17.4	14.7	11	7.32	5.27	4.06
Fuel Comb - Comm/Institutional - Oil						5.2.	
(deaths)							
Premature deaths from air pollution -		3.97	3.41	2.84	2.26	1.69	1.12
Fuel Comb - Comm/Institutional - Other		0.71	0.41	2.04	2.20	1.07	1.12
(deaths)							
Premature deaths from air pollution -		1.26	0.714	0.726	0.732	0.758	0.767
Industrial Processes - Coal Mining		1.20	0.114	0.120	0.102	0.100	0.101
(deaths)							
Premature deaths from air pollution -		71.3	66.5	59	46.8	33.7	20.5
Industrial Processes - Oil & Gas		11.5	00.5	37	40.0	33.1	20.0
Production (deaths)							
Monetary damages from air pollution -		976	0.678	0.674	0.627	0.411	0.029
Fuel Comb - Electric Generation - Coal		710	0.010	0.014	0.021	0.411	0.027
(million \$2019)							
Monetary damages from air pollution -		721	538	367	359	245	100
		721	536	361	359	245	100
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)		0.000	0.7/7	0.000	1 717	700	200
Monetary damages from air pollution -		3,928	3,747	2,908	1,717	789	300
Mobile - On-Road (million \$2019)		007	0/0	001	101	F/ F	00.0
Monetary damages from air pollution -		286	268	204	121	56.5	23.2
Gas Stations (million \$2019)		101:		(45	25.	4=0	
Monetary damages from air pollution -		1,016	877	618	356	173	66
Fuel Comb - Residential - Natural Gas							
(million \$2019)							
Monetary damages from air pollution -		406	336	233	137	60.8	17.8
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		72.4	66.9	53.7	37.7	22.6	12.7
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		21.5	21	20.5	19.8	19.1	18.3
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		875	812	649	452	290	160
Fuel Comb - Comm/Institutional - Natural							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		154	130	97.1	64.8	46.6	35.9
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		35.1	30.2	25.1	20	14.9	9.96
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		11.1	6.3	6.4	6.46	6.69	6.77
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		633	591	524	416	300	182
Industrial Processes - Oil & Gas							
Production (million \$2019)							

Table 2: E+ scenario - IMPACTS - Jobs

Table 2. Et Scellul lu - IMPAGIS - Jubs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		81.7	209	106	83.7	63.6	47.5
By economic sector - Construction (jobs)		11,388	11,060	13,101	13,723	24,134	22,345
By economic sector - Manufacturing		6,739	11,687	11,985	10,259	14,183	12,229
(jobs)							
By economic sector - Mining (jobs)		3,110	2,210	1,447	893	518	276
By economic sector - Other (jobs)		1,396	1,470	1,845	2,094	2,993	4,248
By economic sector - Pipeline (jobs)		749	664	527	373	246	163
By economic sector - Professional (jobs)		4,626	4,569	5,326	5,781	9,712	9,591
By economic sector - Trade (jobs)		3,830	3,515	3,797	3,949	6,142	6,632
By economic sector - Utilities (jobs)		9,849	9,866	13,119	14,835	31,512	23,085
By resource sector - Biomass (jobs)		350	575	302	252	232	203
By resource sector - CO2 (jobs)		0	234	209	0	0	0
By resource sector - Coal (jobs)		209	70	0	0	0	0
By resource sector - Grid (jobs)		10,668	11,893	19,568	22,374	59,501	41,761
By resource sector - Natural Gas (jobs)		7,886	6,335	5,401	6,079	4,247	3,871
By resource sector - Nuclear (jobs)		1,833	1,803	1,775	1,747	1,720	1,693
By resource sector - Oil (jobs)		7,097	5,643	4,064	2,777	1,868	1,091
By resource sector - Solar (jobs)		13,659	18,009	19,383	17,222	17,610	27,119
By resource sector - Wind (jobs)		66.2	687	552	1,540	4,326	2,879
By education level - All sectors - High		17,721	19,409	22,004	22,218	38,438	33,669
school diploma or less (jobs)		,	17, 107	22,00	22,210	00,100	00,007
By education level - All sectors -		13,119	14,285	16,417	16,806	29,244	25,634
Associates degree or some college (jobs)		,	,	,	.5,555	=7,=	_0,00 .
By education level - All sectors -		8,608	9,169	10,156	10,218	17,162	15,131
Bachelors degree (jobs)		0,000	7,.07	.07.00	.5,2.5	,	.07.01
By education level - All sectors - Masters		2,038	2,109	2,370	2,432	4,153	3,697
or professional degree (jobs)		_,,,,,	_,	_,_,	_,	1,100	-,
By education level - All sectors - Doctoral		282	279	307	317	505	487
degree (jobs)							
Related work experience - All sectors -		6,026	6,506	7,418	7,571	13,134	11,530
None (jobs)		.,	-,	, -	, -	, -	,
Related work experience - All sectors - Up		8,337	9,217	10,399	10,467	17,836	15,909
to 1 year (jobs)		3,55.	7,2	10,011	.0, .0.	,000	.0// 0 /
Related work experience - All sectors - 1		15,047	16,191	18,324	18,609	32,092	28,118
to 4 years (jobs)		,		,	,	-,	,
Related work experience - All sectors - 4		9,749	10,455	11,872	12,091	20,879	18,233
to 10 years (jobs)			,	,	,		,
Related work experience - All sectors -		2,609	2,881	3,240	3,253	5,563	4,829
Over 10 years (jobs)		,	,		,	,	,
On-the-Job Training - All sectors - None		2,297	2,449	2,732	2,757	4,597	4,182
(iobs)			_,	_,	_,	.,	.,
On-the-Job Training - All sectors - Up to 1		27,453	30,078	33,824	34,084	58,272	51,230
year (jobs)		, 0	,	,	,	,	, - 3 0

Table 2. F+	scenario	- IMPACTS -	Inhe	(continued)
Table 2. ET	Scellul lu	- IMPAGIS -	JUUS	(CONTINUEU)

2020	2025	2030	2035	2040	2045	2050
	8,821	9,448	10,864	11,142	19,518	16,969
	2,776	2,802	3,312	3,496	6,294	5,489
	422	474	522	513	823	748
	6,772	7,377	8,278	8,360	14,071	12,588
	24,948	27,247	30,713	30,998	53,197	46,686
	6,851	7,368	8,451	8,641	15,107	13,151
	2,846	2,881	3,369	3,531	6,302	5,482
	352	378	444	461	826	711
	2,664	2,851	3,285	3,401	6,024	5,291
	2020	8,821 2,776 422 6,772 24,948 6,851 2,846	8,821 9,448 2,776 2,802 422 474 6,772 7,377 24,948 27,247 6,851 7,368 2,846 2,881 352 378	8,821 9,448 10,864 2,776 2,802 3,312 422 474 522 6,772 7,377 8,278 24,948 27,247 30,713 6,851 7,368 8,451 2,846 2,881 3,369 352 378 444	8,821 9,448 10,864 11,142 2,776 2,802 3,312 3,496 422 474 522 513 6,772 7,377 8,278 8,360 24,948 27,247 30,713 30,998 6,851 7,368 8,451 8,641 2,846 2,881 3,369 3,531 352 378 444 461	8,821 9,448 10,864 11,142 19,518 2,776 2,802 3,312 3,496 6,294 422 474 522 513 823 6,772 7,377 8,278 8,360 14,071 24,948 27,247 30,713 30,998 53,197 6,851 7,368 8,451 8,641 15,107 2,846 2,881 3,369 3,531 6,302 352 378 444 461 826

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		160	138	108	79.4	57.2	35.6
Oil consumption - Cumulative (million							3,314
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		596	503	403	303	191	132
Natural gas consumption - Cumulative							12,141
(tcf)							
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	683	640	573	490	414	364	340
Final energy use - Residential (PJ)	376	351	316	265	217	183	164
Final energy use - Commercial (PJ)	306	301	289	269	251	242	241
Final energy use - Industry (PJ)	130	131	133	133	134	135	137

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.49	3.59	11.3	12.3	10	10.7
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)	94.3	585	1,075	2,791	4,507	5,878	7,249
Vehicle stocks - LDV – All others (1000	6,045	5,756	5,467	3,984	2,501	1,415	329
units)							
Light-duty vehicle capital costs vs. REF -		1,151	2,985	4,782	7,266	7,885	7,530
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.341		1.73		7.27		11.7
units)							
Public EV charging plugs - L2 (1000 units)	0.794		41.6		175		281

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.07	17.8	67.1	90.9	93.9	94.1	94
Heat Pump (%)							
Sales of space heating units - Electric	6.87	9.53	5.27	2.94	2.62	2.66	2.75
Resistance (%)							
Sales of space heating units - Gas (%)	79.3	57.7	22.7	3.87	1.37	1.23	1.23
Sales of space heating units - Fossil (%)	9.77	15	4.87	2.25	2.08	2.05	1.99
Sales of water heating units - Electric	0	7.03	39.6	53.9	55.6	55.7	55.7
Heat Pump (%)							
Sales of water heating units - Electric	17.8	33.3	37.6	43.3	44.2	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	57.8	22.4	2.77	0.146	0	0
(%)							
Sales of water heating units - Other (%)	3.14	1.9	0.397	0.064	0.049	0.049	0.05
Sales of cooking units - Electric	33.6	47.7	91.1	99.5	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	66.4	52.3	8.94	0.45	0	0	0
Residential HVAC investment in 2020s vs.		7.13	8.05				
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	0.831	16.8	53.8	78.3	81.8	82	81.9
Heat Pump (%)							
Sales of space heating units - Electric	2.64	4.45	11.2	16.1	17	17	17.2
Resistance (%)							
Sales of space heating units - Gas (%)	88.4	67.1	32.7	5.5	1.14	0.906	0.899
Sales of space heating units - Fossil (%)	8.14	11.7	2.29	0.1	0	0	0
Sales of water heating units - Electric	0.247	7.96	43.7	60.3	62.3	62.4	62.4
Heat Pump (%)							
Sales of water heating units - Electric	1.46	5.37	23	35.5	37.3	37.4	37.4
Resistance (%)							
Sales of water heating units - Gas (%)	97.6	85.5	33	4.08	0.216	0	0
Sales of water heating units - Other (%)	0.649	1.16	0.372	0.184	0.175	0.176	0.176
Sales of cooking units - Electric	18.5	33.7	75.3	83.5	83.9	84	84
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Commercial HVAC investment in 2020s -		41,628	45,491				
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)	527	527	0	0	0	0	0
Installed thermal - Natural gas (MW)	9,622	13,576	14,948	16,107	21,272	19,702	16,384
Installed thermal - Nuclear (MW)	3,631	3,631	3,631	3,631	3,631	3,631	3,631
Installed renewables - Rooftop PV (MW)	1,929	2,892	3,843	5,079	6,573	8,274	10,225
Installed renewables - Solar - Base land use assumptions (MW)	772	1,809	2,789	3,433	3,433	3,433	3,433
Installed renewables - Wind - Base land use assumptions (MW)	9	9	9	9	9	9	9
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	83.2	159	261	425	28,362	39,330
Installed renewables - Solar - Constrained land use assumptions (MW)	706	1,503	2,022	2,349	2,349	2,349	2,349
Installed renewables - Wind - Constrained land use assumptions (MW)	9	9	9	42.8	295	295	295
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	83.2	179	290	366	23,571	39,144

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Table 9. E+ Scellulio	- PILLAR Z. GIBUII .	CIECUTICILY - GEHEFULHI	a CUDUCILY ICUIILIIIUEUT

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)		1.39	1.17	0.71	0	0	0
Capital invested - Offshore Wind - Base (billion \$2018)		0.236	0.183	0.208	0.284	41.2	14.5
Capital invested - Solar PV - Constrained (billion \$2018)		3.68	0.736	0.911	0	0	0
Capital invested - Wind - Constrained (billion \$2018)		0	0	0.075	0.536	0	0
Capital invested - Offshore Wind - Constrained (billion \$2018)		0.236	0.231	0.226	0.132	34.2	20.6
Capital invested - Biomass power plant (billion \$2018)	0	0.008	0.35	0	0	0.019	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,439	3,311	5,037	6,164	6,164	6,164	6,164
Wind - Base land use assumptions (GWh)	30.5	30.5	30.5	30.5	30.5	30.5	30.5
OffshoreWind - Base land use assumptions (GWh)	0	355	677	1,118	1,823	125,140	175,860
Solar - Constrained land use assumptions (GWh)	77.8	1,539	2,459	3,029	3,029	3,029	3,029
Wind - Constrained land use assumptions (GWh)	30.5	30.5	30.5	155	939	939	939
OffshoreWind - Constrained land use assumptions (GWh)	0	355	677	1,118	1,823	125,140	175,860
Biomass power plant (GWh)	0	14.6	701	701	701	741	741
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment -		8.36	390	27.3	2.77	22.9	0
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		1.81	65.2	66.1	66.2	67.3	67.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	0
Annual - BECCS (MMT)		0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	107	142	142	142	142
Spur (km)		0	0	0	0	0	0
All (km)		0	107	142	142	142	142
Cumulative investment - Trunk (million \$2018)		0	230	438	438	438	438
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	0
Cumulative investment - All (million \$2018)		0	230	438	438	438	438

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-372
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-57.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-161
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tC02e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tC02e/y)							445
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tC02e/y)							-181
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-181
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							U
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tC02e/y)							-100
Carbon sink potential - Mid - Restore							-319
productivity (1000 tCO2e/y)							-317
Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tC02e/y)							-2,207
Carbon sink potential - High - Accelerate							-68.4
regeneration (1000 tCO2e/y)							00.4
Carbon sink potential - High - Avoid							-1,305
deforestation (1000 tC02e/y)							1,000
Carbon sink potential - High - Extend							-969
rotation length (1000 tC02e/y)							-707
Carbon sink potential - High - Improve							-6.74
plantations (1000 tC02e/y)							0.14
Carbon sink potential - High - Increase							-172
retention of HWP (1000 tCO2e/y)							112
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tCO2e/y)							207
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							·
Carbon sink potential - High - Reforest							-308
pasture (1000 tC02e/y)							000
Carbon sink potential - High - All (not							-3,576
counting overlap) (1000 tC02e/y)							0,010
Carbon sink potential - High - Restore							-478
productivity (1000 tC02e/y)							
Land impacted for carbon sink potential -							5.6
Low - Accelerate regeneration (1000							0.0
hectares)							
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							189
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.24
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 -							13.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.51
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							8.4
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							171
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							0.40
Land impacted for carbon sink potential -							342
Mid - Extend rotation length (1000							
hectares) Land impacted for carbon sink potential -							1.87
Mid - Improve plantations (1000 hectares)							1.01
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							19.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							193
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							747
Mid - Total impacted (over 30 years) (1000							
hectares)							11.0
Land impacted for carbon sink potential -							11.2
High - Accelerate regeneration (1000 hectares)							
Land impacted for carbon sink potential -							177
High - Avoid deforestation (over 30 years)							111
(1000 hectares)							
Land impacted for carbon sink potential -							494
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.48
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 -							25.5
High - Increase trees outside forests							
(1000 hectares) Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							U
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares)							0.74
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							100
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							
(1000 hectares)							
<u> </u>							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-178
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-4.19
deployment - Permanent conservation							
cover (1000 tC02e/y)							100
Carbon sink potential - Moderate							-182
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							0/1
Carbon sink potential - Aggressive							-341
deployment - Cropland measures (1000							
tCO2e/y)							0.00
Carbon sink potential - Aggressive							-8.38
deployment - Permanent conservation							
cover (1000 tC02e/y)							0/0
Carbon sink potential - Aggressive							-349
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							89.9
deployment - Cropland measures (1000							07.7
hectares)							
Land impacted for carbon sink - Moderate							7.62
deployment - Permanent conservation							1.02
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							97.6
deployment - Total (1000 hectares)							71.0
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							U
energy grasses (1000 hectares)							
Land impacted for carbon sink -			-				172
Aggressive deployment - Cropland							112
measures (1000 hectares)							
Land impacted for carbon sink -							15.2
Aggressive deployment - Permanent							10.2
conservation cover (1000 hectares)							
Land impacted for carbon sink -			+				188
Aggressive deployment - Total (1000							100
Aggi cosive deployinent - rotal (1000							

Table 17: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		110	0.076	0.076	0.071	0.046	0.003
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		76.6	44.6	21.1	10	3.05	2.33
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		450	467	465	427	347	243
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		33	34.2	33.8	30.9	24.9	17.3
Stations (deaths)							

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

Table 17: E- scenario - IMPACIS - Health (c							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		116	111	102	86.9	66.2	44.3
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		46.7	45.8	44.8	39.9	30.3	19.5
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		8.28	8.48	8.58	8.06	6.68	5.01
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.42	2.37	2.31	2.24	2.16	2.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		99.3	102	102	95.6	83.4	67.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		17.5	16.6	15.9	14.1	12.2	10.1
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.97	3.66	3.33	2.99	2.64	2.29
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.23	0.715	0.731	0.741	0.759	0.748
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		71	62.8	51.6	42.9	36.8	27.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		976	0.678	0.674	0.627	0.411	0.029
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		678	395	187	88.8	27.1	20.6
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,005	4,154	4,132	3,799	3,086	2,158
Monetary damages from air pollution - Gas Stations (million \$2019)		292	303	299	273	220	153
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,025	982	906	770	587	392
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		414	406	397	353	268	173
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		73.4	75.2	76	71.4	59.2	44.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		21.5	21	20.5	19.8	19.1	18.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		879	899	899	847	738	595
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		155	147	141	125	108	89.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		35.1	32.4	29.5	26.4	23.4	20.3
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		10.8	6.31	6.45	6.54	6.7	6.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		631	558	458	381	327	241
Industrial Processes - Oil & Gas							
Production (million \$2019)							

Table 18: E- scenario - IMPACTS - Jobs

Table 18: E- scenario - IMPACTS - Jobs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		99.4	305	128	94.1	67	47.8
By economic sector - Construction (jobs)		10,989	10,502	10,846	10,519	26,987	23,988
By economic sector - Manufacturing (jobs)		6,882	12,101	9,657	8,715	17,664	14,428
By economic sector - Mining (jobs)		3,134	2,276	1,660	1,190	819	484
By economic sector - Other (jobs)		1,375	1,438	1,666	1,852	3,149	4,328
By economic sector - Pipeline (jobs)		752	670	551	429	353	260
By economic sector - Professional (jobs)		4,424	4,380	4,469	4,547	10,733	10,108
By economic sector - Trade (jobs)		3,746	3,457	3,488	3,465	6,883	7,055
By economic sector - Utilities (jobs)		8,924	8,561	9,021	8,713	35,210	24,981
By resource sector - Biomass (jobs)		377	821	426	396	285	197
By resource sector - CO2 (jobs)		0	401	358	0	0	0
By resource sector - Coal (jobs)		209	70	0	0	0	0
By resource sector - Grid (jobs)		9,157	9,822	11,763	11,554	68,524	46,668
By resource sector - Natural Gas (jobs)		7,480	5,447	4,350	4,106	3,289	3,207
By resource sector - Nuclear (jobs)		1,833	1,803	1,775	1,747	1,720	1,693
By resource sector - Oil (jobs)		7,170	6,012	5,040	4,065	3,136	2,039
By resource sector - Solar (jobs)		14,030	18,594	17,281	16,156	18,553	27,346
By resource sector - Wind (jobs)		69.5	720	493	1,499	6,357	4,528
By education level - All sectors - High		17,143	18,811	17,819	16,927	43,866	36,804
school diploma or less (jobs)							•
By education level - All sectors -		12,618	13,692	13,114	12,547	33,186	27,867
Associates degree or some college (jobs)							•
By education level - All sectors -		8,329	8,888	8,347	7,925	19,553	16,491
Bachelors degree (jobs)							
By education level - All sectors - Masters		1,963	2,029	1,943	1,867	4,695	3,998
or professional degree (jobs)							
By education level - All sectors - Doctoral		273	271	263	257	565	519
degree (jobs)							
Related work experience - All sectors -		5,807	6,266	5,983	5,713	14,922	12,548
None (jobs)							
Related work experience - All sectors - Up		8,086	8,974	8,476	8,080	20,351	17,359
to 1 year (jobs)							
Related work experience - All sectors - 1		14,519	15,617	14,840	14,135	36,516	30,643
to 4 years (jobs)							
Related work experience - All sectors - 4		9,392	10,047	9,573	9,120	23,718	19,844
to 10 years (jobs)							
Related work experience - All sectors -		2,523	2,787	2,613	2,476	6,358	5,285
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		2,229	2,380	2,263	2,164	5,222	4,540
(jobs)							
On-the-Job Training - All sectors - Up to 1		26,562	29,182	27,482	26,130	66,513	55,961
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		8,476	9,033	8,681	8,286	22,130	18,448
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		2,646	2,631	2,628	2,536	7,059	5,913
years (jobs)							
On-the-Job Training - All sectors - Over 10		412	465	431	407	942	817
years (jobs)							
On-Site or In-Plant Training - All sectors -		6,557	7,156	6,757	6,446	15,997	13,687
None (jobs)							
On-Site or In-Plant Training - All sectors -		24,123	26,399	24,922	23,702	60,696	50,988
Up to 1 year (jobs)							

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors -		6,591	7,061	6,769	6,456	17,153	14,314
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		2,719	2,716	2,689	2,585	7,083	5,918
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		336	358	349	335	935	772
Over 10 years (jobs)							
Wage income - All (million \$2019)		2,563	2,734	2,649	2,556	6,839	5,758

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	684	645	598	556	522	481	433
Final energy use - Residential (PJ)	376	353	337	317	287	250	214
Final energy use - Commercial (PJ)	306	301	299	297	292	284	276
Final energy use - Industry (PJ)	130	131	133	135	136	137	139

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		2.76	2.76	4.34	4.53	9.51	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	73	217	361	1,027	1,693	3,168	4,643
Vehicle stocks - LDV – All others (1000 units)	6,069	6,069	6,069	5,757	5,445	4,196	2,947
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	192	391	1,332	4,152	6,062
Public EV charging plugs - DC Fast (1000 units)	0.341		0.582		2.73		7.49
Public EV charging plugs - L2 (1000 units)	0.794		14		65.6		180

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.07	9.27	14.9	31.5	59.1	80.8	90.2
Heat Pump (%)							
Sales of space heating units - Electric	6.87	10.2	9.71	8.26	5.82	3.82	3.01
Resistance (%)							
Sales of space heating units - Gas (%)	79.3	63.6	59.6	47.8	27.8	11.6	4.3
Sales of space heating units - Fossil (%)	9.77	16.9	15.8	12.4	7.29	3.83	2.52
Sales of water heating units - Electric	0	1.31	5.02	15.9	33.8	47.5	53.3
Heat Pump (%)							
Sales of water heating units - Electric	17.8	32.8	33.2	34.8	38	41.5	43.4
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	63.7	59.7	47.8	27.4	10.7	3.19
(%)							
Sales of water heating units - Other (%)	3.14	2.18	2.01	1.52	0.769	0.279	0.109
Sales of cooking units - Electric	33.3	35.1	41.2	57.3	79.6	93.4	98.2
Resistance (%)							
Sales of cooking units - Gas (%)	66.7	64.9	58.8	42.7	20.4	6.57	1.77
Residential HVAC investment in 2020s vs.		7.14	8.46				
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	0.831	10.8	15	27.7	49.8	69	77.8
Heat Pump (%)							
Sales of space heating units - Electric	2.64	3.4	4.18	6.57	10.9	14.6	16.6
Resistance (%)							
Sales of space heating units - Gas (%)	88.4	72.3	67.9	55.8	34.4	14.9	5.15
Sales of space heating units - Fossil (%)	8.14	13.5	12.9	9.99	5	1.6	0.431
Sales of water heating units - Electric	0.247	1.77	5.84	17.8	37.6	53.1	59.7
Heat Pump (%)							
Sales of water heating units - Electric	1.46	2.65	4.65	10.7	21.4	30.9	35.4
Resistance (%)							
Sales of water heating units - Gas (%)	97.6	94.3	88.2	70.5	40.4	15.7	4.7
Sales of water heating units - Other (%)	0.649	1.31	1.29	1.01	0.586	0.311	0.212
Sales of cooking units - Electric	18.5	21.6	27.5	43	64.5	77.7	82.3
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	78.4	72.5	57	35.5	22.3	17.7
Commercial HVAC investment in 2020s -		41,604	45,411				
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)	527	527	0	0	0	0	0
Installed thermal - Natural gas (MW)	9,622	11,427	11,246	11,125	9,022	7,630	7,372
Installed thermal - Nuclear (MW)	3,631	3,631	3,631	3,631	3,631	3,631	3,631

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-372
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-57.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-161
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-181
trees outside forests (1000 tCO2e/y)							

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

Item Carbon sink potential - Mid - Reforest	2020	2025	2030	2035	2040	2045	2050
cropland (1000 tCO2e/y)							,
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tC02e/y)							100
Carbon sink potential - Mid - Restore							-319
productivity (1000 tC02e/y)							0.
Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tCO2e/y)							2,20
Carbon sink potential - High - Accelerate							-68.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,30
deforestation (1000 tC02e/y)							.,00
Carbon sink potential - High - Extend							-96
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6.74
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-17:
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-26
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-308
pasture (1000 tC02e/y)							00.
Carbon sink potential - High - All (not							-3,57
counting overlap) (1000 tCO2e/y)							0,0.
Carbon sink potential - High - Restore							-47
productivity (1000 tC02e/y)							•••
Land impacted for carbon sink potential -							5.
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							160
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							189
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.24
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							(
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							13.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.5
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							95.
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							47
Low - Total impacted (over 30 years)							-71
(1000 hectares)							
Land impacted for carbon sink potential -							8.4
Land initiacted for carbon suck ninemar-					ı	1	٠.٠
Mid - Accelerate regeneration (1000							

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

Table 25: E- Scenario - PILLAR 6: Lana Sini	KS - Forests	s (continuec	1)				
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							171
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							342
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.87
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 -							19.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							193
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							747
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							11.2
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							177
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							494
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.48
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 -							25.5
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-178
deployment - Cropland measures (1000 tCO2e/y)							
Carbon sink potential - Moderate							-4.19
deployment - Permanent conservation							-4.17
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-182
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-341
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-8.38
deployment - Permanent conservation							
cover (1000 tC02e/y)							-349
Carbon sink potential - Aggressive							-349
deployment - Total (1000 tC02e/y) Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							U
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate	+	+	+				89.9
deployment - Cropland measures (1000							07.7
hectares)							
Land impacted for carbon sink - Moderate							7.62
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							97.6
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							172
Aggressive deployment - Cropland							
measures (1000 hectares)							15.0
Land impacted for carbon sink -							15.2
Aggressive deployment - Permanent							
conservation cover (1000 hectares) Land impacted for carbon sink -							188
Aggressive deployment - Total (1000							100
hectares)							
nootal coj							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		110	0.076	0.076	0.071	0.046	0.003
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		70.8	52.2	33.4	25.6	9.52	1.77
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		442	421	327	193	88.7	33.7
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		32.3	30.2	23.1	13.7	6.38	2.62
Stations (deaths)							
Premature deaths from air pollution -		115	98.9	69.7	40.2	19.5	7.45
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		45.8	37.9	26.3	15.5	6.86	2.01
Fuel Comb - Residential - Oil (deaths)							

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

Item IADIE 27: E+RE+ SCENATIO - IMPACIS - HEAI	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -	2020	8.17	7.55	6.06	4.25	2.55	1.44
Fuel Comb - Residential - Other (deaths)		0.11	1.55	0.00	4.23	2.33	1.44
Premature deaths from air pollution -		2.42	2.37	2.31	2.24	2.16	2.06
Fuel Comb - Comm/Institutional - Coal				2.0.			
(deaths)							
Premature deaths from air pollution -		98.8	91.7	73.3	51	32.7	18.1
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							
Premature deaths from air pollution -		17.4	14.7	11	7.32	5.27	4.06
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		3.97	3.41	2.84	2.26	1.69	1.12
Fuel Comb - Comm/Institutional - Other							
(deaths)							
Premature deaths from air pollution -		1.35	0.714	0.725	0.731	0.757	0.724
Industrial Processes - Coal Mining							
(deaths)							
Premature deaths from air pollution -		69.5	65.1	53.8	38.9	22.3	2.11
Industrial Processes - Oil & Gas							
Production (deaths)							
Monetary damages from air pollution -		976	0.678	0.674	0.627	0.411	0.029
Fuel Comb - Electric Generation - Coal							
(million \$2019)							
Monetary damages from air pollution -		628	462	296	227	84.3	15.7
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		3,928	3,747	2,908	1,717	789	300
Mobile - On-Road (million \$2019)							
Monetary damages from air pollution -		286	268	204	121	56.5	23.2
Gas Stations (million \$2019)							
Monetary damages from air pollution -		1,016	877	618	356	173	66
Fuel Comb - Residential - Natural Gas							
(million \$2019)							
Monetary damages from air pollution -		406	336	233	137	60.8	17.8
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		72.4	66.9	53.7	37.7	22.6	12.7
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		21.5	21	20.5	19.8	19.1	18.3
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		875	812	649	452	290	160
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		154	130	97.1	64.8	46.6	35.9
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		35.1	30.2	25.1	20	14.9	9.96
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		11.9	6.3	6.4	6.45	6.68	6.39
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		617	578	478	345	198	18.8
Industrial Processes - Oil & Gas							
Production (million \$2019)							

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

Table 28: E+RE+ SCENUTIO - IMPACTS - JOBS							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		82.1	171	102	72	55.8	44.4
By economic sector - Construction (jobs)		13,085	11,023	12,962	17,983	22,899	20,249
By economic sector - Manufacturing (jobs)		8,574	12,074	18,635	15,607	16,285	23,839
By economic sector - Mining (jobs)		3,079	2,159	1,333	741	283	42.9
By economic sector - Other (jobs)		1,780	1,482	1,836	2,433	2,981	4,878
By economic sector - Pipeline (jobs)		730	610	431	282	144	60
By economic sector - Professional (jobs)		5,136	4,581	5,365	7,437	9,146	9,093
By economic sector - Trade (jobs)		4,193	3,519	3,776	4,806	5,753	6,530
By economic sector - Hade (jobs)		9,594	9,887	13,306	21,366	28,871	15,521
By resource sector - Biomass (jobs)		320	481	275	235	20,071	196
		0	0	0	0	0	0
By resource sector - CO2 (jobs)		- 1	70	0	_	0	0
By resource sector - Coal (jobs)		209			0	- 1	_
By resource sector - Grid (jobs)		10,629	12,350	20,442	38,128	56,509	28,491
By resource sector - Natural Gas (jobs)		7,271	6,102	4,957	4,426	3,230	3,555
By resource sector - Nuclear (jobs)		1,833	1,803	1,775	1,516	687	0
By resource sector - Oil (jobs)		7,099	5,577	3,918	2,454	973	3.25
By resource sector - Solar (jobs)		18,830	18,197	24,075	19,036	17,248	44,476
By resource sector - Wind (jobs)		63.4	926	2,305	4,931	7,564	3,536
By education level - All sectors - High school diploma or less (jobs)		19,773	19,514	24,898	30,388	37,257	34,631
By education level - All sectors - Associates degree or some college (jobs)		14,538	14,372	18,483	22,958	28,290	26,125
By education level - All sectors -		9,419	9,224	11,458	13,735	16,460	15,448
Bachelors degree (jobs) By education level - All sectors - Masters		2,213	2,117	2,587	3,243	3,938	3,583
or professional degree (jobs)		2,213	2,111	2,561	3,243	3,730	3,363
By education level - All sectors - Doctoral degree (jobs)		310	279	320	401	473	470
Related work experience - All sectors - None (jobs)		6,657	6,536	8,291	10,294	12,665	11,633
Related work experience - All sectors - Up to 1 year (jobs)		9,376	9,278	11,873	14,274	17,355	16,765
Related work experience - All sectors - 1		16,590	16,278	20,559	25,281	30,907	28,438
to 4 years (jobs) Related work experience - All sectors - 4		10,739	10,510	13,289	16,418	20,095	18,361
to 10 years (jobs) Related work experience - All sectors -		2,890	2,904	3,735	4,458	5,395	5,059
Over 10 years (jobs)							
On-the-Job Training - All sectors - None (jobs)		2,558	2,462	3,057	3,681	4,428	4,320
On-the-Job Training - All sectors - Up to 1 year (jobs)		30,452	30,274	38,556	46,472	56,436	53,244
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,729	9,493	12,072	15,184	18,779	16,856
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,034	2,800	3,449	4,699	5,965	4,992
On-the-Job Training - All sectors - Over 10 years (jobs)		481	478	612	690	809	845
On-Site or In-Plant Training - All sectors -		7,546	7,420	9,391	11,285	13,626	13,168
None (jobs) On-Site or In-Plant Training - All sectors -		27,647	27,421	34,904	42,280	51,469	48,215
Up to 1 year (jobs) On-Site or In-Plant Training - All sectors -		7,569	7,406	9,428	11,789	14,556	13,154
1 to 4 years (jobs) On-Site or In-Plant Training - All sectors -		3,105	2,880	3,535	4,739	5,972	5,025
4 to 10 years (jobs) On-Site or In-Plant Training - All sectors -		387	380	489	633	795	695
Over 10 years (jobs)							
Wage income - All (million \$2019)		2,915	2,862	3,625	4,615	5,757	5,148

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	683	640	573	490	414	364	340
Final energy use - Residential (PJ)	376	351	316	265	217	183	164
Final energy use - Commercial (PJ)	306	301	289	269	251	242	241
Final energy use - Industry (PJ)	130	131	133	133	134	135	137

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.49	3.59	11.3	12.3	10	10.7
Cumulative 5-yr (billion \$2018)							

Table 31: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	94.3	585	1,075	2,791	4,507	5,878	7,249
Vehicle stocks - LDV – All others (1000 units)	6,045	5,756	5,467	3,984	2,501	1,415	329
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,151	2,985	4,782	7,266	7,885	7,530
Public EV charging plugs - DC Fast (1000 units)	0.341		1.73		7.27		11.7
Public EV charging plugs - L2 (1000 units)	0.794		41.6		175		281

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.07	17.8	67.1	90.9	93.9	94.1	94
Heat Pump (%)							
Sales of space heating units - Electric	6.87	9.53	5.27	2.94	2.62	2.66	2.75
Resistance (%)							
Sales of space heating units - Gas (%)	79.3	57.7	22.7	3.87	1.37	1.23	1.23
Sales of space heating units - Fossil (%)	9.77	15	4.87	2.25	2.08	2.05	1.99
Sales of water heating units - Electric	0	7.03	39.6	53.9	55.6	55.7	55.7
Heat Pump (%)							
Sales of water heating units - Electric	17.8	33.3	37.6	43.3	44.2	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	57.8	22.4	2.77	0.146	0	0
(%)							
Sales of water heating units - Other (%)	3.14	1.9	0.397	0.064	0.049	0.049	0.05
Sales of cooking units - Electric	33.6	47.7	91.1	99.5	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	66.4	52.3	8.94	0.45	0	0	0
Residential HVAC investment in 2020s vs.		7.13	8.05				
REF - Cumulative 5-yr (billion \$2018)							

Table 33: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	0.831	16.8	53.8	78.3	81.8	82	81.9
Heat Pump (%)							
Sales of space heating units - Electric	2.64	4.45	11.2	16.1	17	17	17.2
Resistance (%)							
Sales of space heating units - Gas (%)	88.4	67.1	32.7	5.5	1.14	0.906	0.899
Sales of space heating units - Fossil (%)	8.14	11.7	2.29	0.1	0	0	0
Sales of water heating units - Electric	0.247	7.96	43.7	60.3	62.3	62.4	62.4
Heat Pump (%)							
Sales of water heating units - Electric	1.46	5.37	23	35.5	37.3	37.4	37.4
Resistance (%)							
Sales of water heating units - Gas (%)	97.6	85.5	33	4.08	0.216	0	0
Sales of water heating units - Other (%)	0.649	1.16	0.372	0.184	0.175	0.176	0.176

Table 33: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric	18.5	33.7	75.3	83.5	83.9	84	84
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Commercial HVAC investment in 2020s -		41,628	45,491				
Cumulative 5-yr (million \$2018)							

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

	0000	, ,	0000	,	00/0	0015	0050
Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	527	527	0	0	0	0	0
Installed thermal - Natural gas (MW)	9,622	11,427	14,350	17,069	16,891	15,661	17,190
Installed thermal - Nuclear (MW)	3,631	3,631	3,631	3,631	2,461	0	0
Installed renewables - Rooftop PV (MW)	1,929	2,892	3,843	5,079	6,573	8,274	10,225
Installed renewables - Solar - Base land use assumptions (MW)	772	4,096	4,538	4,538	4,538	4,538	10,263
Installed renewables - Wind - Base land use assumptions (MW)	9	9	9	9	9	269	434
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	83.2	159	345	13,537	36,114	39,330
Installed renewables - Solar - Constrained land use assumptions (MW)	772	2,810	3,916	3,916	3,916	3,916	13,425
Installed renewables - Wind - Constrained land use assumptions (MW)	10.3	10.3	10.3	212	296	296	296
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	83.2	179	366	13,410	23,571	39,144
Capital invested - Solar PV - Base (billion \$2018)		4.45	0.529	0	0	0	5.3
Capital invested - Wind - Base (billion \$2018)		0	0	0	0	0.524	0.315
Capital invested - Offshore Wind - Base (billion \$2018)		0.236	0.183	0.38	22.9	33.3	4.26

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,439	7,460	8,237	8,237	8,237	8,237	18,554
Wind - Base land use assumptions (GWh)	30.5	30.5	30.5	30.5	30.5	899	1,382
OffshoreWind - Base land use assumptions (GWh)	0	355	677	1,479	59,134	160,800	175,860
Solar - Constrained land use assumptions (GWh)	2,878	10,226	14,138	14,138	14,138	14,138	48,346
Wind - Constrained land use assumptions (GWh)	61	61	61	1,411	1,878	1,878	1,878
OffshoreWind - Constrained land use assumptions (GWh)	0	710	1,529	3,123	117,853	207,591	350,018

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)							-34.3
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-218
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-372
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3.43
Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)							-57.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
							00.0
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tCO2e/y) Carbon sink potential - Low - Restore							-161
productivity (1000 tC02e/y)							-101
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tCO2e/y)							-703
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							-51.4
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tC02e/y)							-101
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tC02e/y)							-011
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							0.02
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tC02e/y)							-110
Carbon sink potential - Mid - Increase							-181
trees outside forests (1000 tC02e/y)							101
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							J
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tC02e/y)							100
Carbon sink potential - Mid - Restore							-319
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tCO2e/y)							,
Carbon sink potential - High - Accelerate							-68.4
regeneration (1000 tC02e/y)							
Carbon sink potential - High - Avoid							-1,305
deforestation (1000 tCO2e/y)							•
Carbon sink potential - High - Extend							-969
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6.74
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-172
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-308
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-3,576
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-478
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							5.6
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							189
Low - Extend rotation length (1000							
hectares)							

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

Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050 1.24
Low - Improve plantations (1000 hectares)							1.24
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000							0
hectares) Land impacted for carbon sink potential -							13.4
Low - Increase trees outside forests (1000 hectares)							
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							1.51
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							95.8
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							473
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							8.4
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							171
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							342
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1.87
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							O
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							19.5
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							C
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							1
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							193
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							747
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							11.2
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							177
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							494
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2.48
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							O

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 -							25.5
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							
(1000 hectares)							

Table 37: E+RE+ scenario - PILLAR 6: Land							
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-178
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-4.19
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-182
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-341
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-8.38
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-349
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							89.9
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							7.62
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							97.6
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							172
Aggressive deployment - Cropland							_
measures (1000 hectares)							
Land impacted for carbon sink -	+						15.2
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
2222. 12011 20701 (1000 1100121 00)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							188

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal		110	0.076	0.076	0.071	0.046	0.003
(deaths)							
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		76.6	60.7	68.3	54.4	24.2	6.67
Premature deaths from air pollution - Mobile - On-Road (deaths)		442	421	327	193	88.7	33.7
Premature deaths from air pollution - Gas Stations (deaths)		32.3	30.2	23.1	13.7	6.38	2.62
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		115	98.9	69.7	40.2	19.5	7.45
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		45.8	37.9	26.3	15.5	6.86	2.01
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		8.17	7.55	6.06	4.25	2.55	1.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.42	2.37	2.31	2.24	2.16	2.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		98.8	91.7	73.3	51	32.7	18.1
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		17.4	14.7	11	7.32	5.27	4.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.97	3.41	2.84	2.26	1.69	1.12
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.17	0.713	0.725	0.731	0.758	0.724
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		72.5	70.7	70.3	62.9	54	41.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		976	0.678	0.674	0.627	0.411	0.029
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		679	537	605	482	214	59.1
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		3,928	3,747	2,908	1,717	789	300
Monetary damages from air pollution - Gas Stations (million \$2019)		286	268	204	121	56.5	23.2
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,016	877	618	356	173	66
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		406	336	233	137	60.8	17.8
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		72.4	66.9	53.7	37.7	22.6	12.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		21.5	21	20.5	19.8	19.1	18.3
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		875	812	649	452	290	160
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		154	130	97.1	64.8	46.6	35.9
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		35.1	30.2	25.1	20	14.9	9.96
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		10.3	6.29	6.4	6.45	6.69	6.39
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		644	628	624	559	480	369
Industrial Processes - Oil & Gas							
Production (million \$2019)							

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		93.4	326	126	87.2	64.9	50.1
By economic sector - Construction (jobs)		10,233	10,104	12,701	13,390	13,127	16,622
By economic sector - Manufacturing		5,506	5,669	5,431	4,671	4,784	3,375
(jobs)							
By economic sector - Mining (jobs)		3,142	2,260	1,561	1,028	661	435
By economic sector - Other (jobs)		1,219	1,297	1,735	2,049	2,206	3,806
By economic sector - Pipeline (jobs)		769	726	647	508	403	325
By economic sector - Professional (jobs)		4,108	4,185	5,365	5,581	5,572	8,095
By economic sector - Trade (jobs)		3,539	3,257	3,732	3,850	3,844	5,641
By economic sector - Utilities (jobs)		8,712	8,922	14,246	14,160	14,062	17,762
By resource sector - Biomass (jobs)		327	835	430	326	254	208
By resource sector - CO2 (jobs)		0	453	404	0	0	0
By resource sector - Coal (jobs)		209	70	0	0	0	0
By resource sector - Grid (jobs)		8,875	9,836	17,608	19,897	20,490	19,968
By resource sector - Natural Gas (jobs)		7,436	6,330	5,933	6,720	5,807	5,665
By resource sector - Nuclear (jobs)		1,833	1,803	4,230	2,243	2,208	7,229
By resource sector - Oil (jobs)		7,096	5,643	4,064	2,777	1,936	1,391
By resource sector - Solar (jobs)		11,316	11,493	12,820	13,249	13,722	21,501
By resource sector - Wind (jobs)		229	283	53.8	112	308	150
By education level - All sectors - High		15,818	15,694	19,238	19,242	18,985	23,309
school diploma or less (jobs)							
By education level - All sectors -		11,660	11,526	14,472	14,638	14,497	17,978
Associates degree or some college (jobs)							
By education level - All sectors -		7,748	7,491	9,256	8,941	8,777	11,456
Bachelors degree (jobs)							
By education level - All sectors - Masters or professional degree (jobs)		1,838	1,787	2,264	2,203	2,170	2,933
By education level - All sectors - Doctoral		256	249	312	301	296	435
degree (jobs)							
Related work experience - All sectors -		5,382	5,330	6,608	6,646	6,565	8,170
None (jobs)							
Related work experience - All sectors - Up to 1 year (jobs)		7,425	7,374	9,046	8,996	8,902	11,199
Related work experience - All sectors - 1 to 4 years (jobs)		13,470	13,227	16,402	16,295	16,066	20,207
Related work experience - All sectors - 4 to 10 years (jobs)		8,715	8,539	10,657	10,615	10,458	13,116

Table 20:	E+RE-scenario	TMDMCTC	Inhal	(nontinued)
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Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors -		2,327	2,275	2,831	2,772	2,734	3,418
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		2,063	2,010	2,481	2,432	2,399	3,166
(jobs)							
On-the-Job Training - All sectors - Up to 1		24,527	24,162	29,704	29,354	28,970	36,348
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		7,869	7,751	9,761	9,839	9,711	12,043
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		2,486	2,457	3,156	3,271	3,222	4,019
years (jobs)							
On-the-Job Training - All sectors - Over 10		376	367	442	430	422	535
years (jobs)							
On-Site or In-Plant Training - All sectors -		6,048	5,954	7,339	7,253	7,160	9,179
None (jobs)							
On-Site or In-Plant Training - All sectors -		22,293	21,947	27,057	26,779	26,429	33,125
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		6,112	6,022	7,550	7,598	7,500	9,289
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		2,555	2,512	3,203	3,287	3,230	4,033
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		312	311	395	409	404	486
Over 10 years (jobs)							
Wage income - All (million \$2019)		2,390	2,371	3,015	3,032	3,024	3,884

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	683	640	573	490	414	364	340
Final energy use - Residential (PJ)	376	351	316	265	217	183	164
Final energy use - Commercial (PJ)	306	301	289	269	251	242	241
Final energy use - Industry (PJ)	130	131	133	133	134	135	137

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.49	3.59	11.3	12.3	10	10.7
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)	94.3	585	1,075	2,791	4,507	5,878	7,249
Vehicle stocks - LDV – All others (1000 units)	6,045	5,756	5,467	3,984	2,501	1,415	329
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,151	2,985	4,782	7,266	7,885	7,530
Public EV charging plugs - DC Fast (1000 units)	0.341		1.73		7.27		11.7
Public EV charging plugs - L2 (1000 units)	0.794		41.6		175		281

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.07	17.8	67.1	90.9	93.9	94.1	94
Heat Pump (%)							
Sales of space heating units - Electric	6.87	9.53	5.27	2.94	2.62	2.66	2.75
Resistance (%)							
Sales of space heating units - Gas (%)	79.3	57.7	22.7	3.87	1.37	1.23	1.23
Sales of space heating units - Fossil (%)	9.77	15	4.87	2.25	2.08	2.05	1.99

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric	0	7.03	39.6	53.9	55.6	55.7	55.7
Heat Pump (%)							
Sales of water heating units - Electric	17.8	33.3	37.6	43.3	44.2	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	57.8	22.4	2.77	0.146	0	0
(%)							
Sales of water heating units - Other (%)	3.14	1.9	0.397	0.064	0.049	0.049	0.05
Sales of cooking units - Electric	33.6	47.7	91.1	99.5	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	66.4	52.3	8.94	0.45	0	0	0
Residential HVAC investment in 2020s vs.		7.13	8.05				
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	0.831	16.8	53.8	78.3	81.8	82	81.9
Heat Pump (%)							
Sales of space heating units - Electric	2.64	4.45	11.2	16.1	17	17	17.2
Resistance (%)							
Sales of space heating units - Gas (%)	88.4	67.1	32.7	5.5	1.14	0.906	0.899
Sales of space heating units - Fossil (%)	8.14	11.7	2.29	0.1	0	0	0
Sales of water heating units - Electric	0.247	7.96	43.7	60.3	62.3	62.4	62.4
Heat Pump (%)							
Sales of water heating units - Electric	1.46	5.37	23	35.5	37.3	37.4	37.4
Resistance (%)							
Sales of water heating units - Gas (%)	97.6	85.5	33	4.08	0.216	0	0
Sales of water heating units - Other (%)	0.649	1.16	0.372	0.184	0.175	0.176	0.176
Sales of cooking units - Electric	18.5	33.7	75.3	83.5	83.9	84	84
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Commercial HVAC investment in 2020s -		41,628	45,491				
Cumulative 5-yr (million \$2018)							

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

2020	2025	2030	2035	2040	2045	2050
527	527	0	0	0	0	0
9,622	10,065	11,342	12,259	15,714	17,497	15,768
3,631	3,631	3,631	4,662	4,662	4,662	6,887
1,929	2,892	3,843	5,079	6,573	8,274	10,225
772	1,195	1,752	2,347	2,991	2,991	2,991
9	9	9	9	9	9	9
0	159	345	521	879	3,638	4,819
772	1,003	1,892	2,085	2,383	2,383	2,383
9	9	9	9	9	9	9
0	179	290	548	855	3,156	3,936
	0.566	0.667	0.657	0.669	0	0
	0	0	0	0	0	0
	0.451	0.447	0.359	0.621	4.07	1.56
	527 9,622 3,631 1,929 772 9 0 772	527 527 9,622 10,065 3,631 3,631 1,929 2,892 772 1,195 9 9 0 159 772 1,003 9 9 0 179 0.566 0	527 527 0 9,622 10,065 11,342 3,631 3,631 3,631 1,929 2,892 3,843 772 1,195 1,752 9 9 9 0 159 345 772 1,003 1,892 9 9 9 0 179 290 0.566 0.667 0	527 527 0 0 9,622 10,065 11,342 12,259 3,631 3,631 3,631 4,662 1,929 2,892 3,843 5,079 772 1,195 1,752 2,347 9 9 9 9 0 159 345 521 772 1,003 1,892 2,085 9 9 9 9 0 179 290 548 0 0.566 0.667 0.657 0 0 0 0	527 527 0 0 0 9,622 10,065 11,342 12,259 15,714 3,631 3,631 3,631 4,662 4,662 1,929 2,892 3,843 5,079 6,573 772 1,195 1,752 2,347 2,991 9 9 9 9 9 0 159 345 521 879 772 1,003 1,892 2,085 2,383 9 9 9 9 9 0 179 290 548 855 0.566 0.667 0.657 0.669 0 0 0 0 0	527 527 0 0 0 0 9,622 10,065 11,342 12,259 15,714 17,497 3,631 3,631 3,631 4,662 4,662 4,662 1,929 2,892 3,843 5,079 6,573 8,274 772 1,195 1,752 2,347 2,991 2,991 9 9 9 9 9 9 0 159 345 521 879 3,638 772 1,003 1,892 2,085 2,383 2,383 9 9 9 9 9 9 0 179 290 548 855 3,156 0.566 0.667 0.657 0.669 0 0 0 0 0 0

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

Time	0000	0005	0000	0005	00/0	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained		0.309	1.06	0.212	0.31	0	0
(billion \$2018)							
Capital invested - Wind - Constrained (billion \$2018)		0	0	0	0	0	0
Capital invested - Offshore Wind - Constrained (billion \$2018)		0.507	0.267	0.527	0.533	3.39	1.03

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,439	2,213	3,227	4,281	5,425	5,425	5,425
Wind - Base land use assumptions (GWh)	30.5	30.5	30.5	30.5	30.5	30.5	30.5
OffshoreWind - Base land use assumptions (GWh)	0	677	1,479	2,233	3,750	15,641	20,804
Solar - Constrained land use assumptions (GWh)	1,439	1,862	3,445	3,784	4,310	4,310	4,310
Wind - Constrained land use assumptions (GWh)	30.5	30.5	30.5	30.5	30.5	30.5	30.5
OffshoreWind - Constrained land use assumptions (GWh)	0	765	1,239	2,347	3,655	13,568	16,966

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-372
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-57.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-161
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-181
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tCO2e/y)							

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

Item Carbon sink potential - Mid - Restore	2020	2025	2030	2035	2040	2045	205 -31
							-31
productivity (1000 tC02e/y)							0.07
Carbon sink potential - Mid - All (not							-2,26
counting overlap) (1000 tC02e/y)							/0
Carbon sink potential - High - Accelerate							-68.
regeneration (1000 tC02e/y)							1.00
Carbon sink potential - High - Avoid							-1,30
deforestation (1000 tC02e/y)							-96
Carbon sink potential - High - Extend							-96
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6.7
plantations (1000 tCO2e/y)							17
Carbon sink potential - High - Increase							-17
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-26
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-30
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-3,57
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-47
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							5.
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							16
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							18
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.2
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							13.
Low - Increase trees outside forests							.0.
(1000 hectares)							
Land impacted for carbon sink potential -							
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.5
Low - Reforest pasture (1000 hectares)							1.0
Land impacted for carbon sink potential -							95.
Low - Restore productivity (1000							73.
hectares)							
Land impacted for carbon sink potential -							47
							41
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							8.
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							17
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							34
Mid - Extend rotation length (1000							

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

2020	2025	2030	2035	2040	2045	2050
						1.87
						0
						U
						19.5
						0
						11
						193
						747
						141
						11.2
						177
						494
						0 / 0
						2.48
						0
						U
						25.5
						0
						8.74
						158
						877
						011

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-178
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-4.19
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-182
deployment - Total (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-341
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-8.38
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-349
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							89.9
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							7.62
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							97.6
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							_
energy grasses (1000 hectares)							
Land impacted for carbon sink -							172
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							15.2
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							188
Aggressive deployment - Total (1000							.50
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		110	0.076	0.076	0.071	0.046	0.003
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		75.2	41.6	24.9	20.8	12.3	3.35
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		450	467	465	427	347	243
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		33	34.2	33.8	30.9	24.9	17.3
Stations (deaths)							
Premature deaths from air pollution -		116	111	102	86.9	66.2	44.3
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		46.7	45.8	44.8	39.9	30.3	19.5
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		8.28	8.48	8.58	8.06	6.68	5.01
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution -		2.42	2.37	2.31	2.24	2.16	2.06
Fuel Comb - Comm/Institutional - Coal							
(deaths)							
Premature deaths from air pollution -		99.3	102	102	95.6	83.4	67.2
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		17.5	16.6	15.9	14.1	12.2	10.1
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.97	3.66	3.33	2.99	2.64	2.29
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.26	0.715	0.731	0.742	0.768	0.773
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		71	62.8	51.6	42.9	36.8	27.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		976	0.678	0.674	0.627	0.411	0.029
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		666	369	221	185	109	29.7
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,005	4,154	4,132	3,799	3,086	2,158
Monetary damages from air pollution - Gas Stations (million \$2019)		292	303	299	273	220	153
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,025	982	906	770	587	392
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		414	406	397	353	268	173
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		73.4	75.2	76	71.4	59.2	44.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		21.5	21	20.5	19.8	19.1	18.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		879	899	899	847	738	595
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		155	147	141	125	108	89.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		35.1	32.4	29.5	26.4	23.4	20.3
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		11.1	6.31	6.45	6.54	6.77	6.82
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		631	558	458	381	327	241

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		91.1	195	83.3	62.5	52.6	502
By economic sector - Construction (jobs)		10,942	10,459	10,726	10,699	20,803	22,200
By economic sector - Manufacturing		6,809	11,958	8,431	6,350	11,559	12,746
(jobs)							
By economic sector - Mining (jobs)		3,122	2,275	1,668	1,235	819	461
By economic sector - Other (jobs)		1,370	1,432	1,640	1,844	2,720	4,196
By economic sector - Pipeline (jobs)		745	670	559	441	346	246
By economic sector - Professional (jobs)		4,406	4,246	4,363	4,587	8,438	10,294

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

Table 66. E By deciratio 1141/1676 6666 (conti						
	020 2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)	3,737	3,432	3,444	3,519	5,606	6,869
By economic sector - Utilities (jobs)	8,876	8,525	8,948	9,185	25,563	22,147
By resource sector - Biomass (jobs)	362	525	282	262	244	2,366
By resource sector - CO2 (jobs)	0	412	367	0	0	0
By resource sector - Coal (jobs)	209	70	0	0	0	0
By resource sector - Grid (jobs)	9,149	9,755	11,554	12,053	47,663	40,648
By resource sector - Natural Gas (jobs)	7,373	5,432	4,422	4,583	3,642	3,098
By resource sector - Nuclear (jobs)	1,833	1,803	1,775	1,747	1,720	1,693
By resource sector - Oil (jobs)	7,170	6,013	5,040	4,237	3,167	1,945
By resource sector - Solar (jobs)	13,931	18,438	15,992	14,247	15,719	26,930
By resource sector - Wind (jobs)	72	744	430	795	3,752	2,978
By education level - All sectors - High	17,043	18,577	17,091	16,173	32,587	34,204
school diploma or less (jobs)	1.75	,	,	,	,	,=
By education level - All sectors -	12,545	13,566	12,611	12,064	24,668	25,684
Associates degree or some college (jobs)	12,010	10,000	12,011	12,00	2 1,000	20,00
By education level - All sectors -	8,286	8,783	8,023	7,605	14,657	15,465
Bachelors degree (jobs)	0,200	0,.00	0,020	1,000	1 1,001	10, 100
By education level - All sectors - Masters	1,953	2,000	1,880	1,825	3,551	3,791
or professional degree (jobs)	1,700	2,000	1,000	1,020	0,001	0,171
By education level - All sectors - Doctoral	272	266	256	255	443	514
degree (jobs)	212	200	230	200	440	314
Related work experience - All sectors -	5,774	6,192	5,758	5,509	11,128	11,675
None (jobs)	5,114	0,172	3,136	3,309	11,120	11,013
Related work experience - All sectors - Up	8,039	8,854	8,108	7,667	15,149	16,264
to 1 year (jobs)	0,039	0,004	0,100	1,001	13,149	10,204
Related work experience - All sectors - 1	14,438	15,440	14,277	13,606	27,238	28,469
to 4 years (jobs)	14,430	15,440	14,211	13,606	21,230	20,409
Related work experience - All sectors - 4	9,340	9,947	9,220	8,796	17,687	18,377
to 10 years (jobs)	7,340	7,741	9,220	0,170	11,001	10,311
Related work experience - All sectors -	2,508	2,760	2,500	2,345	4,704	4,875
Over 10 years (jobs)	2,506	2,160	2,500	2,345	4,704	4,013
On-the-Job Training - All sectors - None	2,218	2,353	2,178	2,079	3,940	4,269
_	2,218	2,353	2,178	2,079	3,940	4,269
(jobs) On-the-Job Training - All sectors - Up to 1	07 /11	00.01/	07.000	0/ 007	/0//5	FO 010
	26,411	28,814	26,322	24,887	49,465	52,212
year (jobs)	0.400	0.050	0.077	0.000	17 770	1/ 070
On-the-Job Training - All sectors - 1 to 4	8,428	8,952	8,377	8,029	16,478	16,973
years (jobs)	0.400	0 (11	0.575	0.540	F 001	
On-the-Job Training - All sectors - 4 to 10	2,632	2,611	2,575	2,548	5,321	5,450
years (jobs)	/10		/44		700	
On-the-Job Training - All sectors - Over 10	410	461	411	380	702	756
years (jobs)	(500	70/0	((0 0	(454	44.07.5	10.700
On-Site or In-Plant Training - All sectors -	6,520	7,068	6,480	6,151	11,965	12,799
None (jobs)						
On-Site or In-Plant Training - All sectors -	23,986	26,078	23,891	22,620	45,143	47,503
Up to 1 year (jobs)						
On-Site or In-Plant Training - All sectors -	6,554	6,995	6,524	6,239	12,765	13,184
1 to 4 years (jobs)						
On-Site or In-Plant Training - All sectors -	2,705	2,695	2,630	2,586	5,338	5,463
4 to 10 years (jobs)						
On-Site or In-Plant Training - All sectors -	334	355	337	326	694	710
Over 10 years (jobs)						
Wage income - All (million \$2019)	2,549	2,704	2,559	2,486	5,110	5,348

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	684	645	598	556	522	481	433
Final energy use - Residential (PJ)	376	353	337	317	287	250	214
Final energy use - Commercial (PJ)	306	301	299	297	292	284	276
Final energy use - Industry (PJ)	130	131	133	135	136	137	139

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

•••	•	•	•				
Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.76	2.76	4.34	4.53	9.51	10.3
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)	73	217	361	1,027	1,693	3,168	4,643
Vehicle stocks - LDV – All others (1000 units)	6,069	6,069	6,069	5,757	5,445	4,196	2,947
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	192	391	1,332	4,152	6,062
Public EV charging plugs - DC Fast (1000 units)	0.341		0.582		2.73		7.49
Public EV charging plugs - L2 (1000 units)	0.794		14		65.6		180

Table 54: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.07	9.27	14.9	31.5	59.1	80.8	90.2
Heat Pump (%)							
Sales of space heating units - Electric	6.87	10.2	9.71	8.26	5.82	3.82	3.01
Resistance (%)							
Sales of space heating units - Gas (%)	79.3	63.6	59.6	47.8	27.8	11.6	4.3
Sales of space heating units - Fossil (%)	9.77	16.9	15.8	12.4	7.29	3.83	2.52
Sales of water heating units - Electric	0	1.31	5.02	15.9	33.8	47.5	53.3
Heat Pump (%)							
Sales of water heating units - Electric	17.8	32.8	33.2	34.8	38	41.5	43.4
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	63.7	59.7	47.8	27.4	10.7	3.19
(%)							
Sales of water heating units - Other (%)	3.14	2.18	2.01	1.52	0.769	0.279	0.109
Sales of cooking units - Electric	33.3	35.1	41.2	57.3	79.6	93.4	98.2
Resistance (%)							
Sales of cooking units - Gas (%)	66.7	64.9	58.8	42.7	20.4	6.57	1.77
Residential HVAC investment in 2020s vs.		7.14	8.46				
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	0.831	10.8	15	27.7	49.8	69	77.8
Heat Pump (%)							
Sales of space heating units - Electric	2.64	3.4	4.18	6.57	10.9	14.6	16.6
Resistance (%)							
Sales of space heating units - Gas (%)	88.4	72.3	67.9	55.8	34.4	14.9	5.15
Sales of space heating units - Fossil (%)	8.14	13.5	12.9	9.99	5	1.6	0.431
Sales of water heating units - Electric	0.247	1.77	5.84	17.8	37.6	53.1	59.7
Heat Pump (%)							
Sales of water heating units - Electric	1.46	2.65	4.65	10.7	21.4	30.9	35.4
Resistance (%)							
Sales of water heating units - Gas (%)	97.6	94.3	88.2	70.5	40.4	15.7	4.7
Sales of water heating units - Other (%)	0.649	1.31	1.29	1.01	0.586	0.311	0.212
Sales of cooking units - Electric	18.5	21.6	27.5	43	64.5	77.7	82.3
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	78.4	72.5	57	35.5	22.3	17.7
Commercial HVAC investment in 2020s -		41,604	45,411				
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)	527	527	0	0	0	0	0
Installed thermal - Natural gas (MW)	9,526	11,427	11,246	11,125	11,402	10,950	8,438
Installed thermal - Nuclear (MW)	3,631	3,631	3,631	3,631	3,631	3,631	3,631
Capital invested - Biomass power plant (billion \$2018)	0	0.008	0.352	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

Table 57: E-B+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	16.3	707	707	707	707	707
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	7
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment -		9.36	392	34.4	5.46	9	4,899
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		14.3	180	183	183	184	593

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	107	142	142	142	142
Spur (km)		0	0	0	0	0	0
All (km)		0	107	142	142	142	142
Cumulative investment - Trunk (million \$2018)		0	230	438	438	460	460
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	0

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

		•	•				
Item	2020	2025	2030	2035	2040	2045	2050
Cumulative investment - All (million \$2018)		0	230	438	438	460	460

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tC02e/y)							
Carbon sink potential - Low - Extend							-372
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-57.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-161
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-181
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-319
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tC02e/y)							
Carbon sink potential - High - Accelerate							-68.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,305
deforestation (1000 tCO2e/y)							,

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

Item Corbon sink notantial High Extend	2020	2025	2030	2035	2040	2045	2050 -969
Carbon sink potential - High - Extend							-969
rotation length (1000 tC02e/y)							(7)
Carbon sink potential - High - Improve							-6.74
plantations (1000 tC02e/y)							170
Carbon sink potential - High - Increase							-172
retention of HWP (1000 tC02e/y)							0/0
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tC02e/y) Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							U
Carbon sink potential - High - Reforest							-308
pasture (1000 tC02e/y)							-308
Carbon sink potential - High - All (not							-3,576
counting overlap) (1000 tCO2e/y)							-3,510
Carbon sink potential - High - Restore							-478
productivity (1000 tC02e/y)							-410
Land impacted for carbon sink potential -							5.6
							5.0
Low - Accelerate regeneration (1000							
hectares) Land impacted for carbon sink potential -							1//
·							166
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							100
Land impacted for carbon sink potential -							189
Low - Extend rotation length (1000							
hectares)							1.07
Land impacted for carbon sink potential -							1.24
Low - Improve plantations (1000							
hectares)							0
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							10 /
Land impacted for carbon sink potential - Low - Increase trees outside forests							13.4
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							1 [1
Land impacted for carbon sink potential -							1.51
Low - Reforest pasture (1000 hectares)							05.0
Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							
hectares)							/70
Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							
(1000 hectares)							0.7
Land impacted for carbon sink potential -							8.4
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							171
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							342
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.87
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 -							19.5
Mid - Increase trees outside forests (1000							
hectares)					1		

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 -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							193
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							747
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							11.2
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							177
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							494
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.48
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 -							25.5
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							511
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-18.8
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-169
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-3.91
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 tCO2e/y)							
Carbon sink potential - Moderate							-191
deployment - Total (1000 tCO2e/y)							

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

Table 63: E-B+ scenario - PILLAR 6: Land 3 Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive	2020	2023	2030	2000	2040	2043	-18.8
deployment - Corn-ethanol to energy							10.0
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-324
deployment - Cropland measures (1000							02-1
tCO2e/y)							
Carbon sink potential - Aggressive							-7.83
deployment - Permanent conservation							1.00
cover (1000 tC02e/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							-351
deployment - Total (1000 tCO2e/y)							001
Land impacted for carbon sink - Moderate							9.08
deployment - Corn-ethanol to energy							7.00
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							85.2
deployment - Cropland measures (1000							00.2
hectares)							
Land impacted for carbon sink - Moderate							7.12
deployment - Permanent conservation							1.12
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							4.53
deployment - Cropland to woody energy							1.00
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							2.71
deployment - Pasture to energy crops							2.11
(1000 hectares)							
Land impacted for carbon sink - Moderate							109
deployment - Total (1000 hectares)							107
Land impacted for carbon sink -							9.08
Aggressive deployment - Corn-ethanol to							7.00
energy grasses (1000 hectares)							
Land impacted for carbon sink -							403
Aggressive deployment - Cropland							400
measures (1000 hectares)							
Land impacted for carbon sink -							14.2
Aggressive deployment - Permanent							17.2
conservation cover (1000 hectares)							
Land impacted for carbon sink -							4.53
Aggressive deployment - Cropland to							4.00
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							2.71
Aggressive deployment - Pasture to							۷.۱۱
energy crops (1000 hectares)							
Land impacted for carbon sink -							434
Aggressive deployment - Total (1000							404
hectares)							
neutal es)							

Table 64: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		286	183	172	167	164	151

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		55.3	56.9	87.5	90.1	92.3	89.1
Premature deaths from air pollution - Mobile - On-Road (deaths)		449	472	494	519	544	570
Premature deaths from air pollution - Gas Stations (deaths)		32.9	34.5	35.9	37.7	39.4	41
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		113	110	107	107	109	110
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		45.1	39.1	29.3	20.2	13.3	9.33
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		8.03	8.18	8.39	8.68	8.95	9.18
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		2.53	2.6	2.65	2.7	2.75	2.78
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		100	105	106	107	114	125
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		17.6	16.5	14.9	12.1	10.4	9.36
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		4.15	4.34	4.53	4.71	4.88	5.05
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.31	1.74	1.52	1.49	1.49	1.45
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		71.6	79	83.8	81.8	84.1	82.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		2,533	1,622	1,521	1,482	1,457	1,337
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		490	504	775	798	818	790
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		3,992	4,196	4,392	4,611	4,833	5,068
Monetary damages from air pollution - Gas Stations (million \$2019)		291	305	318	334	349	363
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,004	971	949	949	962	971
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		400	347	260	179	118	82.7
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		71.2	72.5	74.3	76.9	79.3	81.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		22.4	23	23.5	23.9	24.3	24.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		888	930	939	949	1,005	1,106
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		156	146	132	107	92	82.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other		36.7	38.4	40.1	41.7	43.2	44.7
(million \$2019)							
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		20.4	15.4	13.4	13.1	13.1	12.8
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		636	701	744	727	747	736

Table 65: REF scenario - IMPACTS - Jobs

Table 65: REF scenario - IMPACTS - Jobs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		86.4	77.4	76.5	62.3	62.2	67.4
By economic sector - Construction (jobs)		5,475	9,568	12,233	13,271	13,493	22,828
By economic sector - Manufacturing (jobs)		2,494	2,853	3,378	3,790	3,620	7,120
By economic sector - Mining (jobs)		3,183	2,595	2,127	1,735	1,477	1,240
By economic sector - Other (jobs)		214	1,164	1,573	1,877	2,087	4,052
By economic sector - Pipeline (jobs)		768	797	806	763	773	770
By economic sector - Professional (jobs)		2,581	3,826	4,907	5,437	5,548	9,509
By economic sector - Trade (jobs)		2,525	3,240	3,769	4,089	4,228	7,01
By economic sector - Utilities (jobs)		8,499	8,541	12,164	13,494	13,320	21,98
By resource sector - Biomass (jobs)		333	312	290	259	265	26
By resource sector - CO2 (jobs)		0	0	0	0	0	(
By resource sector - Coal (jobs)		209	197	187	178	170	65.
By resource sector - Grid (jobs)		8,502	8,810	15,588	17,554	17,536	36,464
By resource sector - Natural Gas (jobs)		7,589	7,258	8,036	8,607	8,612	8,410
By resource sector - Nuclear (jobs)		1,833	1,803	1,775	1,747	1,492	1,14
By resource sector - Oil (jobs)		7,259	6,222	5,494	5,103	4,877	4,72
By resource sector - Solar (jobs)			7,801	9,420	10,843	11,616	21,51
By resource sector - Wind (jobs)		100	257	244	227	40	1,99
By education level - All sectors - High		10,645	13,801	17,395	18,869	18,940	31,87
school diploma or less (jobs)		, , ,	,	,	-,	-, -	- ,-
By education level - All sectors -		7,973	10,243	13,092	14,300	14,371	24,23
Associates degree or some college (jobs)		, -	, -	-,-	,	, -	, -
By education level - All sectors -		5,671	6,750	8,249	8,870	8,823	14,42
Bachelors degree (jobs)					,	,	•
By education level - All sectors - Masters		1,359	1,636	2,019	2,178	2,173	3,56
or professional degree (jobs)							
By education level - All sectors - Doctoral		178	232	279	300	300	48
degree (jobs)							
Related work experience - All sectors -		3,736	4,747	6,009	6,539	6,574	11,01
None (jobs)							
Related work experience - All sectors - Up		4,848	6,415	8,051	8,740	8,771	14,86
to 1 year (jobs)							
Related work experience - All sectors - 1		9,483	11,828	14,827	16,071	16,097	26,81
to 4 years (jobs)							
Related work experience - All sectors - 4		6,127	7,667	9,642	10,458	10,466	17,39
to 10 years (jobs)							
Related work experience - All sectors -		1,632	2,004	2,504	2,709	2,700	4,49
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		1,399	1,803	2,215	2,392	2,397	3,98
(jobs)							
On-the-Job Training - All sectors - Up to 1		17,017	21,276	26,581	28,802	28,828	48,23
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		5,458	6,970	8,879	9,663	9,693	16,22
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,717	2,295	2,970	3,242	3,272	5,458
years (jobs)							

				_
Tabla 45.	RFF scenario -	IMDMCTC	Inhel	(nontinued)
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Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		234	317	388	418	417	692
On-Site or In-Plant Training - All sectors - None (jobs)		4,091	5,251	6,542	7,093	7,103	11,864
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		15,496	19,387	24,258	26,289	26,319	44,041
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,229	5,398	6,861	7,463	7,487	12,546
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,793	2,346	3,006	3,272	3,294	5,456
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		216	280	365	401	404	683
Wage income - All (million \$2019)		1,719	2,150	2,736	2,999	3,040	5,100

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	684	651	614	593	597	615	636
Final energy use - Residential (PJ)	376	350	336	325	318	315	313
Final energy use - Commercial (PJ)	306	305	307	309	314	329	352
Final energy use - Industry (PJ)	130	134	140	145	151	158	164

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.77	2.78	8.27	8.93	8.04	8.51
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	2.27	23.8	24.8	26.1	26.8	27.3	28.1
Heat Pump (%)							
Sales of space heating units - Electric	7.12	8.97	8.81	8.6	8.48	7.9	7.12
Resistance (%)							
Sales of space heating units - Gas (%)	80.7	53.6	59.1	61.5	61.2	61.2	61.3
Sales of space heating units - Fossil (%)	9.93	13.6	7.36	3.84	3.54	3.54	3.56
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	17.8	32.6	32.5	32.5	32.5	32.5	32.4
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	65.2	65.2	65.3	65.3	65.3	65.3
(%)							
Sales of water heating units - Other (%)	3.14	2.24	2.24	2.24	2.24	2.24	2.24
Sales of cooking units - Electric	32.8	32.8	32.8	32.8	32.8	32.8	32.8
Resistance (%)							
Sales of cooking units - Gas (%)	67.2	67.2	67.2	67.2	67.2	67.2	67.2
Residential HVAC investment in 2020s vs.		6.64	7				
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	0.831	15.4	41.5	62.9	66.3	66.6	66.5
Heat Pump (%)							
Sales of space heating units - Electric	2.64	4.05	8.88	20.9	30.7	32.3	32.6
Resistance (%)							
Sales of space heating units - Gas (%)	88.4	67.4	39.3	11.6	2.31	0.996	0.899
Sales of space heating units - Fossil (%)	8.14	13.2	10.3	4.62	0.695	0.058	0

Table 40: DEF acanania	- PTLLAR 1: Efficiency/Electrification	Commonaid (continued)
Table 69: KFF scendrin	- PII I AR I' FMICIENCY/FIECTRITICATION	- Commercial Icontiniieai

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric	0.247	0.326	0.328	0.328	0.329	0.331	0.332
Heat Pump (%)							
Sales of water heating units - Electric	1.46	1.94	1.92	1.93	1.93	1.93	1.93
Resistance (%)							
Sales of water heating units - Gas (%)	97.6	96.4	96.3	96.3	96.3	96.3	96.3
Sales of water heating units - Other (%)	0.649	1.34	1.42	1.41	1.43	1.46	1.47
Sales of cooking units - Electric	18.5	19.4	19.4	19.6	19.7	19.8	19.9
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	80.6	80.6	80.4	80.3	80.2	80.1
Commercial HVAC investment in 2020s -		41,117	42,334				
Cumulative 5-yr (million \$2018)							

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

2020	2025	2030	2035	2040	2045	2050
527	527	527	527	527	527	0
9,526	11,427	11,246	15,095	18,802	21,751	20,939
3,631	3,631	3,631	3,631	3,631	2,461	2,461
1,929	2,892	3,843	5,079	6,573	8,274	10,225
770	770	770	770	770	770	770
9	9	9	9	9	9	9
0	83.2	159	261	345	425	14,757
1.37	1.37	1.37	1.37	1.37	1.37	1.37
	527 9,526 3,631 1,929 770 9	527 527 9,526 11,427 3,631 3,631 1,929 2,892 770 770 9 9 0 83.2	527 527 527 9,526 11,427 11,246 3,631 3,631 3,631 1,929 2,892 3,843 770 770 770 9 9 9 0 83.2 159	527 527 527 527 9,526 11,427 11,246 15,095 3,631 3,631 3,631 3,631 1,929 2,892 3,843 5,079 770 770 770 770 9 9 9 9 0 83.2 159 261	527 527 527 527 527 9,526 11,427 11,246 15,095 18,802 3,631 3,631 3,631 3,631 3,631 1,929 2,892 3,843 5,079 6,573 770 770 770 770 770 9 9 9 9 9 0 83.2 159 261 345	527 527 527 527 527 9,526 11,427 11,246 15,095 18,802 21,751 3,631 3,631 3,631 3,631 3,631 2,461 1,929 2,892 3,843 5,079 6,573 8,274 770 770 770 770 770 770 9 9 9 9 9 0 83.2 159 261 345 425

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,439	1,439	1,439	1,439	1,439	1,439	1,439
Wind - Base land use assumptions (GWh)	30.5	30.5	30.5	30.5	30.5	30.5	30.5
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
		2020		2000	2040	2040	
Business-as-usual carbon sink - Natural	0.55		-1.73				-1.55
uptake (Mt CO2e/y)							
Business-as-usual carbon sink - Retained	-0.047		-0.084				-0.088
in Hardwood Products (Mt CO2e/y)							
Business-as-usual carbon sink - Total (Mt	0.503		-1.82				-1.64
CO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-372
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-57.4
retention of HWP (1000 tCO2e/y)							

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

Iable 73: REF scenario - PILLAR 6: Land sir Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase	2020	2023	2000	2000	2040	2043	-94.1
trees outside forests (1000 tCO2e/y)							,
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							· ·
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tC02e/y)							20.0
Carbon sink potential - Low - Restore						+	-161
productivity (1000 tCO2e/y)							-101
Carbon sink potential - Low - All (not							-963
							-903
counting overlap) (1000 tCO2e/y)							F4 /
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tCO2e/y)							110
Carbon sink potential - Mid - Increase							-181
trees outside forests (1000 tCO2e/y)							-101
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-319
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tCO2e/y)							•
Carbon sink potential - High - Accelerate							-68.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,305
deforestation (1000 tC02e/y)							1,000
							-969
Carbon sink potential - High - Extend							-969
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6.74
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-172
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							_
Carbon sink potential - High - Reforest							-308
pasture (1000 tC02e/y)							500
Carbon sink potential - High - All (not							-3,576
,							-3,310
counting overlap) (1000 tC02e/y)							/70
Carbon sink potential - High - Restore							-478
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							5.6
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -						-	189
Low - Extend rotation length (1000							107
hectares)							

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

Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050 1.24
Low - Improve plantations (1000							1.24
hectares)							
Land impacted for carbon sink potential -							(
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							13.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							(
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.5
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							710
(1000 hectares)							
Land impacted for carbon sink potential -							8.4
							0.4
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							17
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							34:
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.8
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							(
Mid - Increase retention of HWP (1000							`
hectares)							
Land impacted for carbon sink potential -							19.
Mid - Increase trees outside forests (1000							17.
,							
hectares)							
Land impacted for carbon sink potential -							(
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							19
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							74
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							11.:
High - Accelerate regeneration (1000							11
,							
hectares)							17
Land impacted for carbon sink potential -							17
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							49
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.4
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							-
High - Increase retention of HWP (1000							,
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							25.5
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							
(1000 hectares)							