

Net-Zero America - Delaware data

October 29, 2021 (updated November 17, 2023)

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

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Table 1: E+ scenario - IMPACTS - Health

Table 1: E+ scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		14.6	0.01	0.01	0.009	0.006	0.001
Fuel Comb - Electric Generation - Coal							
(deaths) Premature deaths from air pollution -		5.93	4.36	2.9	2.63	1.77	0.736
Fuel Comb - Electric Generation - Natural		3.93	4.30	2.9	2.03	1.77	0.130
Gas (deaths)							
Premature deaths from air pollution -		26.1	24.5	18.7	10.8	4.91	1.87
Mobile - On-Road (deaths)		20	2		10.0	,	
Premature deaths from air pollution - Gas		1.65	1.51	1.14	0.665	0.312	0.134
Stations (deaths)							
Premature deaths from air pollution -		4.31	3.59	2.44	1.36	0.65	0.262
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		2.71	2.2	1.49	0.85	0.366	0.109
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		0.821	0.736	0.567	0.383	0.22	0.121
Fuel Comb - Residential - Other (deaths)		0.000	0.01	0.007	0.000	0.070	0.050
Premature deaths from air pollution -		0.322	0.31	0.297	0.283	0.269	0.253
Fuel Comb - Comm/Institutional - Coal (deaths)							
Premature deaths from air pollution -		4.34	3.82	2.84	1.81	1.09	0.634
Fuel Comb - Comm/Institutional - Natural		4.54	3.02	2.04	1.01	1.07	0.004
Gas (deaths)							
Premature deaths from air pollution -		1.33	1.07	0.766	0.495	0.328	0.223
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		0.304	0.258	0.212	0.167	0.123	0.082
Fuel Comb - Comm/Institutional - Other							
(deaths)							
Premature deaths from air pollution -		0.179	0.101	0.101	0.1	0.102	0.102
Industrial Processes - Coal Mining							
(deaths)		0.00	0.1/	7.1		0.00	0.05
Premature deaths from air pollution - Industrial Processes - Oil & Gas		8.88	8.14	7.1	5.54	3.93	2.35
Production (deaths)							
Monetary damages from air pollution -		129	0.09	0.089	0.082	0.057	0.005
Fuel Comb - Electric Generation - Coal		129	0.07	0.007	0.002	0.031	0.003
(million \$2019)							
Monetary damages from air pollution -		52.5	38.6	25.7	23.3	15.7	6.52
Fuel Comb - Electric Generation - Natural		52.5					0.02
Gas (million \$2019)							
Monetary damages from air pollution -		232	218	166	96.2	43.7	16.6
Mobile - On-Road (million \$2019)							
Monetary damages from air pollution -		14.6	13.4	10.1	5.89	2.76	1.18
Gas Stations (million \$2019)							
Monetary damages from air pollution -		38.2	31.8	21.6	12.1	5.76	2.33
Fuel Comb - Residential - Natural Gas							
(million \$2019)		0/	10.5	10.0	7.50	0.07	0.07
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million		24	19.5	13.2	7.53	3.24	0.967
\$2019)							
Monetary damages from air pollution -		7.27	6.52	5.03	3.39	1.95	1.07
Fuel Comb - Residential - Other (million		1.21	0.32	3.03	3.37	1.75	1.01
\$2019)							
Monetary damages from air pollution -		2.85	2.74	2.63	2.5	2.38	2.24
Fuel Comb - Comm/Institutional - Coal					-		
(million \$2019)							
Monetary damages from air pollution -		38.4	33.9	25.1	16	9.67	5.61
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		11.8	9.47	6.78	4.38	2.9	1.97
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		2.69	2.28	1.88	1.48	1.09	0.722
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		1.58	0.89	0.891	0.886	0.904	0.902
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		78.9	72.3	63	49.2	34.9	20.9
Industrial Processes - Oil & Gas							
Production (million \$2019)							

Table 2: E+ scenario - IMPACTS - Jobs

Table 2: E+ Scenario - IMPACTS - Jobs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3.8	7.71	2.95	2.29	1.68	1.25
By economic sector - Construction (jobs)		1,157	1,093	1,405	1,414	2,997	4,672
By economic sector - Manufacturing (jobs)		880	1,577	1,618	1,384	1,975	2,205
By economic sector - Mining (jobs)		287	197	119	64.2	27.8	8.9
By economic sector - Other (jobs)		116	123	180	173	288	464
By economic sector - Pipeline (jobs)		81.8	67.9	52	36.7	21.4	39.3
By economic sector - Professional (jobs)		475	427	554	576	1,150	1,701
By economic sector - Trade (jobs)		359	317	374	366	684	1,042
By economic sector - Utilities (jobs)		1,295	1,149	1,543	1,835	4,358	6,673
By resource sector - Biomass (jobs)		16.3	21.3	8.39	6.88	6.13	5.33
By resource sector - CO2 (jobs)		0	0	0	0	0	224
By resource sector - Coal (jobs)		60.3	0	0	0	0	0
By resource sector - Grid (jobs)		1,533	1,562	2,384	2,802	8,501	13,175
By resource sector - Natural Gas (jobs)		1,224	934	898	1,048	701	713
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		583	435	275	147	58.8	0
By resource sector - Solar (jobs)		1,228	1,906	2,203	1,624	1,610	2,187
By resource sector - Wind (jobs)		9.84	100	81.4	224	626	504
By education level - All sectors - High school diploma or less (jobs)		1,968	2,134	2,517	2,502	4,955	7,261
By education level - All sectors - Associates degree or some college (jobs)		1,501	1,598	1,905	1,925	3,794	5,558
By education level - All sectors - Bachelors degree (jobs)		938	982	1,136	1,129	2,174	3,140
By education level - All sectors - Masters or professional degree (jobs)		220	219	260	263	521	763
By education level - All sectors - Doctoral degree (jobs)		28	26.3	31.4	31.3	59.3	86.6
Related work experience - All sectors - None (jobs)		679	716	850	856	1,694	2,488
Related work experience - All sectors - Up to 1 year (jobs)		911	1,004	1,182	1,164	2,276	3,316
Related work experience - All sectors - 1 to 4 years (jobs)		1,676	1,769	2,086	2,092	4,123	6,030
Related work experience - All sectors - 4 to 10 years (jobs)		1,096	1,149	1,359	1,368	2,692	3,937
Related work experience - All sectors - Over 10 years (jobs)		293	320	373	370	719	1,038
On-the-Job Training - All sectors - None (jobs)		244	258	303	298	575	839
On-the-Job Training - All sectors - Up to 1 year (jobs)		3,045	3,298	3,858	3,831	7,478	10,858

Table 2: E+ scenario	TMDACTO	loho	Coontinued	1
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Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,003	1,047	1,252	1,271	2,532	3,731
On-the-Job Training - All sectors - 4 to 10 years (jobs)		316	303	377	394	815	1,233
On-the-Job Training - All sectors - Over 10 years (jobs)		45.8	52.2	59.8	57.3	104	148
On-Site or In-Plant Training - All sectors - None (jobs)		745	801	940	931	1,790	2,597
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,770	2,987	3,503	3,486	6,833	9,943
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		776	816	972	983	1,958	2,881
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		322	311	382	397	815	1,227
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		41.5	42.9	52.1	53.7	109	161
Wage income - All (million \$2019)		273	287	342	350	705	1,048

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		13.1	10.7	7.3	4.21	1.8	0
Oil consumption - Cumulative (million							229
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		73.9	62.3	50	37.6	23.7	16.4
Natural gas consumption - Cumulative							1,505
(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)	81.4	75.7	67	56.1	46.1	40	37.3
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.526	0.536	0.919	0.973	0.907	0.947
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)	5.71	88	170	459	747	977	1,207
Vehicle stocks - LDV – All others (1000 units)	1,007	959	910	663	417	236	54.8
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065		0.324		1.42		2.3
Public EV charging plugs - L2 (1000 units)	0.118		7.8		34.2		55.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	14.3	32.1	79.9	90.6	91	91	91
Heat Pump (%)							
Sales of space heating units - Electric	9.9	10.8	4.53	3.11	3.02	3.06	3.07
Resistance (%)							
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49
Sales of water heating units - Electric	0	9.43	49.9	59	59.4	59.4	59.4
Heat Pump (%)							
Sales of water heating units - Electric	30.2	45.9	40.3	39	38.9	38.9	38.9
Resistance (%)							
Sales of water heating units - Gas Furnace	65.2	41.3	7.81	0.329	0	0	0
(%)							
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7
Sales of cooking units - Electric	50.1	60.7	93.3	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Residential HVAC investment in 2020s vs.		0.774	0.771				_
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	1.53	28.2	70.6	83.7	85	85.1	85.1
Heat Pump (%)							
Sales of space heating units - Electric	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Resistance (%)							
Sales of space heating units - Gas (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of water heating units - Electric	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Heat Pump (%)							
Sales of water heating units - Electric	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Resistance (%)							
Sales of water heating units - Gas (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s -		3,472	3,883				
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)	446	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,625	2,963	2,679	2,967	4,449	4,449	4,007
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	110	165	219	290	375	472	584
Installed renewables - Solar - Base land use assumptions (MW)	39.5	164	309	597	597	597	597
Installed renewables - Wind - Base land use assumptions (MW)	2	2	2	2	2	2	2
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	4,059	8,319
Installed renewables - Solar - Constrained land use assumptions (MW)	38	38	134	317	317	317	317
Installed renewables - Wind - Constrained land use assumptions (MW)	2	2	2	2	2	2	2
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	2,240	8,324

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

2020	2025	2030	2035	2040	2045	2050
	0.167	0.173	0.318	0	0	0
	0	0	0	0	5.99	5.64
	0.144	0.276	0.328	0	0	0
	0	0	0	0	3.3	8.06
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
	0	0.167 0 0.144 0 0 0 0	0.167 0.173 0 0 0.144 0.276 0 0 0 0 0 0 0 0	0.167 0.173 0.318 0 0 0 0.144 0.276 0.328 0 0 0 0 0 0 0 0 0 0 0 0	0.167 0.173 0.318 0 0 0 0 0 0.144 0.276 0.328 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.167 0.173 0.318 0 0 0 0 0 0 5.99 0.144 0.276 0.328 0 0 0 0 0 0 3.3 0 0 0 0 0 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)	75.2	309	579	1,122	1,122	1,122	1,122
Wind - Base land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
OffshoreWind - Base land use	0	0	0	0	0	17,643	37,615
assumptions (GWh)							
Solar - Constrained land use assumptions	0	0	180	522	522	522	522
(GWh)							
Wind - Constrained land use assumptions	8.07	8.07	8.07	8.07	8.07	8.07	8.07
(GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	17,643	37,615
assumptions (GWh)							
Biomass power plant (GWh)	0	0	0	0	0	0	0
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	0	0	0	0	0	0
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	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment -		0	0	0	0	0	0
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	0	0	0	0	0

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
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (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
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	0	0	0	0	0
Spur (km)		0	0	0	0	0	166
All (km)		0	0	0	0	0	166
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	122
Cumulative investment - All (million \$2018)		0	0	0	0	0	122

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 regeneration (1000 tCO2e/y)							-3.48
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)							-69.4
Carbon sink potential - Low - Increase trees outside forests (1000 tC02e/y)							-29.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2.7
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-6.51
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-25.8
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-263
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-5.21
Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y)							-120
Carbon sink potential - Mid - Extend rotation length (1000 tC02e/y)							-139
Carbon sink potential - Mid - Improve plantations (1000 tC02e/y)							-20.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase							-139
retention of HWP (1000 tC02e/y)							F//
Carbon sink potential - Mid - Increase							-56.4
trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest							-4.05
cropland (1000 tC02e/y)							-4.05
Carbon sink potential - Mid - Reforest		-					-46.2
pasture (1000 tC02e/y)							-46.2
Carbon sink potential - Mid - Restore		+					-51.2
productivity (1000 tCO2e/y)							-31.2
							F01
Carbon sink potential - Mid - All (not							-581
counting overlap) (1000 tC02e/y)							-6.94
Carbon sink potential - High - Accelerate							-0.94
regeneration (1000 tC02e/y)							007
Carbon sink potential - High - Avoid							-206
deforestation (1000 tC02e/y)							0.01
Carbon sink potential - High - Extend							-201
rotation length (1000 tC02e/y)							
Carbon sink potential - High - Improve							-27.3
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-208
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-83.5
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-5.4
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-85.9
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-901
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-76.6
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							0.567
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							26.1
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							39.3
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							5.03
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 -							4.17
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -		+					0.179
Low - Reforest cropland (1000 hectares)							0.117
Land impacted for carbon sink potential -							0.423
Low - Reforest pasture (1000 hectares)							0.420
Land impacted for carbon sink potential -							15.4
Low - Restore productivity (1000							15.4
hectares)							
Land impacted for carbon sink potential -							01.0
							91.2
Low - Total impacted (over 30 years)							
(1000 hectares)							

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

Table 15: E+ scenario - PILLAR 6: Land Sir		•					
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							0.851
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							27
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							74
Land impacted for carbon sink potential -							71
Mid - Extend rotation length (1000							
hectares) Land impacted for carbon sink potential -							7.57
·							7.57
Mid - Improve plantations (1000 hectares) Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							6.05
Mid - Increase trees outside forests (1000							0.03
hectares)							
Land impacted for carbon sink potential -							0.268
Mid - Reforest cropland (1000 hectares)							0.200
Land impacted for carbon sink potential -							3.06
Mid - Reforest pasture (1000 hectares)							0.00
Land impacted for carbon sink potential -							30.9
Mid - Restore productivity (1000							00.7
hectares)							
Land impacted for carbon sink potential -							147
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							1.13
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							27.8
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							103
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							10.1
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 -							7.93
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0.357
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							2.44
High - Reforest pasture (1000 hectares)							65.
Land impacted for carbon sink potential -							25.4
High - Restore productivity (1000							
hectares)							476
Land impacted for carbon sink potential -							178
High - Total impacted (over 30 years)							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-126
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-3.22
deployment - Permanent conservation							-
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-129
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							•
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-244
deployment - Cropland measures (1000							2-1-1
tCO2e/y)							
Carbon sink potential - Aggressive							-6.43
deployment - Permanent conservation							0.10
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-250
deployment - Total (1000 tC02e/y)							200
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							· ·
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							88.6
deployment - Cropland measures (1000							00.0
hectares)							
Land impacted for carbon sink - Moderate							5.85
deployment - Permanent conservation							0.00
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							94.5
deployment - Total (1000 hectares)							74.0
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							· ·
energy grasses (1000 hectares)							
Land impacted for carbon sink -							171
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -			+				11.7
Aggressive deployment - Permanent							11.1
conservation cover (1000 hectares)							
Land impacted for carbon sink -							183
Aggressive deployment - Total (1000							103
hectares)							
neetal esj							

Table 17: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		14.6	0.01	0.01	0.009	0.006	0.001
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		5.37	3.48	1.51	0.651	0.213	0.146
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		26.6	27	26.4	23.8	19	13.1
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		1.68	1.7	1.65	1.48	1.17	0.806
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)		4.34	4	3.57	2.95	2.2	1.45
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.75	2.65	2.53	2.21	1.64	1.03
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.832	0.84	0.836	0.767	0.616	0.445
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.322	0.31	0.297	0.283	0.269	0.253
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.37	4.32	4.16	3.72	3.04	2.28
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.34	1.18	1.02	0.838	0.684	0.548
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.277	0.249	0.221	0.193	0.166
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.174	0.101	0.102	0.102	0.103	0.1
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.85	7.69	6.2	5.07	4.27	3.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		129	0.09	0.089	0.082	0.057	0.005
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		47.6	30.8	13.4	5.77	1.89	1.29
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		237	240	234	212	169	116
Monetary damages from air pollution - Gas Stations (million \$2019)		14.9	15.1	14.6	13.1	10.4	7.13
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		38.5	35.5	31.6	26.1	19.5	12.9
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		24.4	23.4	22.4	19.6	14.6	9.13
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.37	7.44	7.41	6.8	5.46	3.94
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.85	2.74	2.63	2.5	2.38	2.24
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		38.7	38.2	36.8	32.9	26.9	20.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		11.9	10.4	9.01	7.42	6.06	4.85
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.69	2.45	2.2	1.96	1.71	1.47
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.53	0.892	0.898	0.896	0.905	0.88

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		78.6	68.3	55	45	37.9	27.6
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)		4.63	5.93	2.26	1.46	1.32	1.27
By economic sector - Construction (jobs)		1,100	995	1,095	888	3,182	5,552
By economic sector - Manufacturing (jobs)		904	1,628	1,287	1,135	2,409	2,642
By economic sector - Mining (jobs)		314	205	144	97.6	61.7	28.2
By economic sector - Other (jobs)		113	117	152	133	296	513
By economic sector - Pipeline (jobs)		82.1	66	52.4	42.8	33.8	68.4
By economic sector - Professional (jobs)		455	396	426	351	1,204	1,975
By economic sector - Trade (jobs)		373	307	322	267	735	1,211
By economic sector - Utilities (jobs)		1,166	968	1,005	819	4,502	7,927
By resource sector - Biomass (jobs)		17.6	15.9	7.51	6.12	5.61	5.22
By resource sector - CO2 (jobs)		0	0	0	0	0	384
By resource sector - Coal (jobs)		177	59.1	0	0	0	0
By resource sector - Grid (jobs)		1,378	1,204	1,497	1,191	9,161	15,941
By resource sector - Natural Gas (jobs)		1,061	837	657	557	395	494
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		591	479	389	292	200	83
By resource sector - Solar (jobs)		1,277	1,987	1,863	1,470	1,745	2,219
By resource sector - Wind (jobs)		10.3	105	72.9	218	918	792
By education level - All sectors - High		1,917	2,017	1,936	1,612	5,373	8,624
school diploma or less (jobs)		.				,	
By education level - All sectors -		1,446	1,503	1,445	1,206	4,077	6,578
Associates degree or some college (jobs)		,	,	, -	,	, -	-,-
By education level - All sectors -		911	935	880	731	2,353	3,715
Bachelors degree (jobs)						,	•
By education level - All sectors - Masters		211	206	199	165	559	901
or professional degree (jobs)							
By education level - All sectors - Doctoral		27.1	24.9	24.8	20.4	63.1	101
degree (jobs)							
Related work experience - All sectors -		655	674	649	541	1,823	2,947
None (jobs)							
Related work experience - All sectors - Up		891	954	913	762	2,475	3,932
to 1 year (jobs)							
Related work experience - All sectors - 1		1,626	1,670	1,600	1,330	4,450	7,145
to 4 years (jobs)							
Related work experience - All sectors - 4		1,057	1,083	1,037	862	2,896	4,663
to 10 years (jobs)							
Related work experience - All sectors -		284	305	286	239	781	1,231
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		238	246	236	196	623	992
(jobs)							
On-the-Job Training - All sectors - Up to 1		2,966	3,133	2,972	2,478	8,113	12,873
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		963	981	949	788	2,716	4,420
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		300	277	282	232	860	1,459
years (jobs)							
On-the-Job Training - All sectors - Over 10		44.6	50.4	46.9	39.3	114	175
years (jobs)							
On-Site or In-Plant Training - All sectors -		723	762	725	604	1,936	3,071
None (jobs)							
On-Site or In-Plant Training - All sectors -		2,696	2,833	2,695	2,246	7,407	11,791
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 -		747	766	739	615	2,104	3,414
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		306	286	288	237	862	1,452
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		39.5	39.9	39	32.4	116	191
Over 10 years (jobs)							
Wage income - All (million \$2019)		263	270	262	220	759	1,242

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.5	76.4	70.2	64.9	60.8	55.9	50.1
Final energy use - Residential (PJ)	41.7	39.5	38.4	37	34.6	31.5	28.6
Final energy use - Commercial (PJ)	29.9	29.9	29.5	28.9	28	27	26.5
Final energy use - Industry (PJ)	16	16.3	16.7	17.1	17.5	17.9	18.4

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)		0.457	0.458	0.597	0.614	0.89	0.939

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	4.42	28.6	52.8	165	277	525	773
Vehicle stocks - LDV – All others (1000	1,011	1,011	1,011	959	907	699	491
units)							
Light-duty vehicle capital costs vs. REF -		0	31.3	65.7	222	699	1,018
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.065		0.1		0.527		1.47
units)							
Public EV charging plugs - L2 (1000 units)	0.118		2.42		12.7		35.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	14.3	22.9	28.3	44	68	83.7	89.1
Heat Pump (%)							
Sales of space heating units - Electric	9.9	12	11.2	9.09	5.93	3.95	3.26
Resistance (%)							
Sales of space heating units - Gas (%)	55.3	35.2	32.6	25.4	14.2	6.89	4.33
Sales of space heating units - Fossil (%)	20.5	29.9	27.8	21.5	11.8	5.49	3.29
Sales of water heating units - Electric	0	1.62	6.23	19.5	39.9	53.2	57.8
Heat Pump (%)							
Sales of water heating units - Electric	30.2	47	46.3	44.4	41.6	39.8	39.1
Resistance (%)							
Sales of water heating units - Gas Furnace	65.2	47.8	44	33.1	16.2	5.18	1.35
(%)							
Sales of water heating units - Other (%)	4.6	3.59	3.44	3	2.33	1.9	1.75
Sales of cooking units - Electric	49.9	51.2	55.8	67.9	84.7	95.1	98.7
Resistance (%)							
Sales of cooking units - Gas (%)	50.1	48.8	44.2	32.1	15.3	4.94	1.33
Residential HVAC investment in 2020s vs.		0.769	0.798				
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	1.53	20.1	24.9	38.9	61.1	76.8	82.8
Heat Pump (%)							
Sales of space heating units - Electric	1.94	8.06	8.33	9.15	10.6	12	12.8
Resistance (%)							
Sales of space heating units - Gas (%)	84.3	66.9	62.2	48.4	26.6	10.7	4.3
Sales of space heating units - Fossil (%)	12.2	4.9	4.55	3.47	1.71	0.536	0.14
Sales of water heating units - Electric	0.078	2.03	7.05	21.5	43.6	58.1	63.1
Heat Pump (%)							
Sales of water heating units - Electric	1.96	7.38	9.33	15.1	24	29.7	31.7
Resistance (%)							
Sales of water heating units - Gas (%)	93.3	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	4.67	4.49	4.43	3.93	3.32	2.91	2.76
Sales of cooking units - Electric	32	36.2	40.9	53.4	71	81.7	85.5
Resistance (%)							
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s -		3,468	3,852				
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)	446	446	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,629	2,286	1,958	1,670	1,330	1,330	2,061
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-3.48
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-34.3
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-77.3
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-13.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-69.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-29.2
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2.7
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-6.51
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-25.8
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-263
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-5.21
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-120
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-139
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-20.4
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-139
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-56.4
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 -4.05
cropland (1000 tCO2e/y)							-4.05
Carbon sink potential - Mid - Reforest							-46.2
pasture (1000 tCO2e/y)							-40.2
Carbon sink potential - Mid - Restore							-51.2
productivity (1000 tCO2e/y)							-01.2
Carbon sink potential - Mid - All (not							-58
counting overlap) (1000 tCO2e/y)							-36
Carbon sink potential - High - Accelerate							-6.94
regeneration (1000 tC02e/y)							-0.7-
Carbon sink potential - High - Avoid							-206
deforestation (1000 tC02e/y)							-200
Carbon sink potential - High - Extend							-20
rotation length (1000 tC02e/y)							20
Carbon sink potential - High - Improve							-27.3
plantations (1000 tC02e/y)							21.0
Carbon sink potential - High - Increase							-208
retention of HWP (1000 tCO2e/y)							200
Carbon sink potential - High - Increase							-83.5
trees outside forests (1000 tCO2e/y)							00.0
Carbon sink potential - High - Reforest							-5.4
cropland (1000 tCO2e/y)							o.
Carbon sink potential - High - Reforest							-85.9
pasture (1000 tC02e/y)							00.7
Carbon sink potential - High - All (not							-90
counting overlap) (1000 tC02e/y)							, ,
Carbon sink potential - High - Restore							-76.6
productivity (1000 tC02e/y)							10.0
Land impacted for carbon sink potential -							0.567
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							26.
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							39.3
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							5.03
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							C
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							4.17
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0.179
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							0.423
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							15.4
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							91.2
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							0.85
	1		1				
Mid - Accelerate regeneration (1000							

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

Table 25: E- Scenario - PILLAR 6: Lana Sink	KS - FORESTS	s (continued	IJ				
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							27
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							71
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							7.57
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 -							6.05
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0.268
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							3.06
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							30.9
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							147
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							1.13
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							27.8
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							103
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							10.1
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 -							7.93
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0.357
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							2.44
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							25.4
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							178
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							-126
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-3.22
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-129
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-244
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-6.43
deployment - Permanent conservation							00
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-250
deployment - Total (1000 tC02e/y)							200
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							U
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							88.6
deployment - Cropland measures (1000							00.0
hectares)							
Land impacted for carbon sink - Moderate							5.85
deployment - Permanent conservation							5.65
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							94.5
·							94.5
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							474
Land impacted for carbon sink -							171
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							11.7
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -		T	T	T			183
Aggressive deployment - Total (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		14.6	0.01	0.01	0.009	0.006	0.001
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		4.93	3.65	2.23	1.52	0.539	0.107
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		26.1	24.5	18.7	10.8	4.91	1.87
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		1.65	1.51	1.14	0.665	0.312	0.134
Stations (deaths)							
Premature deaths from air pollution -		4.31	3.59	2.44	1.36	0.65	0.262
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		2.71	2.2	1.49	0.85	0.366	0.109
Fuel Comb - Residential - Oil (deaths)							

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

Table 27: E+RE+ Scenario - IMPACTS - Heat		•					
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		0.821	0.736	0.567	0.383	0.22	0.121
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal		0.322	0.31	0.297	0.283	0.269	0.253
(deaths)		/ 0/	0.00	0.07	1.01	1.00	0.707
Premature deaths from air pollution -		4.34	3.82	2.84	1.81	1.09	0.634
Fuel Comb - Comm/Institutional - Natural Gas (deaths)							
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.33	1.07	0.766	0.495	0.328	0.223
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.258	0.212	0.167	0.123	0.082
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.191	0.101	0.101	0.1	0.102	0.097
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.67	7.96	6.47	4.6	2.59	0.24
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal		129	0.09	0.089	0.082	0.057	0.005
(million \$2019)							
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		43.7	32.3	19.8	13.5	4.78	0.946
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		232	218	166	96.2	43.7	16.6
Monetary damages from air pollution - Gas Stations (million \$2019)		14.6	13.4	10.1	5.89	2.76	1.18
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		38.2	31.8	21.6	12.1	5.76	2.33
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		24	19.5	13.2	7.53	3.24	0.967
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.27	6.52	5.03	3.39	1.95	1.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.85	2.74	2.63	2.5	2.38	2.24
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		38.4	33.9	25.1	16	9.67	5.61
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		11.8	9.47	6.78	4.38	2.9	1.97
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.69	2.28	1.88	1.48	1.09	0.722
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.69	0.89	0.89	0.884	0.903	0.853
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		77	70.7	57.5	40.9	23	2.13

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

Table 28: E+RE+ scenario - IMPACTS - Job							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		3.82	7.93	2.93	1.87	1.51	1.1
By economic sector - Construction (jobs)		990	1,054	1,012	2,075	5,408	3,860
By economic sector - Manufacturing (jobs)		1,135	1,616	2,514	2,180	2,924	3,615
By economic sector - Mining (jobs)		307	191	105	45.4	9.67	5.25
By economic sector - Other (jobs)		90	125	120	207	432	791
By economic sector - Pipeline (jobs)		79.5	64.8	43.2	25.3	11.5	7.42
By economic sector - Professional (jobs)		421	426	402	831	1,999	1,651
By economic sector - Trade (jobs)		348	312	276	492	1,145	1,150
By economic sector - Utilities (jobs)		1,169	1,069	1,170	2,970	8,363	3,648
By resource sector - Biomass (jobs)		14.9	22.4	7.89	6.1	5.6	4.86
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		177	59.1	0	0	0	0
By resource sector - Grid (jobs)		1,391	1,352	1,767	5,475	17,219	6,924
By resource sector - Natural Gas (jobs)		1,053	898	726	777	497	668
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		583	427	257	107	0.002	0
By resource sector - Solar (jobs)		1,316	1,972	2,554	1,739	1,420	6,600
By resource sector - Wind (jobs)		9.59	134	333	723	1,151	531
By education level - All sectors - High school diploma or less (jobs)		1,930	2,091	2,449	3,797	8,765	6,350
By education level - All sectors -		1,456	1,566	1,826	2,901	6,702	4,816
Associates degree or some college (jobs) By education level - All sectors -		921	967	1,108	1,691	3,804	2,813
Bachelors degree (jobs)							
By education level - All sectors - Masters or professional degree (jobs)		210	215	236	394	921	663
By education level - All sectors - Doctoral		25.9	26.1	25.9	44.6	102	84.4
degree (jobs) Related work experience - All sectors - None (jobs)		657	701	807	1,289	2,997	2,148
Related work experience - All sectors - Up		898	988	1,168	1,764	3,994	3,029
to 1 year (jobs) Related work experience - All sectors - 1		1,635	1,734	1,999	3,155	7,285	5,238
to 4 years (jobs)		1212	1.10=	100		. ===	
Related work experience - All sectors - 4 to 10 years (jobs)		1,062	1,127	1,295	2,058	4,755	3,392
Related work experience - All sectors - Over 10 years (jobs)		290	315	376	562	1,262	921
On-the-Job Training - All sectors - None (jobs)		238	254	290	444	1,002	779
On-the-Job Training - All sectors - Up to 1 year (jobs)		3,008	3,242	3,812	5,797	13,145	9,693
On-the-Job Training - All sectors - 1 to 4 years (jobs)		964	1,024	1,173	1,915	4,499	3,142
On-the-Job Training - All sectors - 4 to 10 years (jobs)		289	293	308	587	1,470	965
On-the-Job Training - All sectors - Over 10 years (jobs)		45.6	51.8	62.6	84.6	177	148
On-Site or In-Plant Training - All sectors - None (jobs)		728	790	920	1,393	3,122	2,380
On-Site or In-Plant Training - All sectors -		2,730	2,934	3,440	5,277	12,036	8,805
Up to 1 year (jobs) On-Site or In-Plant Training - All sectors -		749	798	918	1,485	3,476	2,444
1 to 4 years (jobs) On-Site or In-Plant Training - All sectors -		297	302	319	592	1,465	967
4 to 10 years (jobs) On-Site or In-Plant Training - All sectors -		39.4	41.8	47.8	81.2	194	131
Over 10 years (jobs)		0/5	001	007	F00	1.050	007
Wage income - All (million \$2019)		265	281	324	529	1,252	884

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.526	0.536	0.919	0.973	0.907	0.947
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)	5.71	88	170	459	747	977	1,207
Vehicle stocks - LDV – All others (1000 units)	1,007	959	910	663	417	236	54.8
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065		0.324		1.42		2.3
Public EV charging plugs - L2 (1000 units)	0.118		7.8		34.2		55.3

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

2020	2025	2030	2035	2040	2045	2050
14.3	32.1	79.9	90.6	91	91	91
9.9	10.8	4.53	3.11	3.02	3.06	3.07
55.3	30.9	8.61	3.64	3.44	3.45	3.44
20.5	26.2	6.99	2.7	2.51	2.5	2.49
0	9.43	49.9	59	59.4	59.4	59.4
30.2	45.9	40.3	39	38.9	38.9	38.9
65.2	41.3	7.81	0.329	0	0	0
4.6	3.33	1.97	1.68	1.67	1.69	1.7
50.1	60.7	93.3	99.7	100	100	100
49.9	39.3	6.72	0.338	0	0	0
	0.774	0.771				
	14.3 9.9 55.3 20.5 0 30.2 65.2 4.6 50.1	14.3 32.1 9.9 10.8 55.3 30.9 20.5 26.2 0 9.43 30.2 45.9 65.2 41.3 4.6 3.33 50.1 60.7 49.9 39.3	14.3 32.1 79.9 9.9 10.8 4.53 55.3 30.9 8.61 20.5 26.2 6.99 0 9.43 49.9 30.2 45.9 40.3 65.2 41.3 7.81 4.6 3.33 1.97 50.1 60.7 93.3 49.9 39.3 6.72	14.3 32.1 79.9 90.6 9.9 10.8 4.53 3.11 55.3 30.9 8.61 3.64 20.5 26.2 6.99 2.7 0 9.43 49.9 59 30.2 45.9 40.3 39 65.2 41.3 7.81 0.329 4.6 3.33 1.97 1.68 50.1 60.7 93.3 99.7 49.9 39.3 6.72 0.338	14.3 32.1 79.9 90.6 91 9.9 10.8 4.53 3.11 3.02 55.3 30.9 8.61 3.64 3.44 20.5 26.2 6.99 2.7 2.51 0 9.43 49.9 59 59.4 30.2 45.9 40.3 39 38.9 65.2 41.3 7.81 0.329 0 4.6 3.33 1.97 1.68 1.67 50.1 60.7 93.3 99.7 100 49.9 39.3 6.72 0.338 0	14.3 32.1 79.9 90.6 91 91 9.9 10.8 4.53 3.11 3.02 3.06 55.3 30.9 8.61 3.64 3.44 3.45 20.5 26.2 6.99 2.7 2.51 2.5 0 9.43 49.9 59 59.4 59.4 30.2 45.9 40.3 39 38.9 38.9 65.2 41.3 7.81 0.329 0 0 4.6 3.33 1.97 1.68 1.67 1.69 50.1 60.7 93.3 99.7 100 100 49.9 39.3 6.72 0.338 0 0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	1.53	28.2	70.6	83.7	85	85.1	85.1
Heat Pump (%)							
Sales of space heating units - Electric	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Resistance (%)							
Sales of space heating units - Gas (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of water heating units - Electric	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Heat Pump (%)							
Sales of water heating units - Electric	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Resistance (%)							
Sales of water heating units - Gas (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s -		3,472	3,883				
Cumulative 5-yr (million \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	446	446	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,629	2,194	2,387	2,391	3,293	3,293	4,368
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	110	165	219	290	375	472	584
Installed renewables - Solar - Base land use assumptions (MW)	39.5	39.5	241	241	241	241	3,383
Installed renewables - Wind - Base land use assumptions (MW)	2	2	2	2	2	2	131
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	2,235	7,552	8,319
Installed renewables - Solar - Constrained land use assumptions (MW)	39.5	145	741	741	741	741	3,713
Installed renewables - Wind - Constrained land use assumptions (MW)	2.29	2.29	2.29	2.29	2.29	2.29	2.29
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	2,240	2,240	8,324
Capital invested - Solar PV - Base (billion \$2018)		0	0.242	0	0	0	2.91
Capital invested - Wind - Base (billion \$2018)		0	0	0	0	0	0.246
Capital invested - Offshore Wind - Base (billion \$2018)		0	0	0	3.88	7.84	1.02

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	75.2	75.2	454	454	454	454	6,352
Wind - Base land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	403
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	9,506	33,967	37,615
Solar - Constrained land use assumptions (GWh)	150	548	2,786	2,786	2,786	2,786	13,929
Wind - Constrained land use assumptions (GWh)	16.1	16.1	16.1	16.1	16.1	16.1	16.1
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	19,052	19,052	75,270

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)							-3.48
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-34.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-77.3
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.9
Carbon sink potential - Low - Increase retention of HWP (1000 tC02e/y)							-69.4

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

Item Copper sink natantial Law Ingresse	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase							-29.5
trees outside forests (1000 tC02e/y)							0.
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2.
Carbon sink potential - Low - Reforest							-6.5
pasture (1000 tCO2e/y)							-0.5
Carbon sink potential - Low - Restore							-25.
productivity (1000 tC02e/y)							-20.
Carbon sink potential - Low - All (not							-26
counting overlap) (1000 tC02e/y)							-20
Carbon sink potential - Mid - Accelerate	+						-5.2
regeneration (1000 tCO2e/y)							-3.2
Carbon sink potential - Mid - Avoid							-12
deforestation (1000 tCO2e/y)							-12
Carbon sink potential - Mid - Extend							-13
rotation length (1000 tCO2e/y)							-13
Carbon sink potential - Mid - Improve							-20.
plantations (1000 tCO2e/y)							-20.
Carbon sink potential - Mid - Increase							-13
retention of HWP (1000 tCO2e/y)							-13
Carbon sink potential - Mid - Increase							-56.
trees outside forests (1000 tC02e/y)							-30.
Carbon sink potential - Mid - Reforest							-4.0
cropland (1000 tCO2e/y)							-4.0
Carbon sink potential - Mid - Reforest							-46.
pasture (1000 tCO2e/y)							-40.
Carbon sink potential - Mid - Restore							-51.
productivity (1000 tCO2e/y)							-51.
Carbon sink potential - Mid - All (not							-58
counting overlap) (1000 tC02e/y)							-30
Carbon sink potential - High - Accelerate							-6.9
regeneration (1000 tCO2e/y)							-0.7
Carbon sink potential - High - Avoid							-20
deforestation (1000 tC02e/y)							-20
Carbon sink potential - High - Extend							-20
rotation length (1000 tCO2e/y)							-20
Carbon sink potential - High - Improve							-27.
plantations (1000 tCO2e/y)							-21.
Carbon sink potential - High - Increase							-20
retention of HWP (1000 tCO2e/y)							-20
Carbon sink potential - High - Increase							-83.
trees outside forests (1000 tC02e/y)							-03.
Carbon sink potential - High - Reforest							-5.
cropland (1000 tCO2e/y)							-3.
Carbon sink potential - High - Reforest							-85.
pasture (1000 tCO2e/y)							-00.
Carbon sink potential - High - All (not							-90
counting overlap) (1000 tCO2e/y)							-70
Carbon sink potential - High - Restore							-76.
productivity (1000 tCO2e/y)							-10.
Land impacted for carbon sink potential -							0.56
Low - Accelerate regeneration (1000							0.50
hectares)							
							26
Land impacted for carbon sink potential -							26
Low - Avoid deforestation (over 30 years) (1000 hectares)							
							39.
Land impacted for carbon sink potential - Low - Extend rotation length (1000							39.
		1				1	

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

Item Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050 5.03
Low - Improve plantations (1000 hectares)							5.03
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000							0
hectares) Land impacted for carbon sink potential -							4.17
Low - Increase trees outside forests (1000 hectares)							
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0.179
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.423
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							15.4
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							91.2
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.851
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							27
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							71
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.57
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							6.05
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0.268
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							3.06
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							30.9
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							147
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.13
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							27.8
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							103
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							10.1
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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 -							7.93
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0.357
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							2.44
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							25.4
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							178
High - Total impacted (over 30 years)							
(1000 hectares)							

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

		i i	1	2050
				C
				-126
				-3.22
				-129
				С
				-244
				-6.43
				-250
				C
				_
				88.6
				5.85
				94.5
				C
				171
				11.7

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)							183

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Table 50.	LTNL	acenun iu -	IIVIFAGIO-	116011111

Table 38: E+RE- scenario - IMPACTS - Healt		0005	0000	0005	00/0	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		14.6	0.01	0.01	0.009	0.006	0.001
Premature deaths from air pollution -		5.79	4.72	5.44	4.16	1.66	0.482
Fuel Comb - Electric Generation - Natural Gas (deaths)		0.17	7.12	0.44	4.10	1.00	0.402
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.1	24.5	18.7	10.8	4.91	1.87
Premature deaths from air pollution - Gas Stations (deaths)		1.65	1.51	1.14	0.665	0.312	0.134
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.31	3.59	2.44	1.36	0.65	0.262
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		2.71	2.2	1.49	0.85	0.366	0.109
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.821	0.736	0.567	0.383	0.22	0.121
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.322	0.31	0.297	0.283	0.269	0.253
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.34	3.82	2.84	1.81	1.09	0.634
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.33	1.07	0.766	0.495	0.328	0.223
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.258	0.212	0.167	0.123	0.082
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.166	0.101	0.101	0.1	0.102	0.097
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		9.04	8.65	8.46	7.46	6.3	4.77
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		129	0.09	0.089	0.082	0.057	0.005
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		51.3	41.8	48.2	36.9	14.7	4.27
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		232	218	166	96.2	43.7	16.6
Monetary damages from air pollution - Gas Stations (million \$2019)		14.6	13.4	10.1	5.89	2.76	1.18
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		38.2	31.8	21.6	12.1	5.76	2.33
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		24	19.5	13.2	7.53	3.24	0.967
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.27	6.52	5.03	3.39	1.95	1.07

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		2.85	2.74	2.63	2.5	2.38	2.24
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		38.4	33.9	25.1	16	9.67	5.61
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		11.8	9.47	6.78	4.38	2.9	1.97
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		2.69	2.28	1.88	1.48	1.09	0.722
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		1.47	0.889	0.891	0.885	0.904	0.853
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		80.3	76.8	75.1	66.2	56	42.4
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)		4.34	6.22	2.08	1.72	1.58	1.37
By economic sector - Construction (jobs)		856	776	934	1,088	1,142	1,806
By economic sector - Manufacturing		672	681	612	548	575	509
(jobs)							
By economic sector - Mining (jobs)		291	203	133	80.9	45.6	25.6
By economic sector - Other (jobs)		78.6	78.4	103	127	145	251
By economic sector - Pipeline (jobs)		84.2	72.3	63.9	53.4	41	83.5
By economic sector - Professional (jobs)		337	295	345	509	460	1,084
By economic sector - Trade (jobs)		286	244	251	302	293	564
By economic sector - Utilities (jobs)		894	804	1,033	1,870	1,543	4,804
By resource sector - Biomass (jobs)		15.2	15.9	7.13	6.41	6.19	5.7
By resource sector - CO2 (jobs)		0	0	0	0	0	434
By resource sector - Coal (jobs)		60.3	0	0	0	0	0
By resource sector - Grid (jobs)		923	814	1,434	1,822	2,152	2,675
By resource sector - Natural Gas (jobs)		1,023	971	830	905	871	803
By resource sector - Nuclear (jobs)		0	0	0	797	161	3,880
By resource sector - Oil (jobs)		582	435	275	147	67.5	21.1
By resource sector - Solar (jobs)		866	882	922	886	954	1,289
By resource sector - Wind (jobs)		32.1	40.7	7.88	16.1	34.7	18.7
By education level - All sectors - High		1,481	1,345	1,488	1,671	1,755	2,525
school diploma or less (jobs)							
By education level - All sectors -		1,119	1,016	1,133	1,306	1,365	2,031
Associates degree or some college (jobs)							
By education level - All sectors -		715	634	677	783	789	1,248
Bachelors degree (jobs)							
By education level - All sectors - Masters		166	146	159	192	191	322
or professional degree (jobs)							
By education level - All sectors - Doctoral		21.2	18.4	19.8	25.5	23.8	48.3
degree (jobs)							
Related work experience - All sectors -		509	461	511	583	610	899
None (jobs)							
Related work experience - All sectors - Up		684	622	685	776	808	1,199
to 1 year (jobs)		1011	1101	1010	1.01	1100	
Related work experience - All sectors - 1		1,264	1,136	1,248	1,431	1,480	2,226
to 4 years (jobs)		00/	7/1	017	0/0	070	4 / 70
Related work experience - All sectors - 4		824	741	817	942	972	1,473
to 10 years (jobs)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors -		221	200	217	246	254	377
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		185	166	180	206	211	326
(jobs)							
On-the-Job Training - All sectors - Up to 1		2,298	2,073	2,261	2,573	2,661	3,971
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		750	678	758	873	912	1,357
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		234	210	244	289	302	464
years (jobs)							
On-the-Job Training - All sectors - Over 10		34.8	31.8	33.8	37.3	38.3	56.5
years (jobs)							
On-Site or In-Plant Training - All sectors -		561	506	551	633	651	999
None (jobs)							
On-Site or In-Plant Training - All sectors -		2,089	1,884	2,061	2,345	2,430	3,615
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		581	525	586	672	702	1,039
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		240	216	247	290	302	463
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		30.7	27.9	31.9	37.2	39.1	58.1
Over 10 years (jobs)							
Wage income - All (million \$2019)		206	186	208	242	253	387

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.4	75.7	67	56.1	46.1	40	37.3
Final energy use - Residential (PJ)	41.7	39.3	35.9	31.4	27.7	25.3	24.4
Final energy use - Commercial (PJ)	29.9	29.8	28.5	26.5	24.9	24.3	24.6
Final energy use - Industry (PJ)	16	16.3	16.6	16.9	17.1	17.5	18

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.526	0.536	0.919	0.973	0.907	0.947
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)	5.71	88	170	459	747	977	1,207
Vehicle stocks - LDV – All others (1000 units)	1,007	959	910	663	417	236	54.8
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		193	496	803	1,217	1,325	1,263
Public EV charging plugs - DC Fast (1000 units)	0.065		0.324		1.42		2.3
Public EV charging plugs - L2 (1000 units)	0.118		7.8		34.2		55.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	14.3	32.1	79.9	90.6	91	91	91
Heat Pump (%)							
Sales of space heating units - Electric	9.9	10.8	4.53	3.11	3.02	3.06	3.07
Resistance (%)							
Sales of space heating units - Gas (%)	55.3	30.9	8.61	3.64	3.44	3.45	3.44
Sales of space heating units - Fossil (%)	20.5	26.2	6.99	2.7	2.51	2.5	2.49

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	9.43	49.9	59	59.4	59.4	59.4
Heat Pump (%)							
Sales of water heating units - Electric	30.2	45.9	40.3	39	38.9	38.9	38.9
Resistance (%)							
Sales of water heating units - Gas Furnace	65.2	41.3	7.81	0.329	0	0	0
(%)							
Sales of water heating units - Other (%)	4.6	3.33	1.97	1.68	1.67	1.69	1.7
Sales of cooking units - Electric	50.1	60.7	93.3	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	49.9	39.3	6.72	0.338	0	0	0
Residential HVAC investment in 2020s vs.		0.774	0.771				
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	1.53	28.2	70.6	83.7	85	85.1	85.1
Heat Pump (%)							
Sales of space heating units - Electric	1.94	8.4	10.6	12.7	13.1	13.1	13.1
Resistance (%)							
Sales of space heating units - Gas (%)	84.3	59.2	18.1	3.53	1.88	1.85	1.84
Sales of space heating units - Fossil (%)	12.2	4.23	0.808	0.035	0	0	0
Sales of water heating units - Electric	0.078	10.5	54.6	64.4	64.9	64.9	64.9
Heat Pump (%)							
Sales of water heating units - Electric	1.96	10.8	28.3	32.2	32.4	32.4	32.4
Resistance (%)							
Sales of water heating units - Gas (%)	93.3	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	4.67	4.25	3.03	2.72	2.72	2.72	2.71
Sales of cooking units - Electric	32	46	79.9	86.5	86.9	86.9	86.9
Resistance (%)							
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s -		3,472	3,883				
Cumulative 5-yr (million \$2018)							

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

2020	2025	2030	2035	2040	2045	2050
446	0	0	0	0	0	0
1,598	1,746	1,414	2,038	2,558	3,610	3,168
0	0	0	0	340	340	1,978
110	165	219	290	375	472	584
39.5	39.5	39.5	39.5	39.5	39.5	39.5
2	2	2	2	2	2	2
39.5	39.5	145	395	395	616	616
2	2	2	2	2	2	2
0	0	0	0	0	241	321
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0.127	0.275	0	0.217	0
	0	0	0	0	0	0
	446 1,598 0 110 39.5 2 39.5	446 0 1,598 1,746 0 0 110 165 39.5 39.5 2 2 39.5 39.5 2 2 0 0 0 0 0 0 0 0	446 0 0 1,598 1,746 1,414 0 0 0 110 165 219 39.5 39.5 39.5 2 2 2 39.5 145 2 2 2 0 0 0 0 0 0 0 0 0 0 0 0	446 0 0 0 1,598 1,746 1,414 2,038 0 0 0 0 110 165 219 290 39.5 39.5 39.5 39.5 2 2 2 2 39.5 39.5 145 395 2 2 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0.127 0.275	446 0 0 0 0 1,598 1,746 1,414 2,038 2,558 0 0 0 0 340 110 165 219 290 375 39.5 39.5 39.5 39.5 39.5 2 2 2 2 2 39.5 39.5 145 395 395 2 2 2 2 2 0 0 0 0 0 0 0 0 0 0 0 0.127 0.275 0	446 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 340

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

		-			-		
Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind -		0	0	0	0	0.356	0.106
Constrained (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	75.2	75.2	75.2	75.2	75.2	75.2	75.2
Wind - Base land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	75.2	75.2	274	743	743	1,157	1,157
Wind - Constrained land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	1,008	1,348

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-3.48
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-34.3
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-77.3
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-13.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-69.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-29.2
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2.7
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-6.51
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-25.8
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-263
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-5.21
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-120
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-139
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-20.4
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-139
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-56.4
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-4.05
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-46.2
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-51.2
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not				+			-581
counting overlap) (1000 tC02e/y)							

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

2020	2025	2030	2035	2040	2045	2050
						-6.94
						00
						-206
						-20
						-20
						-27.3
						-27.3
	+					-208
						-200
						-83.5
						-00.0
	+					-5.4
						-0
						-85.9
						00.
	+					-90
						, 0
						-76.6
	+					0.56
						26.
						39.3
						5.03
						(
						4.1
						0.179
						0.404
						0.423
						45
						15.4
						01.0
						91.2
						0.85
						0.65
						2
						2
						7
						(
						7.5
						1.0
		2020 2025	2020 2025 2030		2020 2025 2030 2035 2040	2020 2025 2030 2035 2040 2045

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

Iable 47: E+RE- scenario - PILLAR 6: Land Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -	2020	2023	2030	2000	2040	2043	2030
Mid - Increase retention of HWP (1000							J
hectares)							
Land impacted for carbon sink potential -							6.05
Mid - Increase trees outside forests (1000							0.00
hectares)							
Land impacted for carbon sink potential -							0.268
Mid - Reforest cropland (1000 hectares)							0.200
Land impacted for carbon sink potential -							3.06
Mid - Reforest pasture (1000 hectares)							0.00
Land impacted for carbon sink potential -							30.9
Mid - Restore productivity (1000							00.7
hectares)							
Land impacted for carbon sink potential -							147
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							1.13
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							27.8
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							103
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							10.1
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 -							7.93
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0.357
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							2.44
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							25.4
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -		T	T	T		T	178
High - Total impacted (over 30 years)							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-126
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-3.22
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-129
deployment - Total (1000 tCO2e/y)							

Table 48: E+RE- 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							-244
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-6.43
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-250
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							88.6
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							5.85
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							94.5
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							171
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							11.7
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							183
Aggressive deployment - Total (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		14.6	0.01	0.01	0.009	0.006	0.001
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		5.26	3.19	1.79	1.29	0.751	0.223
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		26.6	27	26.4	23.8	19	13.1
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		1.68	1.7	1.65	1.48	1.17	0.806
Stations (deaths)							
Premature deaths from air pollution -		4.34	4	3.57	2.95	2.2	1.45
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		2.75	2.65	2.53	2.21	1.64	1.03
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		0.832	0.84	0.836	0.767	0.616	0.445
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution -		0.322	0.31	0.297	0.283	0.269	0.253
Fuel Comb - Comm/Institutional - Coal							
(deaths)							
Premature deaths from air pollution -		4.37	4.32	4.16	3.72	3.04	2.28
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)		1.34	1.18	1.02	0.838	0.684	0.548
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.304	0.277	0.249	0.221	0.193	0.166
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.178	0.101	0.102	0.102	0.104	0.103
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.85	7.69	6.2	5.07	4.27	3.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		129	0.09	0.089	0.082	0.057	0.005
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		46.6	28.3	15.9	11.4	6.65	1.97
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		237	240	234	212	169	116
Monetary damages from air pollution - Gas Stations (million \$2019)		14.9	15.1	14.6	13.1	10.4	7.13
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		38.5	35.5	31.6	26.1	19.5	12.9
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		24.4	23.4	22.4	19.6	14.6	9.13
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		7.37	7.44	7.41	6.8	5.46	3.94
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.85	2.74	2.63	2.5	2.38	2.24
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		38.7	38.2	36.8	32.9	26.9	20.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		11.9	10.4	9.01	7.42	6.06	4.85
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		2.69	2.45	2.2	1.96	1.71	1.47
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.57	0.892	0.898	0.897	0.916	0.908
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		78.6	68.3	55	45	37.9	27.6

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.24	5.93	2.22	1.64	1.36	55.9
By economic sector - Construction (jobs)		1,096	992	1,057	982	2,321	4,585
By economic sector - Manufacturing		894	1,613	1,112	816	1,542	2,228
(jobs)							
By economic sector - Mining (jobs)		312	204	145	103	61.3	25.1
By economic sector - Other (jobs)		112	117	144	136	236	448
By economic sector - Pipeline (jobs)		81.3	65.9	53.2	44.4	32.9	67.9
By economic sector - Professional (jobs)	-	454	395	410	395	887	1,726

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

Tuble 66. E Bi beenand 1141 Note 6688 (cor						
Item	2020 2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)	373	306	313	292	557	1,033
By economic sector - Utilities (jobs)	1,162	967	978	1,018	3,170	6,389
By resource sector - Biomass (jobs)	16.8	16	7.5	6.88	6.3	264
By resource sector - CO2 (jobs)	0	0	0	0	0	394
By resource sector - Coal (jobs)	177	59.1	0	0	0	0
By resource sector - Grid (jobs)	1,378	1,204	1,433	1,446	6,243	12,719
By resource sector - Natural Gas (jobs)	1,051	835	666	711	477	432
By resource sector - Nuclear (jobs)	0	0	0	0	0	0
By resource sector - Oil (jobs)	591	479	389	314	202	70.1
By resource sector - Solar (jobs)	1,264	1,965	1,655	1,194	1,336	2,157
By resource sector - Wind (jobs)	10.6	108	63.9	117	543	521
By education level - All sectors - High	1,907	2,008	1,816	1,623	3,800	7,173
school diploma or less (jobs)						
By education level - All sectors -	1,438	1,497	1,358	1,230	2,891	5,442
Associates degree or some college (jobs)						
By education level - All sectors -	906	931	827	740	1,672	3,101
Bachelors degree (jobs)						
By education level - All sectors - Masters	210	206	189	173	399	754
or professional degree (jobs)						
By education level - All sectors - Doctoral	27	24.8	23.8	21.9	46.2	87.3
degree (jobs)						
Related work experience - All sectors -	652	671	612	554	1,295	2,450
None (jobs)						
Related work experience - All sectors - Up	886	950	854	757	1,749	3,288
to 1 year (jobs)						
Related work experience - All sectors - 1	1,617	1,663	1,505	1,357	3,157	5,934
to 4 years (jobs)						
Related work experience - All sectors - 4	1,052	1,079	977	883	2,057	3,866
to 10 years (jobs)						
Related work experience - All sectors -	282	303	267	237	550	1,020
Over 10 years (jobs)						
On-the-Job Training - All sectors - None	237	245	222	198	444	830
(jobs)						
On-the-Job Training - All sectors - Up to 1	2,951	3,118	2,783	2,482	5,736	10,729
year (jobs)						
On-the-Job Training - All sectors - 1 to 4	958	977	895	815	1,929	3,650
years (jobs)						
On-the-Job Training - All sectors - 4 to 10	298	276	270	255	619	1,202
years (jobs)						
On-the-Job Training - All sectors - Over 10	44.4	50.2	43.5	37.6	80.5	146
years (jobs)						
On-Site or In-Plant Training - All sectors -	719	759	679	606	1,374	2,564
None (jobs)						
On-Site or In-Plant Training - All sectors -	2,682	2,821	2,526	2,258	5,239	9,816
Up to 1 year (jobs)						
On-Site or In-Plant Training - All sectors -	743	762	696	632	1,493	2,822
1 to 4 years (jobs)						
On-Site or In-Plant Training - All sectors -	305	285	275	258	620	1,198
4 to 10 years (jobs)						
On-Site or In-Plant Training - All sectors -	39.3	39.7	36.9	34	82.3	157
Over 10 years (jobs)						
Wage income - All (million \$2019)	262	269	247	226	539	1,031

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.5	76.4	70.2	64.9	60.8	55.9	50.1
Final energy use - Residential (PJ)	41.7	39.5	38.4	37	34.6	31.5	28.6
Final energy use - Commercial (PJ)	29.9	29.9	29.5	28.9	28	27	26.5
Final energy use - Industry (PJ)	16	16.3	16.7	17.1	17.5	17.9	18.4

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

•••	•	•	•				
Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.457	0.458	0.597	0.614	0.89	0.939
Guillulative 3-yi (billion \$2010)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	4.42	28.6	52.8	165	277	525	773
Vehicle stocks - LDV – All others (1000 units)	1,011	1,011	1,011	959	907	699	491
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	31.3	65.7	222	699	1,018
Public EV charging plugs - DC Fast (1000 units)	0.065		0.1		0.527		1.47
Public EV charging plugs - L2 (1000 units)	0.118		2.42		12.7		35.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	14.3	22.9	28.3	44	68	83.7	89.1
Heat Pump (%)							
Sales of space heating units - Electric	9.9	12	11.2	9.09	5.93	3.95	3.26
Resistance (%)							
Sales of space heating units - Gas (%)	55.3	35.2	32.6	25.4	14.2	6.89	4.33
Sales of space heating units - Fossil (%)	20.5	29.9	27.8	21.5	11.8	5.49	3.29
Sales of water heating units - Electric	0	1.62	6.23	19.5	39.9	53.2	57.8
Heat Pump (%)							
Sales of water heating units - Electric	30.2	47	46.3	44.4	41.6	39.8	39.1
Resistance (%)							
Sales of water heating units - Gas Furnace	65.2	47.8	44	33.1	16.2	5.18	1.35
(%)							
Sales of water heating units - Other (%)	4.6	3.59	3.44	3	2.33	1.9	1.75
Sales of cooking units - Electric	49.9	51.2	55.8	67.9	84.7	95.1	98.7
Resistance (%)							
Sales of cooking units - Gas (%)	50.1	48.8	44.2	32.1	15.3	4.94	1.33
Residential HVAC investment in 2020s vs.		0.769	0.798				
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	1.53	20.1	24.9	38.9	61.1	76.8	82.8
Heat Pump (%)							
Sales of space heating units - Electric	1.94	8.06	8.33	9.15	10.6	12	12.8
Resistance (%)							
Sales of space heating units - Gas (%)	84.3	66.9	62.2	48.4	26.6	10.7	4.3
Sales of space heating units - Fossil (%)	12.2	4.9	4.55	3.47	1.71	0.536	0.14
Sales of water heating units - Electric	0.078	2.03	7.05	21.5	43.6	58.1	63.1
Heat Pump (%)							
Sales of water heating units - Electric	1.96	7.38	9.33	15.1	24	29.7	31.7
Resistance (%)							
Sales of water heating units - Gas (%)	93.3	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	4.67	4.49	4.43	3.93	3.32	2.91	2.76
Sales of cooking units - Electric	32	36.2	40.9	53.4	71	81.7	85.5
Resistance (%)							
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s -		3,468	3,852				
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)	446	446	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,627	2,286	1,958	1,670	2,142	2,142	2,061
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	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	0	0	0	0	0	0
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	0	0	0	0	0	0
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	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	1
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment -		0	0	0	0	0	772
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	0	0	0	0	69.2

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	0	0	0	0	0
Spur (km)		0	0	0	0	0	0
All (km)		0	0	0	0	0	0
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
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		0	0	0	0	0	0
ΦΖ (10)							

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, permitting costs (million \$2020)		0	0	0	0	0	0
Wells and facilities construction costs (million \$2020)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-3.48
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-34.3
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-77.3
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-13.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-69.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-29.2
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2.7
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-6.51
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-25.8
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-263
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-5.21
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-120
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-139
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-20.4
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-139
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-56.4
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-4.05
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-46.2
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-51.2
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-581
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-6.94
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-206
deforestation (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend							-201
rotation length (1000 tC02e/y)							07.0
Carbon sink potential - High - Improve							-27.3
plantations (1000 tC02e/y)							000
Carbon sink potential - High - Increase							-208
retention of HWP (1000 tC02e/y)							00.5
Carbon sink potential - High - Increase							-83.5
trees outside forests (1000 tC02e/y)							F /
Carbon sink potential - High - Reforest							-5.4
cropland (1000 tC02e/y)							0.5.0
Carbon sink potential - High - Reforest							-85.9
pasture (1000 tC02e/y)							0.01
Carbon sink potential - High - All (not							-901
counting overlap) (1000 tCO2e/y)							7,,
Carbon sink potential - High - Restore							-76.6
productivity (1000 tCO2e/y)							0.5/5
Land impacted for carbon sink potential -							0.567
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							26.1
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							39.3
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							5.03
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 -							4.17
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0.179
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							0.423
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							15.4
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							91.2
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							0.851
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							27
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							71
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							7.57
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 -							۷ ۵۲
Mid - Increase trees outside forests (1000							6.05
1110 - 11101 6496 11 669 0019106 101 6919 11000						I .	

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							0.268
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							3.06
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							30.9
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							147
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							1.13
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							27.8
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							103
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							10.1
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 -							7.93
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0.357
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							2.44
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							25.4
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							178
High - Total impacted (over 30 years)							
(1000 hectares)						1	

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-25.9
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-116
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-2.8
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							-145
deployment - Total (1000 tCO2e/y)							

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

Table 63: E-B+ scenario - PILLAR 6: Land s Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-25.9
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-225
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-5.61
deployment - Permanent conservation							0.0.
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							·
crops (1000 tC02e/y)							
Carbon sink potential - Aggressive							0
deployment - Pasture to energy crops							U
(1000 tCO2e/y)							
Carbon sink potential - Aggressive							-257
deployment - Total (1000 tC02e/y)							-201
Land impacted for carbon sink - Moderate							13.8
deployment - Corn-ethanol to energy							13.0
grasses (1000 hectares)							01.5
Land impacted for carbon sink - Moderate							81.5
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							5.1
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							3.07
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							0.14
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							104
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							13.8
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							390
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							10.2
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							3.07
Aggressive deployment - Cropland to							
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							0.14
Aggressive deployment - Pasture to							5.14
energy crops (1000 hectares)							
Land impacted for carbon sink -							417
Aggressive deployment - Total (1000							417
hectares)							
Heotal esj							

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)		38.9	24.3	22.8	22.2	21.8	19.9

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

Table 64: REF scenario - IMPACTS - Health Item	2020	<i>]</i> 2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -	2020	4.15	4.63	6.08	6.31	6.31	5.9
Fuel Comb - Electric Generation - Natural		4.13	4.03	0.00	0.31	0.51	3.7
Gas (deaths)							
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.6	27.3	28.1	28.9	29.8	30.6
Premature deaths from air pollution - Gas		1.68	1.72	1.75	1.8	1.85	1.88
Stations (deaths)							
Premature deaths from air pollution -		4.28	4.02	3.86	3.81	3.82	3.81
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		2.64	2.22	1.59	1.03	0.628	0.402
Fuel Comb - Residential - Oil (deaths)		2 = 2 /				2.215	
Premature deaths from air pollution -		0.794	0.784	0.785	0.798	0.815	0.829
Fuel Comb - Residential - Other (deaths)		0.007	0.000	0.0/1	0.070	0.070	0.341
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal		0.336	0.339	0.341	0.342	0.342	0.341
(deaths)							
Premature deaths from air pollution -		4.4	4.41	4.21	3.97	3.94	4.13
Fuel Comb - Comm/Institutional - Natural		7.7	7.71	7.21	0.71	0.74	7.10
Gas (deaths)							
Premature deaths from air pollution -		1.36	1.23	1.08	0.909	0.811	0.761
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		0.318	0.328	0.339	0.348	0.357	0.367
Fuel Comb - Comm/Institutional - Other							
(deaths)						2.125	
Premature deaths from air pollution -		0.324	0.241	0.207	0.2	0.197	0.189
Industrial Processes - Coal Mining							
(deaths) Premature deaths from air pollution -		8.92	9.67	10.1	9.7	9.81	9.51
Industrial Processes - Oil & Gas		0.72	7.01	10.1	7.1	7.01	7.01
Production (deaths)							
Monetary damages from air pollution -		345	215	202	196	193	177
Fuel Comb - Electric Generation - Coal					.,,	.,,	
(million \$2019)							
Monetary damages from air pollution -		36.8	41	53.9	55.9	55.9	52.3
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		236	243	249	257	265	272
Mobile - On-Road (million \$2019)		1/ 0	45.0	45.5	4.	1(0)	4/7
Monetary damages from air pollution -		14.8	15.2	15.5	16	16.3	16.7
Gas Stations (million \$2019) Monetary damages from air pollution -		38	35.6	34.2	33.7	33.9	33.8
Fuel Comb - Residential - Natural Gas		30	35.6	34.2	33.1	33.9	33.0
(million \$2019)							
Monetary damages from air pollution -		23.4	19.7	14.1	9.14	5.56	3.56
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		7.03	6.95	6.95	7.08	7.22	7.35
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		2.98	3	3.02	3.02	3.03	3.01
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)		20	20	07.0	25.0	2/ 0	0/ 5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural		39	39	37.3	35.2	34.9	36.5
Gas (million \$2019)							
Monetary damages from air pollution -		12	10.9	9.56	8.04	7.18	6.74
Fuel Comb - Comm/Institutional - Oil					• .		J 1
(million \$2019)							
•							

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 (million \$2019)		2.81	2.91	3	3.08	3.16	3.24
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		2.86	2.13	1.82	1.76	1.74	1.67
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		79.2	85.9	89.6	86.1	87.1	84.5

Table 65: REE scenario - IMPACTS - Johs

Table 65: REF scenario - IMPACTS - Jobs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		4.02	3.6	3.56	2.9	2.89	3.14
By economic sector - Construction (jobs)		726	925	1,112	1,360	1,555	2,287
By economic sector - Manufacturing (jobs)		277	320	362	453	470	895
By economic sector - Mining (jobs)		317	257	209	168	143	110
By economic sector - Other (jobs)		34.2	84.8	110	141	163	288
By economic sector - Pipeline (jobs)		83.8	87.2	88.1	82.5	83.3	82.3
By economic sector - Professional (jobs)		329	372	445	552	610	890
By economic sector - Trade (jobs)		290	307	337	393	430	613
By economic sector - Utilities (jobs)		1,132	1,064	1,343	1,767	2,043	2,796
By resource sector - Biomass (jobs)		15.5	14.5	13.5	12	12.3	12.5
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		177	167	158	150	143	55
By resource sector - Grid (jobs)		1,314	1,183	1,616	2,287	2,901	4,636
By resource sector - Natural Gas (jobs)		1,079	1,062	1,199	1,378	1,351	1,260
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		594	488	418	383	365	352
By resource sector - Solar (jobs)			470	571	675	721	1,353
By resource sector - Wind (jobs)		13.5	36.8	33.7	33	6.68	295
By education level - All sectors - High		1,327	1,443	1,694	2,078	2,335	3,408
school diploma or less (jobs)		,				.	
By education level - All sectors -		1,024	1,104	1,308	1,617	1,812	2,621
Associates degree or some college (jobs)							·
By education level - All sectors -		663	688	792	960	1,061	1,519
Bachelors degree (jobs)							
By education level - All sectors - Masters		159	165	192	234	259	371
or professional degree (jobs)							
By education level - All sectors - Doctoral		19.8	21.5	24.7	29.5	32.2	46
degree (jobs)							
Related work experience - All sectors -		469	503	593	730	818	1,181
None (jobs)							
Related work experience - All sectors - Up		595	655	768	942	1,057	1,560
to 1 year (jobs)							
Related work experience - All sectors - 1		1,168	1,241	1,451	1,778	1,987	2,865
to 4 years (jobs)							
Related work experience - All sectors - 4		762	811	952	1,168	1,304	1,872
to 10 years (jobs)							
Related work experience - All sectors -		198	210	245	300	335	487
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		165	179	207	252	280	408
(jobs)							
On-the-Job Training - All sectors - Up to 1		2,076	2,213	2,582	3,162	3,531	5,135
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		696	748	884	1,091	1,224	1,760
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		229	250	299	369	417	590
years (jobs)							

Table 45	REF scenario -	TMDACTO	loho	(continued)
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Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10		27.9	31.5	36.6	44.3	48.9	72
years (jobs)							
On-Site or In-Plant Training - All sectors -		498	539	630	770	857	1,246
None (jobs)							
On-Site or In-Plant Training - All sectors -		1,896	2,021	2,360	2,892	3,232	4,696
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		536	576	681	839	941	1,357
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		234	253	301	371	417	589
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		29	31.2	37.5	46.7	52.6	75.4
Over 10 years (jobs)							
Wage income - All (million \$2019)		193	206	244	303	343	497

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	81.4	76.3	70.4	66.8	66.7	68.4	70.6
Final energy use - Residential (PJ)	41.7	39.3	38.7	38.6	39	40	41.1
Final energy use - Commercial (PJ)	29.9	30.3	30.5	30.5	30.7	31.5	33.2
Final energy use - Industry (PJ)	16	16.8	17.7	18.8	20	21.3	22.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.488	0.492	0.647	0.67	0.83	0.869
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	11.1	37.9	39.1	40.3	41.2	41.9	42.9
Heat Pump (%)							
Sales of space heating units - Electric	10.4	9.91	9.75	9.4	9.02	8.38	7.34
Resistance (%)							
Sales of space heating units - Gas (%)	57.3	30.9	39.4	42.7	42.6	42.6	42.6
Sales of space heating units - Fossil (%)	21.2	21.3	11.8	7.55	7.21	7.18	7.25
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	30.2	47.2	47.2	47.1	47	47	46.9
Resistance (%)							
Sales of water heating units - Gas Furnace	65.2	49.1	49.2	49.2	49.3	49.4	49.4
(%)							
Sales of water heating units - Other (%)	4.6	3.64	3.64	3.65	3.66	3.66	3.67
Sales of cooking units - Electric	49.4	49.4	49.4	49.4	49.4	49.4	49.4
Resistance (%)							
Sales of cooking units - Gas (%)	50.6	50.6	50.6	50.6	50.6	50.6	50.6
Residential HVAC investment in 2020s vs.		0.756	0.716				
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	1.53	24.1	48.5	68.4	71.7	72.1	72.1
Heat Pump (%)							
Sales of space heating units - Electric	1.94	8.79	12.8	20.1	25.2	25.9	26
Resistance (%)							
Sales of space heating units - Gas (%)	84.3	62.4	35.2	9.91	2.84	1.91	1.84
Sales of space heating units - Fossil (%)	12.2	4.76	3.52	1.51	0.221	0.018	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric	0.078	0.268	0.265	0.267	0.268	0.267	0.268
Heat Pump (%)							
Sales of water heating units - Electric	1.96	6.67	6.62	6.62	6.65	6.63	6.65
Resistance (%)							
Sales of water heating units - Gas (%)	93.3	88.5	88.5	88.6	88.5	88.5	88.5
Sales of water heating units - Other (%)	4.67	4.54	4.63	4.53	4.56	4.58	4.53
Sales of cooking units - Electric	32	34.3	34.3	34.3	34.4	34.3	34.3
Resistance (%)							
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Commercial HVAC investment in 2020s -		3,421	3,558				
Cumulative 5-yr (million \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	446	446	446	446	446	446	0
Installed thermal - Natural gas (MW)	1,620	2,286	1,958	2,627	4,157	5,313	5,232
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	110	165	219	290	375	472	584
Installed renewables - Solar - Base land use assumptions (MW)	39.5	39.5	39.5	39.5	39.5	39.5	39.5
Installed renewables - Wind - Base land use assumptions (MW)	2	2	2	2	2	2	2
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	0	1,497

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	75.2	75.2	75.2	75.2	75.2	75.2	75.2
Wind - Base land use assumptions (GWh)	8.07	8.07	8.07	8.07	8.07	8.07	8.07
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							

Table 72: REF scenario - PILLAR 6: Land sinks - Forests - REF only

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-0.69		-0.314				-0.281
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.057		-0.102				-0.106
Business-as-usual carbon sink - Total (Mt CO2e/y)	-0.747		-0.416				-0.387

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-3.48
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-34.3
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-77.3
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-13.9
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-69.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-29.2
trees outside forests (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest							-2.7
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-6.51
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-25.8
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-263
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-5.21
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-120
deforestation (1000 tC02e/y)							
Carbon sink potential - Mid - Extend							-139
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-20.4
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-139
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-56.4
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-4.05
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-46.2
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-51.2
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-581
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-6.94
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-206
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-201
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-27.3
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-208
retention of HWP (1000 tCO2e/y)							200
Carbon sink potential - High - Increase							-83.5
trees outside forests (1000 tCO2e/y)							00.0
Carbon sink potential - High - Reforest							-5.4
cropland (1000 tC02e/y)							0.4
Carbon sink potential - High - Reforest							-85.9
pasture (1000 tCO2e/y)							-03.7
Carbon sink potential - High - All (not							-901
counting overlap) (1000 tCO2e/y)							-901
Carbon sink potential - High - Restore							-76.6
·							-10.0
productivity (1000 tC02e/y)							0.567
Land impacted for carbon sink potential -							0.567
Low - Accelerate regeneration (1000							
hectares)							0/1
Land impacted for carbon sink potential -							26.1
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							_
Land impacted for carbon sink potential -							39.3
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							5.03
Low - Improve plantations (1000							
hectares)							

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

Land impacted for carbon sink potential -	2020	2025	2030	2035	2040	2045	2050
Low - Increase retention of HWP (1000 hectares)							·
Land impacted for carbon sink potential -							4.1
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0.179
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							0.423
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							15.4
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							91.5
Low - Total impacted (over 30 years)							
(1000 hectares) Land impacted for carbon sink potential -							0.85
Mid - Accelerate regeneration (1000							0.65
hectares)							
Land impacted for carbon sink potential -							2
Mid - Avoid deforestation (over 30 years)							2
(1000 hectares)							
Land impacted for carbon sink potential -							7
Mid - Extend rotation length (1000							'
hectares)							
Land impacted for carbon sink potential -							7.5
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							(
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							6.0
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0.268
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							3.06
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							30.9
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							14
Mid - Total impacted (over 30 years) (1000							
hectares) Land impacted for carbon sink potential -							1 11
·							1.13
High - Accelerate regeneration (1000 hectares)							
Land impacted for carbon sink potential -							27.8
High - Avoid deforestation (over 30 years)							21.0
(1000 hectares)							
Land impacted for carbon sink potential -							10:
High - Extend rotation length (1000							10.
hectares)							
Land impacted for carbon sink potential -							10
High - Improve plantations (1000							10
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							7.9
High - Increase trees outside forests							
(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 -							0.357
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							2.44
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							25.4
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							178
High - Total impacted (over 30 years)							
(1000 hectares)							