

Net-Zero America - Idaho data

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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

lable 1: E+ scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		4.77	0.005	0.005	0.005	0.003	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		1.41	0.8	0.651	0.591	0.39	0.216
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		14.1	13.5	10.5	6.15	2.81	1.06
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		2.74	2.6	2.03	1.23	0.617	0.3
Stations (deaths)							
Premature deaths from air pollution -		2.49	2.22	1.63	0.955	0.473	0.188
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		0.136	0.124	0.087	0.046	0.022	0.01
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		0.29	0.275	0.224	0.156	0.091	0.047
Fuel Comb - Residential - Other (deaths)		0.27	0.2.0	0.22	000	0.07.	0.0
Premature deaths from air pollution -		0.043	0.041	0.04	0.038	0.036	0.034
Fuel Comb - Comm/Institutional - Coal		0.0 10	0.0	0.0 1	0.000	0.000	0.001
(deaths)							
Premature deaths from air pollution -		1.7	1.58	1.24	0.806	0.448	0.213
Fuel Comb - Comm/Institutional - Natural		""	1.50	1.24	0.000	0.440	0.210
Gas (deaths)							
Premature deaths from air pollution -		0.257	0.209	0.166	0.128	0.092	0.06
Fuel Comb - Comm/Institutional - Oil		0.231	0.209	0.100	0.120	0.072	0.00
(deaths)							
Premature deaths from air pollution -		0.201	0.173	0.144	0.114	0.085	0.057
		0.201	0.173	0.144	0.114	0.085	0.057
Fuel Comb - Comm/Institutional - Other							
(deaths)		0.111	0.010	0.010	0.011	0.01	0.000
Premature deaths from air pollution -		0.111	0.013	0.012	0.011	0.01	0.009
Industrial Processes - Coal Mining							
(deaths)			0.00	7.0	,	, -	
Premature deaths from air pollution -		8.7	8.29	7.62	6	4.5	2.81
Industrial Processes - Oil & Gas							
Production (deaths)							
Monetary damages from air pollution -		42.3	0.049	0.049	0.042	0.027	0
Fuel Comb - Electric Generation - Coal							
(million \$2019)							
Monetary damages from air pollution -		12.5	7.09	5.76	5.23	3.46	1.91
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		125	120	93.3	54.7	25	9.4
Mobile - On-Road (million \$2019)							
Monetary damages from air pollution -		24.3	23	17.9	10.9	5.47	2.66
Gas Stations (million \$2019)							
Monetary damages from air pollution -		22.1	19.7	14.4	8.46	4.19	1.67
Fuel Comb - Residential - Natural Gas							
(million \$2019)							
Monetary damages from air pollution -		1.2	1.1	0.767	0.404	0.194	0.087
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		2.57	2.44	1.99	1.38	0.805	0.416
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		0.378	0.367	0.353	0.338	0.321	0.303
Fuel Comb - Comm/Institutional - Coal		5.5.5	0.551	2.555	5.555	5.521	2.000
(million \$2019)							
Monetary damages from air pollution -		15.1	14	11	7.14	3.96	1.88
Fuel Comb - Comm/Institutional - Natural		.5.1	'-	"		5.70	1.00
Gas (million \$2019)							
GGG (111111011 #2017)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		2.27	1.85	1.47	1.13	0.817	0.533
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		1.78	1.53	1.27	1.01	0.754	0.503
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		0.98	0.118	0.108	0.095	0.086	0.083
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		77.3	73.6	67.6	53.3	39.9	25
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)		143	185	130	77.8	26	64.7
By economic sector - Construction (jobs)		2,764	4,218	4,697	5,162	5,696	7,064
By economic sector - Manufacturing (jobs)		829	1,233	1,234	1,158	1,071	1,172
By economic sector - Mining (jobs)		581	414	265	155	83.3	39.4
By economic sector - Other (jobs)		316	454	546	676	810	1,246
By economic sector - Pipeline (jobs)		123	105	133	58.9	37.3	51.3
By economic sector - Professional (jobs)		1,446	2,404	2,739	3,337	3,950	5,122
By economic sector - Trade (jobs)		999	1,406	1,572	1,879	2,231	3,001
By economic sector - Utilities (jobs)		1,869	3,653	3,812	3,973	4,443	5,006
By resource sector - Biomass (jobs)		413	459	309	198	99.6	293
By resource sector - CO2 (jobs)		0	0	419	0	0	236
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,448	6,108	6,032	7,110	8,065	8,810
By resource sector - Natural Gas (jobs)		922	775	780	569	462	474
By resource sector - Nuclear (jobs)		303	298	173	0	0	0
By resource sector - Oil (jobs)		1,419	1,118	783	500	302	151
By resource sector - Solar (jobs)		1,863	1,783	2,063	2,260	2,450	4,426
By resource sector - Wind (jobs)		1,700	3,528	4,569	5,840	6,969	8,377
By education level - All sectors - High school diploma or less (jobs)		3,835	5,896	6,282	6,742	7,404	9,143
By education level - All sectors - Associates degree or some college (jobs)		2,795	4,443	4,840	5,301	5,933	7,360
By education level - All sectors - Bachelors degree (jobs)		1,893	2,883	3,086	3,397	3,826	4,768
By education level - All sectors - Masters or professional degree (jobs)		474	737	795	893	1,019	1,281
By education level - All sectors - Doctoral degree (jobs)		74.2	113	125	144	167	215
Related work experience - All sectors - None (jobs)		1,307	2,034	2,187	2,371	2,634	3,274
Related work experience - All sectors - Up to 1 year (jobs)		1,850	2,828	3,023	3,271	3,606	4,495
Related work experience - All sectors - 1 to 4 years (jobs)		3,255	5,056	5,431	5,931	6,624	8,218
Related work experience - All sectors - 4 to 10 years (jobs)		2,109	3,298	3,569	3,906	4,372	5,412
Related work experience - All sectors - Over 10 years (jobs)		550	855	917	998	1,112	1,369
On-the-Job Training - All sectors - None (jobs)		510	764	819	895	999	1,258
On-the-Job Training - All sectors - Up to 1 year (jobs)		5,960	9,182	9,809	10,665	11,852	14,720

Table 2. F+	scenario	- IMPACTS -	Inhe	(continued))
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Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,889	2,992	3,251	3,548	3,964	4,891
On-the-Job Training - All sectors - 4 to 10 years (jobs)		623	1,002	1,105	1,215	1,365	1,690
On-the-Job Training - All sectors - Over 10 years (jobs)		88.6	132	143	153	168	208
On-Site or In-Plant Training - All sectors - None (jobs)		1,483	2,282	2,462	2,696	3,012	3,768
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		5,408	8,342	8,914	9,687	10,763	13,353
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		1,466	2,311	2,503	2,727	3,040	3,752
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		636	1,011	1,110	1,217	1,364	1,686
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		76.8	125	137	150	168	207
Wage income - All (million \$2019)		468	739	801	883	999	1,250

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		31.7	27.2	20.5	14.1	9.1	4.81
Oil consumption - Cumulative (million							629
bbls)							
Oil production - Annual (million bbls)		0.114	0.114	0.114	0.091	0.074	0.049
Natural gas consumption - Annual (tcf)		86.5	72.9	58.5	44	27.7	19.2
Natural gas consumption - Cumulative							1,761
(tcf)							
Natural gas production - Annual (tcf)		2.13	2.02	1.76	1.48	1.18	0.915

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Commercial (PJ)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		1.28	1.35	2.22	2.38	2.18	2.3
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)	10.1	164	317	854	1,392	1,821	2,250
Vehicle stocks - LDV – All others (1000	1,876	1,787	1,697	1,237	776	439	102
units)							
Light-duty vehicle capital costs vs. REF -		361	924	1,498	2,269	2,469	2,354
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.066		0.688		3.02		4.88
units)							
Public EV charging plugs - L2 (1000 units)	0.128		16.6		72.7		118

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	9.46	20.4	40.3	80.7	88.3	89	88.8
Heat Pump (%)							
Sales of space heating units - Electric	10.7	17	13.5	5.83	4.48	4.43	4.48
Resistance (%)							
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of water heating units - Electric	0	0.814	11.1	33.7	37.7	38	38
Heat Pump (%)							
Sales of water heating units - Electric	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Resistance (%)							
Sales of water heating units - Gas Furnace	76.7	60.4	43.6	6.97	0.411	0	0
(%)							
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1
Sales of cooking units - Electric	61.7	69.9	94.8	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Residential HVAC investment in 2020s vs.		1.25	1.37				
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	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Heat Pump (%)							
Sales of space heating units - Electric	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Resistance (%)							
Sales of space heating units - Gas (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	0	0	0
Sales of water heating units - Electric	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Heat Pump (%)							
Sales of water heating units - Electric	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Resistance (%)							
Sales of water heating units - Gas (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
Sales of cooking units - Electric	41.9	54.6	83	88.6	88.9	88.9	88.9
Resistance (%)							
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s -		4,239	4,716				
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)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	1,069	1,091	1,488	1,136	1,577
Installed thermal - Nuclear (MW)	600	600	600	0	0	0	0
Installed renewables - Rooftop PV (MW)	393	606	810	1,055	1,347	1,687	2,089
Installed renewables - Solar - Base land use assumptions (MW)	1.71	1.71	1.71	1.71	1.71	1.71	1.71
Installed renewables - Wind - Base land use assumptions (MW)	952	952	13,786	18,850	23,115	27,723	28,298
Installed renewables - Wind - Constrained land use assumptions (MW)	1,034	1,034	12,987	18,481	25,008	30,182	30,390
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)		0	17.1	6.28	5.04	5.17	0.609
Capital invested - Solar PV - Constrained (billion \$2018)		0.002	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Constrained (billion \$2018)		0	14.8	7.01	7.45	5.78	0.297
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 10: E+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	4.27	4.27
Wind - Base land use assumptions (GWh)	3,041	3,041	41,571	55,922	67,439	79,837	81,354
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions	0	0	0	0	0	0	0
(GWh)							
Wind - Constrained land use assumptions (GWh)	3,306	3,306	37,783	52,357	68,321	80,402	80,877
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	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	3
(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	871
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	0	0	0	0	55.2

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	1.08
Annual - BECCS (MMT)		0	0	0	0	0	1.08
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	1.08
Cumulative - BECCS (MMT)		0	0	0	0	0	1.08
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	177	177	177	177
Spur (km)		0	0	0	0	0	332
All (km)		0	0	177	177	177	508
Cumulative investment - Trunk (million \$2018)		0	0	423	423	423	423
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	183
Cumulative investment - All (million \$2018)		0	0	423	423	423	606

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	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							-2,216
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-132
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-1,790
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-148
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,420
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-284
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2,977
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-233
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-2,279
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-11,479
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-3,320
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-463
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,224
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-217
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-2,839
retention of HWP (1000 tCO2e/y)							•
Carbon sink potential - Mid - Increase							-548
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-4,465
cropland (1000 tCO2e/y)							,
Carbon sink potential - Mid - Reforest							-1,656
pasture (1000 tC02e/y)							.,500

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

Item Carbon sink potential - Mid - Restore	2020	2025	2030	2035	2040	2045	2050 -4,520
productivity (1000 tCO2e/y)							-4,320
Carbon sink potential - Mid - All (not							-21,253
counting overlap) (1000 tCO2e/y)							,
Carbon sink potential - High - Accelerate							-4,423
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-793
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-4,659
rotation length (1000 tC02e/y)							
Carbon sink potential - High - Improve							-290
plantations (1000 tCO2e/y) Carbon sink potential - High - Increase							-4,259
retention of HWP (1000 tCO2e/y)							-4,239
Carbon sink potential - High - Increase	+						-812
trees outside forests (1000 tC02e/y)							-012
Carbon sink potential - High - Reforest							-5,953
cropland (1000 tCO2e/y)							0,700
Carbon sink potential - High - Reforest							-3,080
pasture (1000 tCO2e/y)							•
Carbon sink potential - High - All (not							-31,032
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-6,761
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							362
Low - Accelerate regeneration (1000							
hectares)							101
Land impacted for carbon sink potential -							101
Low - Avoid deforestation (over 30 years)							
(1000 hectares) Land impacted for carbon sink potential -							910
Low - Extend rotation length (1000							910
hectares)							
Land impacted for carbon sink potential -							53.5
Low - Improve plantations (1000							00.0
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							40.6
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							197
Low - Reforest cropland (1000 hectares)							15.0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.2
Land impacted for carbon sink potential -							1,356
Low - Restore productivity (1000							1,356
hectares)							
Land impacted for carbon sink potential -							3,035
Low - Total impacted (over 30 years)							0,000
(1000 hectares)							
Land impacted for carbon sink potential -							543
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							104
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,643
Mid - Extend rotation length (1000							
hectares)							

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

Table for E : Gooriar to Tiller in Grilland on	11110 101000	o (oontinaoa	,				
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							80.5
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 -							58.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							295
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							110
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,731
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,565
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							724
High - Accelerate regeneration (1000							
hectares)							107
Land impacted for carbon sink potential -							107
High - Avoid deforestation (over 30 years)							
(1000 hectares)	_						0.07/
Land impacted for carbon sink potential - High - Extend rotation length (1000							2,376
hectares)							
Land impacted for carbon sink potential -	1						107
High - Improve plantations (1000							107
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -	+						77.2
High - Increase trees outside forests							11.2
(1000 hectares)							
Land impacted for carbon sink potential -							394
High - Reforest cropland (1000 hectares)							374
Land impacted for carbon sink potential -	1					+	87.5
High - Reforest pasture (1000 hectares)							01.0
Land impacted for carbon sink potential -	+						2,241
High - Restore productivity (1000							-,- ··
hectares)							
Land impacted for carbon sink potential -	+						6,113
High - Total impacted (over 30 years)							5,
(1000 hectares)							
	1						

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 tCO2e/y)							
Carbon sink potential - Moderate							-972
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-31.4
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,003
deployment - Total (1000 tC02e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive					2.12		0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,914
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-62.8
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,976
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							1,168
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							51.8
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,220
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,284
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							104
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,387
Aggressive deployment - Total (1000							
hectares)							

Table 17: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		4.77	0.005	0.005	0.005	0.003	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		1.47	0.708	0.47	0.295	0.168	0.125
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		14.3	14.8	14.7	13.5	10.9	7.6
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		2.79	2.88	2.84	2.61	2.12	1.51
Stations (deaths)							
Premature deaths from air pollution -		2.5	2.39	2.23	1.99	1.62	1.18
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		0.138	0.144	0.13	0.105	0.083	0.06
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		0.292	0.297	0.302	0.29	0.247	0.192
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution -		0.043	0.041	0.04	0.038	0.036	0.034
Fuel Comb - Comm/Institutional - Coal							
(deaths)							
Premature deaths from air pollution -		1.71	1.73	1.7	1.58	1.34	1.05
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.224	0.196	0.17	0.145	0.123
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.185	0.169	0.151	0.133	0.116
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.105	0.014	0.013	0.012	0.01	0.006
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.68	7.98	7	6.19	5.53	3.91
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.3	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		13	6.27	4.16	2.62	1.49	1.11
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		127	131	131	120	97	67.5
Monetary damages from air pollution - Gas Stations (million \$2019)		24.7	25.5	25.2	23.1	18.8	13.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		22.2	21.2	19.8	17.6	14.3	10.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		1.23	1.27	1.15	0.933	0.734	0.535
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.59	2.64	2.68	2.57	2.19	1.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.378	0.367	0.353	0.338	0.321	0.303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		15.1	15.3	15.1	14	11.9	9.25
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		2.27	1.98	1.73	1.5	1.29	1.09
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		1.78	1.64	1.49	1.34	1.18	1.03
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.924	0.12	0.116	0.109	0.088	0.055
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		77.1	70.8	62.2	55	49.1	34.8

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		152	166	123	69	22.1	64.8
By economic sector - Construction (jobs)		2,751	4,286	4,527	4,930	6,275	8,122
By economic sector - Manufacturing		836	1,264	1,141	1,134	1,321	1,413
(jobs)							
By economic sector - Mining (jobs)		586	433	319	228	154	87
By economic sector - Other (jobs)		316	460	522	654	859	1,357
By economic sector - Pipeline (jobs)		124	104	174	73.1	59.5	90.7
By economic sector - Professional (jobs)		1,450	2,432	2,602	3,217	4,332	5,966

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

Table 10. E- Scellul 10 - IMPAG 13 - Jubs (Cul	шиши						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		1,001	1,443	1,542	1,866	2,477	3,486
By economic sector - Utilities (jobs)		1,809	3,670	3,472	3,562	4,952	5,794
By resource sector - Biomass (jobs)		426	403	300	190	94.1	284
By resource sector - CO2 (jobs)		0	0	719	0	0	405
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,314	6,161	5,080	6,266	9,012	10,130
By resource sector - Natural Gas (jobs)		922	727	715	557	523	469
By resource sector - Nuclear (jobs)		303	298	173	0	0	0
By resource sector - Oil (jobs)		1,435	1,205	1,015	815	615	380
By resource sector - Solar (jobs)		1,871	1,792	2,019	2,225	2,480	4,433
By resource sector - Wind (jobs)		1,750	3,671	4,402	5,679	7,729	10,278
By education level - All sectors - High		3,816	5,969	5,990	6,431	8,264	10,569
school diploma or less (jobs)							
By education level - All sectors -		2,775	4,503	4,602	5,037	6,599	8,518
Associates degree or some college (jobs)							
By education level - All sectors -		1,885	2,925	2,952	3,268	4,272	5,552
Bachelors degree (jobs)							
By education level - All sectors - Masters		472	746	758	857	1,132	1,490
or professional degree (jobs)							
By education level - All sectors - Doctoral		74.3	115	120	140	185	250
degree (jobs)							
Related work experience - All sectors -		1,300	2,060	2,085	2,260	2,935	3,787
None (jobs)							
Related work experience - All sectors - Up		1,844	2,864	2,881	3,126	4,015	5,192
to 1 year (jobs)							
Related work experience - All sectors - 1		3,238	5,124	5,178	5,667	7,388	9,530
to 4 years (jobs)							
Related work experience - All sectors - 4		2,096	3,344	3,404	3,727	4,872	6,281
to 10 years (jobs)							
Related work experience - All sectors -		546	867	873	953	1,243	1,591
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		508	775	785	861	1,112	1,455
(jobs)							
On-the-Job Training - All sectors - Up to 1		5,934	9,303	9,350	10,202	13,231	17,063
year (jobs)					0.074		
On-the-Job Training - All sectors - 1 to 4		1,875	3,032	3,095	3,371	4,411	5,667
years (jobs)		(10					
On-the-Job Training - All sectors - 4 to 10		618	1,015	1,054	1,151	1,511	1,954
years (jobs)							
On-the-Job Training - All sectors - Over 10		88.4	134	137	147	187	242
years (jobs)		1 / 70	0.010	0.054	0.500	0.050	
On-Site or In-Plant Training - All sectors -		1,478	2,312	2,351	2,580	3,352	4,364
None (jobs)						10.01=	
On-Site or In-Plant Training - All sectors -		5,382	8,453	8,496	9,262	12,015	15,477
Up to 1 year (jobs)		4.5.	0.010	0.000	0.500	0.007	
On-Site or In-Plant Training - All sectors -		1,456	2,342	2,383	2,593	3,386	4,346
1 to 4 years (jobs)			1 005	10/1	4457	1 510	1050
On-Site or In-Plant Training - All sectors -		631	1,025	1,061	1,156	1,513	1,953
4 to 10 years (jobs)		7/4	407	400	410	107	0/0
On-Site or In-Plant Training - All sectors -		76.1	127	130	142	187	240
Over 10 years (jobs)		,,,,	7/0	7/0	0.40	4 445	1 / 50
Wage income - All (million \$2019)		465	749	763	843	1,115	1,452

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	142	130	120	112	103	93
Final energy use - Residential (PJ)	71.3	68.1	66.1	64.1	61.5	57.8	53.1
Final energy use - Commercial (PJ)	49	49.1	48.9	48.7	48	47.1	46.1
Final energy use - Industry (PJ)	165	176	181	184	188	193	197

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		1.09	1.13	1.39	1.45	2.09	2.22
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.84	52.9	98.1	307	516	979	1,441
Vehicle stocks - LDV – All others (1000 units)	1,884	1,884	1,884	1,787	1,690	1,302	915
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	58.3	123	414	1,303	1,898
Public EV charging plugs - DC Fast (1000 units)	0.066		0.213		1.12		3.13
Public EV charging plugs - L2 (1000 units)	0.128		5.12		27		75.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	9.46	19.2	21.1	27.7	43.3	62.6	73.4
Heat Pump (%)							
Sales of space heating units - Electric	10.7	17.2	16.8	15.7	12.9	9.42	7.34
Resistance (%)							
Sales of space heating units - Gas (%)	73.4	53	51.3	46.6	35.6	21.5	13.1
Sales of space heating units - Fossil (%)	6.36	10.7	10.8	9.99	8.15	6.52	6.16
Sales of water heating units - Electric	0	0.373	1.39	4.79	13	23.4	29.5
Heat Pump (%)							
Sales of water heating units - Electric	21.3	36.4	37.1	39.3	44.4	50.9	54.7
Resistance (%)							
Sales of water heating units - Gas Furnace	76.7	61.1	59.4	53.8	40.4	23.6	13.6
(%)							
Sales of water heating units - Other (%)	1.97	2.1	2.1	2.11	2.11	2.11	2.11
Sales of cooking units - Electric	61.6	62.6	66.1	75.4	88.3	96.2	99
Resistance (%)							
Sales of cooking units - Gas (%)	38.4	37.4	33.9	24.6	11.7	3.79	1.02
Residential HVAC investment in 2020s vs.		1.25	1.37				
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	3.53	7.33	9.61	17.1	35.2	58.2	71.6
Heat Pump (%)							
Sales of space heating units - Electric	3.3	3.45	3.58	4.06	5.22	6.69	7.54
Resistance (%)							
Sales of space heating units - Gas (%)	92.1	89	86.6	78.7	59.5	35.1	20.8
Sales of space heating units - Fossil (%)	1.07	0.256	0.242	0.19	0.113	0.063	0.046
Sales of water heating units - Electric	0.03	0.512	1.83	6.23	16.9	30.4	38.3
Heat Pump (%)							
Sales of water heating units - Electric	1.46	1.95	3.27	7.65	18.2	31.6	39.5
Resistance (%)							
Sales of water heating units - Gas (%)	98.1	97.2	94.5	85.7	64.5	37.6	21.8
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
Sales of cooking units - Electric	41.9	46.2	50.2	60.8	75.4	84.6	87.8
Resistance (%)							
Sales of cooking units - Gas (%)	58.1	53.8	49.8	39.2	24.6	15.4	12.2
Commercial HVAC investment in 2020s -		4,239	4,714				
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)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	1,069	1,063	1,484	1,136	1,176
Installed thermal - Nuclear (MW)	600	600	600	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							-2,216
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-132
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-1,790
rotation length (1000 tCO2e/y)							•
Carbon sink potential - Low - Improve							-148
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,420
retention of HWP (1000 tCO2e/y)							.,
Carbon sink potential - Low - Increase							-284
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2,977
cropland (1000 tCO2e/y)							_,,
Carbon sink potential - Low - Reforest							-233
pasture (1000 tC02e/y)							200
Carbon sink potential - Low - Restore		+		+			-2,279
productivity (1000 tC02e/y)							-2,219
Carbon sink potential - Low - All (not							-11,479
counting overlap) (1000 tC02e/y)							-11,419
							-3,320
Carbon sink potential - Mid - Accelerate							-3,320
regeneration (1000 tCO2e/y)							/ / 0
Carbon sink potential - Mid - Avoid							-463
deforestation (1000 tCO2e/y)							0.007
Carbon sink potential - Mid - Extend							-3,224
rotation length (1000 tC02e/y)							04=
Carbon sink potential - Mid - Improve							-217
plantations (1000 tC02e/y)							
Carbon sink potential - Mid - Increase							-2,839
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-548
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-4,465
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,656
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-4,520
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-21,253
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-4,423
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-793
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-4,659
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-290
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,259
retention of HWP (1000 tCO2e/y)							•
Carbon sink potential - High - Increase							-812
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-5,953
cropland (1000 tCO2e/y)							2,.00
or opiana (1000 to026/y)							

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

Item Carbon sink potential - High - Reforest	2020	2025	2030	2035	2040	2045	2050 -3,080
pasture (1000 tC02e/y)							-3,080
Carbon sink potential - High - All (not							-31,032
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,761
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000							362
hectares)							
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years)							101
(1000 hectares)							
Land impacted for carbon sink potential -							910
Low - Extend rotation length (1000							
hectares) Land impacted for carbon sink potential -							53.5
Low - Improve plantations (1000							55.5
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							40.6
Low - Increase trees outside forests (1000 hectares)							
Land impacted for carbon sink potential -							197
Low - Reforest cropland (1000 hectares)							171
Land impacted for carbon sink potential -							15.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,356
Low - Restore productivity (1000							
hectares) Land impacted for carbon sink potential -							3,035
Low - Total impacted (over 30 years)							3,033
(1000 hectares)							
Land impacted for carbon sink potential -							543
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							104
Mid - Avoid deforestation (over 30 years)							
(1000 hectares) Land impacted for carbon sink potential -							1,643
Mid - Extend rotation length (1000							1,043
hectares)							
Land impacted for carbon sink potential -							80.5
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 -							58.9
Mid - Increase trees outside forests (1000							30.7
hectares)							
Land impacted for carbon sink potential -							295
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							110
Mid - Reforest pasture (1000 hectares)							0.704
Land impacted for carbon sink potential -							2,731
Mid - Restore productivity (1000 hectares)							
Land impacted for carbon sink potential -							5,565
Mid - Total impacted (over 30 years) (1000							0,000
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							724
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							107
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,376
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							107
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 -							77.2
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							394
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							87.5
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,241
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,113
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)							
Carbon sink potential - Moderate							-972
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-31.4
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,003
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,914
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-62.8
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,976
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							1,168
deployment - Cropland measures (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate							51.8
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,220
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,284
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							104
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,387
Aggressive deployment - Total (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.28	0.659	0.364	0.285	0.169	0.088
Premature deaths from air pollution - Mobile - On-Road (deaths)		14.1	13.5	10.5	6.15	2.81	1.06
Premature deaths from air pollution - Gas Stations (deaths)		2.74	2.6	2.03	1.23	0.617	0.3
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		2.49	2.22	1.63	0.955	0.473	0.188
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.136	0.124	0.087	0.046	0.022	0.01
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.29	0.275	0.224	0.156	0.091	0.047
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.043	0.041	0.04	0.038	0.036	0.034
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.7	1.58	1.24	0.806	0.448	0.213
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.209	0.166	0.128	0.092	0.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.173	0.144	0.114	0.085	0.057
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.127	0.013	0.012	0.011	0.01	0.002
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.55	8.16	7.12	5.19	3.2	0.478
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.3	0.049	0.049	0.042	0.027	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		11.3	5.84	3.23	2.52	1.5	0.779
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		125	120	93.3	54.7	25	9.4
Monetary damages from air pollution - Gas Stations (million \$2019)		24.3	23	17.9	10.9	5.47	2.66
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		22.1	19.7	14.4	8.46	4.19	1.67
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		1.2	1.1	0.767	0.404	0.194	0.087
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.57	2.44	1.99	1.38	0.805	0.416
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.378	0.367	0.353	0.338	0.321	0.303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		15.1	14	11	7.14	3.96	1.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		2.27	1.85	1.47	1.13	0.817	0.533
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		1.78	1.53	1.27	1.01	0.754	0.503
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.12	0.118	0.107	0.093	0.085	0.02
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		76	72.5	63.2	46	28.4	4.25

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		143	187	130	73.4	24.1	63.3
By economic sector - Construction (jobs)		2,829	4,369	5,391	7,178	8,263	11,953
By economic sector - Manufacturing		913	1,313	1,528	1,726	1,652	2,688
(jobs)							
By economic sector - Mining (jobs)		576	406	246	129	46.1	6.33
By economic sector - Other (jobs)		322	469	627	866	1,087	1,783
By economic sector - Pipeline (jobs)		121	101	71	44.8	21.9	8.7
By economic sector - Professional (jobs)		1,488	2,526	3,332	4,712	5,985	8,934
By economic sector - Trade (jobs)		1,017	1,460	1,863	2,572	3,277	5,050
By economic sector - Utilities (jobs)		1,901	3,656	4,262	6,052	6,717	9,774
By resource sector - Biomass (jobs)		398	471	304	190	93.9	295
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,519	6,244	7,596	11,269	12,420	18,412
By resource sector - Natural Gas (jobs)		891	780	665	452	379	338
By resource sector - Nuclear (jobs)		303	176	0	0	0	0
By resource sector - Oil (jobs)		1,420	1,106	755	437	160	0.805
By resource sector - Solar (jobs)		1,911	1,844	2,097	2,356	2,582	4,717
By resource sector - Wind (jobs)		1,864	3,867	6,034	8,650	11,439	16,497
By education level - All sectors - High		3,934	6,066	7,213	9,529	10,854	16,123
school diploma or less (jobs)							

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors -		2,873	4,582	5,588	7,542	8,766	13,035
Associates degree or some college (jobs)							
By education level - All sectors -		1,941	2,965	3,575	4,814	5,683	8,464
Bachelors degree (jobs)							
By education level - All sectors - Masters		486	758	927	1,267	1,520	2,266
or professional degree (jobs)							
By education level - All sectors - Doctoral		76	117	147	202	250	373
degree (jobs)							
Related work experience - All sectors -		1,340	2,094	2,514	3,357	3,873	5,766
None (jobs)							
Related work experience - All sectors - Up		1,900	2,913	3,488	4,611	5,299	7,896
to 1 year (jobs)							
Related work experience - All sectors - 1		3,340	5,204	6,268	8,413	9,780	14,547
to 4 years (jobs)							
Related work experience - All sectors - 4		2,165	3,397	4,120	5,550	6,471	9,600
to 10 years (jobs)							
Related work experience - All sectors -		565	879	1,060	1,422	1,649	2,451
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		522	785	944	1,257	1,468	2,190
(jobs)							
On-the-Job Training - All sectors - Up to 1		6,118	9,452	11,330	15,107	17,491	26,072
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		1,939	3,082	3,744	5,049	5,856	8,673
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		638	1,033	1,269	1,725	2,012	2,962
years (jobs)							
On-the-Job Training - All sectors - Over 10		91.3	136	164	214	246	364
years (jobs)							
On-Site or In-Plant Training - All sectors -		1,524	2,352	2,845	3,808	4,449	6,626
None (jobs)							
On-Site or In-Plant Training - All sectors -		5,551	8,584	10,291	13,728	15,878	23,656
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		1,505	2,380	2,882	3,877	4,486	6,650
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		651	1,042	1,274	1,726	2,011	2,960
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		78.9	129	159	215	249	369
Over 10 years (jobs)							
Wage income - All (million \$2019)		480	760	923	1,256	1,478	2,225

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Commercial (PJ)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		1.28	1.35	2.22	2.38	2.18	2.3
Cumulative 5-yr (billion \$2018)							

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

Vehicle stocks - LDV - All others (1000 1,876 1,787 1,697 1,237 776 439 10	Item	2020	2025	2030	2035	2040	2045	2050
	Vehicle stocks - LDV – EV (1000 units)	10.1	164	317	854	1,392	1,821	2,250
	Vehicle stocks - LDV – All others (1000 units)	1,876	1,787	1,697	1,237	776	439	102

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs vs. REF -		361	924	1,498	2,269	2,469	2,354
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.066		0.688		3.02		4.88
units)							
Public EV charging plugs - L2 (1000 units)	0.128		16.6		72.7		118

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	9.46	20.4	40.3	80.7	88.3	89	88.8
Heat Pump (%)							
Sales of space heating units - Electric	10.7	17	13.5	5.83	4.48	4.43	4.48
Resistance (%)							
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of water heating units - Electric	0	0.814	11.1	33.7	37.7	38	38
Heat Pump (%)							
Sales of water heating units - Electric	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Resistance (%)							
Sales of water heating units - Gas Furnace	76.7	60.4	43.6	6.97	0.411	0	0
(%)							
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1
Sales of cooking units - Electric	61.7	69.9	94.8	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Residential HVAC investment in 2020s vs.		1.25	1.37				
REF - Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Heat Pump (%)							
Sales of space heating units - Electric	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Resistance (%)							
Sales of space heating units - Gas (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	0	0	0
Sales of water heating units - Electric	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Heat Pump (%)							
Sales of water heating units - Electric	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Resistance (%)							
Sales of water heating units - Gas (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
Sales of cooking units - Electric	41.9	54.6	83	88.6	88.9	88.9	88.9
Resistance (%)							
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s -		4,239	4,716				
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)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	1,290	1,091	1,488	1,143	1,176
Installed thermal - Nuclear (MW)	600	600	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	393	606	810	1,055	1,347	1,687	2,089
Installed renewables - Solar - Base land	1.71	1.71	1.71	1.71	1.71	1.71	1.71
use assumptions (MW)							
Installed renewables - Wind - Base land	952	952	14,294	22,314	34,448	42,003	55,310
use assumptions (MW)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar -	1.71	1.71	1.71	1.71	1.71	1.71	5,579
Constrained land use assumptions (MW)							
Installed renewables - Wind - Constrained	1,456	1,456	13,618	23,353	33,346	39,640	58,104
land use assumptions (MW)							
Installed renewables - Offshore Wind -	0	0	0	0	0	0	0
Constrained land use assumptions (MW)							
Capital invested - Wind - Base (billion		0	17.8	9.95	14.3	8.47	14.1
\$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	4.27	4.27
Wind - Base land use assumptions (GWh)	3,041	3,041	43,012	65,295	97,655	117,079	150,061
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions	8.54	8.54	8.54	8.54	8.54	8.54	23,418
(GWh)							
Wind - Constrained land use assumptions (GWh)	8,434	8,434	78,211	128,207	174,357	201,000	269,797
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-2,216
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-132
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-1,790
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-148
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,420
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-284
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2,977
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-233
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-2,279
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-11,479
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-3,320
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-463
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,224
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-217
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-2,839
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-548
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-4,465
cropland (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest							-1,656
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-4,520
productivity (1000 tCO2e/y)							01.050
Carbon sink potential - Mid - All (not							-21,253
counting overlap) (1000 tC02e/y)							/ / 00
Carbon sink potential - High - Accelerate							-4,423
regeneration (1000 tCO2e/y)							700
Carbon sink potential - High - Avoid							-793
deforestation (1000 tC02e/y)							/ / [0
Carbon sink potential - High - Extend							-4,659
rotation length (1000 tCO2e/y)							-290
Carbon sink potential - High - Improve							-290
plantations (1000 tC02e/y)							/ 050
Carbon sink potential - High - Increase							-4,259
retention of HWP (1000 tCO2e/y) Carbon sink potential - High - Increase							-812
,							-012
trees outside forests (1000 tC02e/y) Carbon sink potential - High - Reforest							F 0F0
							-5,953
cropland (1000 tCO2e/y)							-3,080
Carbon sink potential - High - Reforest							-3,080
pasture (1000 tC02e/y)							01.000
Carbon sink potential - High - All (not							-31,032
counting overlap) (1000 tC02e/y)							/ 7/1
Carbon sink potential - High - Restore							-6,761
productivity (1000 tC02e/y)							0/0
Land impacted for carbon sink potential -							362
Low - Accelerate regeneration (1000							
hectares)							101
Land impacted for carbon sink potential -							101
Low - Avoid deforestation (over 30 years) (1000 hectares)							
Land impacted for carbon sink potential -							910
Low - Extend rotation length (1000							910
hectares)							
Land impacted for carbon sink potential -							53.5
Low - Improve plantations (1000							33.3
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							40.6
Low - Increase trees outside forests							40.0
(1000 hectares)							
Land impacted for carbon sink potential -							197
Low - Reforest cropland (1000 hectares)							171
Land impacted for carbon sink potential -							15.2
Low - Reforest pasture (1000 hectares)							10.2
Land impacted for carbon sink potential -							1,356
Low - Restore productivity (1000							1,000
hectares)							
Land impacted for carbon sink potential -							3,035
Low - Total impacted (over 30 years)			[0,000
(1000 hectares)			[
Land impacted for carbon sink potential -			-		-		543
Mid - Accelerate regeneration (1000			[545
hectares)			[
Land impacted for carbon sink potential -							104
Mid - Avoid deforestation (over 30 years)			[104
			I				

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,643
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							3.08
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							(
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							58.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							295
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							110
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -		+					2,73
Mid - Restore productivity (1000							_,. 0
hectares)							
Land impacted for carbon sink potential -							5,56
Mid - Total impacted (over 30 years) (1000							3,30
hectares)							
Land impacted for carbon sink potential -		+					72
High - Accelerate regeneration (1000							12
hectares)							
Land impacted for carbon sink potential -							10
High - Avoid deforestation (over 30 years)							10
(1000 hectares)							
Land impacted for carbon sink potential -							0.07
							2,37
High - Extend rotation length (1000							
hectares)							10
Land impacted for carbon sink potential -							10
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							(
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							77.
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							39
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -	\neg	T	T	T		T	87.
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,24
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,11
High - Total impacted (over 30 years)							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-972
deployment - Cropland measures (1000							
tCO2e/y)							

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

Table 37: E+RE+ Scenario - PILLAR 6: Land	•	•	•				
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-31.4
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,003
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,914
deployment - Cropland measures (1000							
tC02e/y)							
Carbon sink potential - Aggressive							-62.8
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,976
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							1,168
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							51.8
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,220
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,284
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							104
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							2,387
Aggressive deployment - Total (1000							
hectares)							
Table 38: E+RE- scenario - IMPACTS - Hea							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		4.77	0.005	0.005	0.005	0.003	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		1.45	0.77	0.794	0.919	0.48	0.151
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		14.1	13.5	10.5	6.15	2.81	1.06
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		2.74	2.6	2.03	1.23	0.617	0.3
Stations (deaths)							
Premature deaths from air pollution -		2.49	2.22	1.63	0.955	0.473	0.188
Fuel Comb Decidential Natural Con							

0.136

0.29

0.124

0.275

0.087

0.224

0.046

0.156

0.022

0.091

0.01

0.047

Fuel Comb - Residential - Natural Gas

Premature deaths from air pollution -

Fuel Comb - Residential - Other (deaths)

Fuel Comb - Residential - Oil (deaths)

Premature deaths from air pollution -

(deaths)

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -	2020	0.043	0.041	0.04	0.038	0.036	0.034
Fuel Comb - Comm/Institutional - Coal (deaths)		3.0-10	3.041	3.04	0.000	0.000	3.004
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.7	1.58	1.24	0.806	0.448	0.213
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.209	0.166	0.128	0.092	0.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.173	0.144	0.114	0.085	0.057
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.095	0.013	0.012	0.011	0.01	0.002
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.81	8.64	8.55	7.32	6.17	4.63
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.3	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		12.8	6.82	7.04	8.14	4.25	1.34
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		125	120	93.3	54.7	25	9.4
Monetary damages from air pollution - Gas Stations (million \$2019)		24.3	23	17.9	10.9	5.47	2.66
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		22.1	19.7	14.4	8.46	4.19	1.67
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		1.2	1.1	0.767	0.404	0.194	0.087
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.57	2.44	1.99	1.38	0.805	0.416
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.378	0.367	0.353	0.338	0.321	0.303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		15.1	14	11	7.14	3.96	1.88
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		2.27	1.85	1.47	1.13	0.817	0.533
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		1.78	1.53	1.27	1.01	0.754	0.503
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.837	0.116	0.108	0.094	0.087	0.02
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		78.2	76.7	75.9	65	54.8	41.1

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		149	169	121	71.7	24.9	65.8
By economic sector - Construction (jobs)		2,771	3,442	3,657	3,775	3,581	4,532

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

Table 39: E+RE-Scendino - IMPAG13 - Jobs (C	-					
Item	2020 2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing	887	990	961	929	674	741
(jobs)						
By economic sector - Mining (jobs)	586	422	283	176	106	66.2
By economic sector - Other (jobs)	314	386	428	520	574	926
By economic sector - Pipeline (jobs)	126	110	194	78.6	60.5	102
By economic sector - Professional (jobs)	1,428	1,868	1,830	2,138	2,212	2,794
By economic sector - Trade (jobs)	989	1,160	1,133	1,280	1,327	1,756
By economic sector - Utilities (jobs)	1,938	2,918	3,033	3,044	2,659	2,954
By resource sector - Biomass (jobs)	402	403	296	193	100	290
By resource sector - CO2 (jobs)	0	0	813	0	0	458
By resource sector - Coal (jobs)	2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)	2,568	4,639	4,215	5,383	4,596	4,737
By resource sector - Natural Gas (jobs)	966	844	869	744	664	622
By resource sector - Nuclear (jobs)	303	298	173	0	0	0
By resource sector - Oil (jobs)	1,419	1,118	783	500	316	209
By resource sector - Solar (jobs)	1,915	1,757	1,961	2,161	2,320	4,332
By resource sector - Wind (jobs)	1,614	2,404	2,531	3,030	3,222	3,289
By education level - All sectors - High	3,891	4,833	4,909	5,007	4,600	5,731
school diploma or less (jobs)						
By education level - All sectors -	2,836	3,602	3,728	3,867	3,628	4,513
Associates degree or some college (jobs)						
By education level - All sectors -	1,910	2,344	2,326	2,419	2,292	2,825
Bachelors degree (jobs)						
By education level - All sectors - Masters	477	595	588	624	602	745
or professional degree (jobs)						
By education level - All sectors - Doctoral	73.8	90.6	88.3	96.4	96.8	122
degree (jobs)						
Related work experience - All sectors -	1,325	1,662	1,699	1,745	1,624	2,029
None (jobs)						
Related work experience - All sectors - Up	1,873	2,314	2,333	2,400	2,223	2,790
to 1 year (jobs)						
Related work experience - All sectors - 1	3,297	4,117	4,169	4,314	4,041	5,010
to 4 years (jobs)						
Related work experience - All sectors - 4	2,135	2,678	2,736	2,828	2,656	3,280
to 10 years (jobs)						
Related work experience - All sectors -	557	694	703	725	675	827
Over 10 years (jobs)						
On-the-Job Training - All sectors - None	514	626	628	649	613	774
(jobs)						
On-the-Job Training - All sectors - Up to 1	6,038	7,490	7,533	7,776	7,240	8,995
year (jobs)						
On-the-Job Training - All sectors - 1 to 4	1,916	2,429	2,512	2,591	2,425	2,997
years (jobs)						
On-the-Job Training - All sectors - 4 to 10	630	812	856	885	836	1,040
years (jobs)						
On-the-Job Training - All sectors - Over 10	89.7	108	111	112	104	130
years (jobs)						
On-Site or In-Plant Training - All sectors -	1,500	1,857	1,881	1,946	1,835	2,298
None (jobs)						
On-Site or In-Plant Training - All sectors -	5,479	6,806	6,857	7,075	6,582	8,172
Up to 1 year (jobs)						
On-Site or In-Plant Training - All sectors -	1,487	1,879	1,935	1,996	1,863	2,306
1 to 4 years (jobs)						
On-Site or In-Plant Training - All sectors -	643	821	861	885	835	1,035
4 to 10 years (jobs)						
On-Site or In-Plant Training - All sectors -	78	101	106	110	103	127
Over 10 years (jobs)						
Wage income - All (million \$2019)	474	602	615	642	607	757

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Commercial (PJ)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		1.28	1.35	2.22	2.38	2.18	2.3
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)	10.1	164	317	854	1,392	1,821	2,250
Vehicle stocks - LDV – All others (1000 units)	1,876	1,787	1,697	1,237	776	439	102
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		361	924	1,498	2,269	2,469	2,354
Public EV charging plugs - DC Fast (1000 units)	0.066		0.688		3.02		4.88
Public EV charging plugs - L2 (1000 units)	0.128		16.6		72.7		118

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	9.46	20.4	40.3	80.7	88.3	89	88.8
Heat Pump (%)							
Sales of space heating units - Electric	10.7	17	13.5	5.83	4.48	4.43	4.48
Resistance (%)							
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of water heating units - Electric	0	0.814	11.1	33.7	37.7	38	38
Heat Pump (%)							
Sales of water heating units - Electric	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Resistance (%)							
Sales of water heating units - Gas Furnace	76.7	60.4	43.6	6.97	0.411	0	0
(%)							
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1
Sales of cooking units - Electric	61.7	69.9	94.8	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Residential HVAC investment in 2020s vs.		1.25	1.37				
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	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Heat Pump (%)							
Sales of space heating units - Electric	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Resistance (%)							
Sales of space heating units - Gas (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	0	0	0
Sales of water heating units - Electric	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Heat Pump (%)							
Sales of water heating units - Electric	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Resistance (%)							
Sales of water heating units - Gas (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric	41.9	54.6	83	88.6	88.9	88.9	88.9
Resistance (%)							
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s -		4,239	4,716				
Cumulative 5-yr (million \$2018)							

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

		,	5 - 1	,			
Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,170	1,170	1,170	789	1,189	837	1,057
Installed thermal - Nuclear (MW)	600	600	600	0	0	0	0
Installed renewables - Rooftop PV (MW)	393	606	810	1,055	1,347	1,687	2,089
Installed renewables - Solar - Base land	1.71	1.71	1.71	1.71	1.71	1.71	1.71
use assumptions (MW)							
Installed renewables - Wind - Base land	952	1,820	10,104	13,951	19,089	20,990	20,990
use assumptions (MW)							
Installed renewables - Solar -	1.71	1.71	1.71	1.71	1.71	223	838
Constrained land use assumptions (MW)							
Installed renewables - Wind - Constrained	1,317	2,486	11,110	13,021	18,974	22,030	22,030
land use assumptions (MW)							
Installed renewables - Offshore Wind -	0	0	0	0	0	0	0
Constrained land use assumptions (MW)							
Capital invested - Solar PV - Base (billion		0	0	0	0	0	0
\$2018)							
Capital invested - Wind - Base (billion		1.28	11	4.77	6.07	2.13	0
\$2018)							
Capital invested - Solar PV - Constrained		0	0	0	0	0.217	0.57
(billion \$2018)							
Capital invested - Wind - Constrained		1.72	11.5	2.37	7.03	3.43	0
(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)	4.27	4.27	4.27	4.27	4.27	4.27	4.27
Wind - Base land use assumptions (GWh)	3,041	5,811	30,893	42,045	56,581	61,738	61,738
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	470	1,775
Wind - Constrained land use assumptions (GWh)	4,217	7,876	32,710	37,875	53,612	61,273	61,273
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tC02e/y)							-2,216
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)							-132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,420

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

Item Combon sink notantial Law Increase	2020	2025	2030	2035	2040	2045	205
Carbon sink potential - Low - Increase							-28
trees outside forests (1000 tC02e/y)							0.07
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,97
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-23
Carbon sink potential - Low - Restore productivity (1000 tC02e/y)							-2,27
Carbon sink potential - Low - All (not							-11,47
counting overlap) (1000 tCO2e/y) Carbon sink potential - Mid - Accelerate							-3,32
regeneration (1000 tC02e/y) Carbon sink potential - Mid - Avoid							-46
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,22
Carbon sink potential - Mid - Improve plantations (1000 tC02e/y)							-21
Carbon sink potential - Mid - Increase							-2,83
retention of HWP (1000 tC02e/y) Carbon sink potential - Mid - Increase							-54
trees outside forests (1000 tC02e/y) Carbon sink potential - Mid - Reforest							-4,46
cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest							-1,65
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,52
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-21,25
Carbon sink potential - High - Accelerate							-4,42
regeneration (1000 tCO2e/y) Carbon sink potential - High - Avoid							-79
deforestation (1000 tC02e/y) Carbon sink potential - High - Extend							-4,65
rotation length (1000 tCO2e/y) Carbon sink potential - High - Improve							-29
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,25
Carbon sink potential - High - Increase trees outside forests (1000 tC02e/y)							-81
Carbon sink potential - High - Reforest							-5,95
cropland (1000 tCO2e/y) Carbon sink potential - High - Reforest							-3,08
pasture (1000 tCO2e/y) Carbon sink potential - High - All (not							-31,03
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,76
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000							36
hectares)							
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years)							10
(1000 hectares) Land impacted for carbon sink potential -							91
Low - Extend rotation length (1000 hectares)							71

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000							53.5
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							_
hectares)							
Land impacted for carbon sink potential -							40.6
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							197
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							15.2
Low - Reforest pasture (1000 hectares) Land impacted for carbon sink potential -							1,356
Low - Restore productivity (1000							1,336
hectares)							
Land impacted for carbon sink potential -							3,035
Low - Total impacted (over 30 years)							0,000
(1000 hectares)							
Land impacted for carbon sink potential -							543
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							104
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,643
Mid - Extend rotation length (1000							
hectares) Land impacted for carbon sink potential -							80.5
Mid - Improve plantations (1000 hectares)							80.5
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							Ü
hectares)							
Land impacted for carbon sink potential -							58.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							295
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							110
Mid - Reforest pasture (1000 hectares)							0.701
Land impacted for carbon sink potential -							2,731
Mid - Restore productivity (1000 hectares)							
Land impacted for carbon sink potential -							5,565
Mid - Total impacted (over 30 years) (1000							0,000
hectares)							
Land impacted for carbon sink potential -							724
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							107
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -						T	2,376
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							107
High - Improve plantations (1000							
hectares) Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							U
	I .	1	1		1		

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							77.2
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							394
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							87.5
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,241
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,113
High - Total impacted (over 30 years)							
(1000 hectares)							

Table 48: E+RE- scenario - PILLAR 6: Land Item	2020	2025	2030	2035	2040	2045	2050
	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy							U
grasses (1000 tCO2e/y)							
							-972
Carbon sink potential - Moderate							-912
deployment - Cropland measures (1000							
tCO2e/y)							01./
Carbon sink potential - Moderate							-31.4
deployment - Permanent conservation							
cover (1000 tC02e/y)							1.000
Carbon sink potential - Moderate							-1,003
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,914
deployment - Cropland measures (1000							
tC02e/y)							
Carbon sink potential - Aggressive							-62.8
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,976
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							1,168
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							51.8
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,220
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,284
Aggressive deployment - Cropland							,
measures (1000 hectares)							
Land impacted for carbon sink -							104
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							

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

	•	•	•				
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,387
· · · · · · · · · · · · · · · · ·							

Tah	le 49·	F-R+	scenario	n – T	MΡΔ	CTS -	Heal	th
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Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal		4.77	0.005	0.005	0.005	0.003	0
(deaths)							
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		1.39	0.682	0.497	0.416	0.267	0.174
Premature deaths from air pollution - Mobile - On-Road (deaths)		14.3	14.8	14.7	13.5	10.9	7.6
Premature deaths from air pollution - Gas Stations (deaths)		2.79	2.88	2.84	2.61	2.12	1.51
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		2.5	2.39	2.23	1.99	1.62	1.18
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.138	0.144	0.13	0.105	0.083	0.06
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.292	0.297	0.302	0.29	0.247	0.192
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.043	0.041	0.04	0.038	0.036	0.034
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		1.71	1.73	1.7	1.58	1.34	1.05
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.257	0.224	0.196	0.17	0.145	0.123
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.201	0.185	0.169	0.151	0.133	0.116
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.11	0.014	0.013	0.012	0.011	0.01
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.68	7.98	7	6.19	5.53	3.91
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		42.3	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		12.3	6.04	4.41	3.69	2.37	1.54
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		127	131	131	120	97	67.5
Monetary damages from air pollution - Gas Stations (million \$2019)		24.7	25.5	25.2	23.1	18.8	13.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		22.2	21.2	19.8	17.6	14.3	10.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		1.23	1.27	1.15	0.933	0.734	0.535
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.59	2.64	2.68	2.57	2.19	1.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal		0.378	0.367	0.353	0.338	0.321	0.303
(million \$2019)							
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		15.1	15.3	15.1	14	11.9	9.25
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		2.27	1.98	1.73	1.5	1.29	1.09
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		1.78	1.64	1.49	1.34	1.18	1.03
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.973	0.119	0.116	0.11	0.101	0.092
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		77.1	70.8	62.2	55	49.1	34.8

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		147	166	122	70.9	22.6	73.9
By economic sector - Construction (jobs)		2,765	4,329	4,391	4,271	5,054	6,679
By economic sector - Manufacturing		839	1,275	1,062	903	1,001	1,200
(jobs)							
By economic sector - Mining (jobs)		584	433	320	237	154	82.3
By economic sector - Other (jobs)		317	464	509	587	729	1,180
By economic sector - Pipeline (jobs)		123	104	177	75.4	58.5	89.6
By economic sector - Professional (jobs)		1,460	2,469	2,505	2,725	3,387	4,687
By economic sector - Trade (jobs)		1,007	1,461	1,494	1,620	1,981	2,787
By economic sector - Utilities (jobs)		1,815	3,694	3,322	2,993	3,880	4,736
By resource sector - Biomass (jobs)		419	403	300	198	101	365
By resource sector - CO2 (jobs)		0	0	738	0	0	416
By resource sector - Coal (jobs)		2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)		2,330	6,163	4,816	5,192	6,994	8,138
By resource sector - Natural Gas (jobs)		911	757	674	564	509	536
By resource sector - Nuclear (jobs)		303	298	173	0	0	0
By resource sector - Oil (jobs)		1,436	1,205	1,015	849	619	360
By resource sector - Solar (jobs)		1,869	1,790	1,991	2,164	2,383	4,417
By resource sector - Wind (jobs)		1,789	3,778	4,196	4,515	5,662	7,284
By education level - All sectors - High		3,828	6,021	5,780	5,531	6,602	8,693
school diploma or less (jobs)							
By education level - All sectors -		2,787	4,547	4,433	4,306	5,243	6,946
Associates degree or some college (jobs)							
By education level - All sectors -		1,893	2,955	2,845	2,794	3,383	4,482
Bachelors degree (jobs)							
By education level - All sectors - Masters		474	755	731	732	894	1,196
or professional degree (jobs)							
By education level - All sectors - Doctoral		74.7	116	115	120	146	199
degree (jobs)							
Related work experience - All sectors -		1,304	2,079	2,011	1,941	2,340	3,102
None (jobs)							
Related work experience - All sectors - Up		1,850	2,890	2,780	2,685	3,203	4,258
to 1 year (jobs)							
Related work experience - All sectors - 1		3,250	5,173	4,991	4,855	5,874	7,761
to 4 years (jobs)							
Related work experience - All sectors - 4		2,105	3,377	3,281	3,188	3,866	5,103
to 10 years (jobs)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors -		549	875	841	813	985	1,292
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		510	783	758	741	888	1,188
(jobs)							
On-the-Job Training - All sectors - Up to 1		5,955	9,390	9,012	8,744	10,522	13,920
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		1,883	3,062	2,983	2,884	3,505	4,617
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		621	1,025	1,018	988	1,203	1,592
years (jobs)							
On-the-Job Training - All sectors - Over 10		88.7	135	132	126	149	198
years (jobs)							
On-Site or In-Plant Training - All sectors -		1,484	2,336	2,267	2,209	2,664	3,553
None (jobs)							
On-Site or In-Plant Training - All sectors -		5,402	8,532	8,190	7,940	9,558	12,631
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		1,462	2,365	2,297	2,220	2,692	3,546
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		634	1,035	1,024	992	1,205	1,590
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		76.5	128	126	122	148	196
Over 10 years (jobs)							
Wage income - All (million \$2019)		467	756	735	722	885	1,180

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	142	130	120	112	103	93
Final energy use - Residential (PJ)	71.3	68.1	66.1	64.1	61.5	57.8	53.1
Final energy use - Commercial (PJ)	49	49.1	48.9	48.7	48	47.1	46.1
Final energy use - Industry (PJ)	165	176	181	184	188	193	197

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		1.09	1.13	1.39	1.45	2.09	2.22
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.84	52.9	98.1	307	516	979	1,441
Vehicle stocks - LDV – All others (1000 units)	1,884	1,884	1,884	1,787	1,690	1,302	915
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	58.3	123	414	1,303	1,898
Public EV charging plugs - DC Fast (1000 units)	0.066		0.213		1.12		3.13
Public EV charging plugs - L2 (1000 units)	0.128		5.12		27		75.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	9.46	19.2	21.1	27.7	43.3	62.6	73.4
Heat Pump (%)							
Sales of space heating units - Electric	10.7	17.2	16.8	15.7	12.9	9.42	7.34
Resistance (%)							
Sales of space heating units - Gas (%)	73.4	53	51.3	46.6	35.6	21.5	13.1
Sales of space heating units - Fossil (%)	6.36	10.7	10.8	9.99	8.15	6.52	6.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric	0	0.373	1.39	4.79	13	23.4	29.5
Heat Pump (%)							
Sales of water heating units - Electric	21.3	36.4	37.1	39.3	44.4	50.9	54.7
Resistance (%)							
Sales of water heating units - Gas Furnace	76.7	61.1	59.4	53.8	40.4	23.6	13.6
(%)							
Sales of water heating units - Other (%)	1.97	2.1	2.1	2.11	2.11	2.11	2.11
Sales of cooking units - Electric	61.6	62.6	66.1	75.4	88.3	96.2	99
Resistance (%)							
Sales of cooking units - Gas (%)	38.4	37.4	33.9	24.6	11.7	3.79	1.02
Residential HVAC investment in 2020s vs.		1.25	1.37				
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	3.53	7.33	9.61	17.1	35.2	58.2	71.6
Heat Pump (%)							
Sales of space heating units - Electric	3.3	3.45	3.58	4.06	5.22	6.69	7.54
Resistance (%)							
Sales of space heating units - Gas (%)	92.1	89	86.6	78.7	59.5	35.1	20.8
Sales of space heating units - Fossil (%)	1.07	0.256	0.242	0.19	0.113	0.063	0.046
Sales of water heating units - Electric	0.03	0.512	1.83	6.23	16.9	30.4	38.3
Heat Pump (%)							
Sales of water heating units - Electric	1.46	1.95	3.27	7.65	18.2	31.6	39.5
Resistance (%)							
Sales of water heating units - Gas (%)	98.1	97.2	94.5	85.7	64.5	37.6	21.8
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
Sales of cooking units - Electric	41.9	46.2	50.2	60.8	75.4	84.6	87.8
Resistance (%)							
Sales of cooking units - Gas (%)	58.1	53.8	49.8	39.2	24.6	15.4	12.2
Commercial HVAC investment in 2020s -		4,239	4,714				
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)	6.2	6.2	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	901	1,063	1,484	1,132	1,627
Installed thermal - Nuclear (MW)	600	600	600	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	0.041
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0.096

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	107
Biomass w/ccu allam power plant (GWh)		0	0	0	0	0	40.5

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	1
(quantity)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Allam power w ccu	0	0	0	0	0	0	1
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	0	2
(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	1
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment -		0	0	0	0	0	1,084
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	0	0	0	0	78.2

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	1.16
Annual - BECCS (MMT)		0	0	0	0	0	1.16
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	1.16
Cumulative - BECCS (MMT)		0	0	0	0	0	1.16
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	177	177	177	177
Spur (km)		0	0	0	0	0	262
All (km)		0	0	177	177	177	439
Cumulative investment - Trunk (million \$2018)		0	0	423	423	423	423
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	150
Cumulative investment - All (million \$2018)		0	0	423	423	423	573

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							-2,216
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-132
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-1,790
rotation length (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	205
Carbon sink potential - Low - Improve							-14
plantations (1000 tC02e/y)							1.10
Carbon sink potential - Low - Increase							-1,42
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-28
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2,97
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-2,27
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-11,47
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-3,32
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-46
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,22
rotation length (1000 tC02e/y)							0,
Carbon sink potential - Mid - Improve							-21
plantations (1000 tCO2e/y)							۷.
Carbon sink potential - Mid - Increase							-2,83
retention of HWP (1000 tC02e/y)							-2,00
Carbon sink potential - Mid - Increase							-54
							-54
trees outside forests (1000 tC02e/y)							1.17
Carbon sink potential - Mid - Reforest							-4,46
cropland (1000 tCO2e/y)							4 / 5
Carbon sink potential - Mid - Reforest							-1,65
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-4,52
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-21,25
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-4,42
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-79
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-4,65
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-29
plantations (1000 tC02e/y)							
Carbon sink potential - High - Increase							-4,25
retention of HWP (1000 tCO2e/y)							, -
Carbon sink potential - High - Increase							-81
trees outside forests (1000 tC02e/y)							-
Carbon sink potential - High - Reforest							-5,95
cropland (1000 tCO2e/y)							0,70
Carbon sink potential - High - Reforest							-3,08
pasture (1000 tC02e/y)							-3,00
Carbon sink potential - High - All (not		-					-31,03
							-31,03
counting overlap) (1000 tC02e/y)							/ 7/
Carbon sink potential - High - Restore							-6,76
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							36
Low - Accelerate regeneration (1000							
nectares)							
Land impacted for carbon sink potential -							10
ow - Avoid deforestation (over 30 years)		I	1				

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

Item Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							910
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							53.5
Low - Improve plantations (1000							
hectares) Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							40.6
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							197
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							15.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,356
Low - Restore productivity (1000							
hectares)							0.005
Land impacted for carbon sink potential - Low - Total impacted (over 30 years)							3,035
(1000 hectares)							
Land impacted for carbon sink potential -							543
Mid - Accelerate regeneration (1000							0-10
hectares)							
Land impacted for carbon sink potential -							104
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,643
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							80.5
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 -							58.9
Mid - Increase trees outside forests (1000							00.7
hectares)							
Land impacted for carbon sink potential -							295
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							110
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,731
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000							5,565
hectares)							
Land impacted for carbon sink potential -							724
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							107
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,376
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							107
High - Improve plantations (1000							
hectares)							

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
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							77.2
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							394
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							87.5
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,241
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,113
High - Total impacted (over 30 years)							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-972
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-31.4
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy							
crops (1000 tC02e/y)							
Carbon sink potential - Moderate							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Moderate							-1,003
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,913
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-62.8
deployment - Permanent conservation							
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							
(1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,976
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							1,168
deployment - Cropland measures (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate							51.8
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							0.25
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							4.37
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							1,224
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							5,638
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							104
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							0.25
Aggressive deployment - Cropland to							
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							4.37
Aggressive deployment - Pasture to							
energy crops (1000 hectares)							
Land impacted for carbon sink -							5,746
Aggressive deployment - Total (1000							
hectares)							

Table 64: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		7.93	5.22	2.58	2.03	1.87	1.75
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		1.56	1.42	1.63	1.2	1.13	0.961
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		14.3	15	15.6	16.3	17.1	17.8
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		2.78	2.91	3.02	3.15	3.26	3.38
Stations (deaths)							
Premature deaths from air pollution -		2.49	2.4	2.33	2.31	2.33	2.37
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		0.138	0.134	0.103	0.067	0.047	0.037
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		0.288	0.296	0.31	0.327	0.335	0.343
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution -		0.045	0.045	0.046	0.046	0.046	0.046
Fuel Comb - Comm/Institutional - Coal							
(deaths)							
Premature deaths from air pollution -		1.72	1.75	1.67	1.57	1.53	1.58
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							
Premature deaths from air pollution -		0.268	0.264	0.264	0.264	0.266	0.269
Fuel Comb - Comm/Institutional - Oil							
(deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.21	0.22	0.229	0.238	0.247	0.255
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.299	0.195	0.15	0.14	0.133	0.122
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		8.73	9.33	9.67	9.36	9.39	8.89
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		70.3	46.3	22.9	18	16.5	15.5
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		13.8	12.6	14.5	10.6	10	8.51
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		127	133	139	145	152	158
Monetary damages from air pollution - Gas Stations (million \$2019)		24.6	25.7	26.7	27.8	28.9	29.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		22.1	21.3	20.6	20.4	20.7	21
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		1.22	1.19	0.914	0.595	0.416	0.324
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		2.55	2.62	2.75	2.89	2.97	3.04
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		0.395	0.401	0.405	0.408	0.409	0.409
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		15.3	15.5	14.8	13.9	13.6	14
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		2.37	2.34	2.34	2.34	2.35	2.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		1.86	1.95	2.03	2.11	2.18	2.26
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		2.64	1.72	1.32	1.24	1.17	1.08
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		77.5	82.8	85.8	83.1	83.4	78.9

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		145	141	140	133	133	136
By economic sector - Construction (jobs)		1,372	2,312	2,543	3,337	3,189	3,845
By economic sector - Manufacturing		544	676	814	912	745	761
(jobs)							
By economic sector - Mining (jobs)		593	478	389	318	271	230
By economic sector - Other (jobs)		74.1	287	346	461	502	841
By economic sector - Pipeline (jobs)		126	129	130	124	126	126
By economic sector - Professional (jobs)		828	1,176	1,320	1,823	1,801	2,241
By economic sector - Trade (jobs)		649	842	907	1,178	1,195	1,563
By economic sector - Utilities (jobs)		1,554	1,688	1,969	2,700	2,321	2,149
By resource sector - Biomass (jobs)		405	387	370	350	348	346

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

14510 00: 1121 000114110 111111010 0050 (continuou						
Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		2.46	2.32	0.808	0	0	0
By resource sector - Grid (jobs)		1,931	2,109	2,472	4,329	3,737	3,339
By resource sector - Natural Gas (jobs)		943	995	1,192	952	1,008	1,003
By resource sector - Nuclear (jobs)		303	298	293	180	14	0
By resource sector - Oil (jobs)		1,448	1,235	1,088	1,008	963	931
By resource sector - Solar (jobs)			1,648	1,901	2,083	2,254	4,232
By resource sector - Wind (jobs)		854	1,056	1,240	2,082	1,960	2,039
By education level - All sectors - High		2,466	3,283	3,625	4,625	4,323	4,979
school diploma or less (jobs)							
By education level - All sectors -		1,770	2,383	2,671	3,476	3,261	3,781
Associates degree or some college (jobs)							
By education level - All sectors -		1,284	1,602	1,754	2,230	2,082	2,403
Bachelors degree (jobs)							
By education level - All sectors - Masters		318	400	440	568	535	624
or professional degree (jobs)							
By education level - All sectors - Doctoral		46.5	61.6	67.2	86.8	83.5	102
degree (jobs)							
Related work experience - All sectors -		851	1,121	1,245	1,599	1,502	1,740
None (jobs)							
Related work experience - All sectors - Up		1,171	1,575	1,737	2,214	2,075	2,424
to 1 year (jobs)							
Related work experience - All sectors - 1		2,133	2,775	3,070	3,945	3,693	4,265
to 4 years (jobs)							
Related work experience - All sectors - 4		1,369	1,792	1,989	2,565	2,400	2,762
to 10 years (jobs)							
Related work experience - All sectors -		362	466	517	662	613	699
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		326	433	474	600	564	670
(jobs)							
On-the-Job Training - All sectors - Up to 1		3,920	5,080	5,608	7,162	6,697	7,737
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		1,204	1,610	1,798	2,334	2,184	2,510
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		382	532	596	786	743	861
years (jobs)							
On-the-Job Training - All sectors - Over 10		53.4	74.6	82.3	103	95.6	112
years (jobs)							
On-Site or In-Plant Training - All sectors -		946	1,257	1,391	1,776	1,666	1,954
None (jobs)							
On-Site or In-Plant Training - All sectors -		3,555	4,613	5,093	6,512	6,087	7,025
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		937	1,251	1,393	1,805	1,689	1,942
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		398	544	606	793	748	863
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		48.6	65.8	74.3	98	92.3	106
Over 10 years (jobs)							
Wage income - All (million \$2019)		314	405	453	589	557	643

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	150	142	131	124	124	127	132
Final energy use - Residential (PJ)	71.3	68.6	67.8	67.5	68	68.9	69.7
Final energy use - Commercial (PJ)	49	50.1	51.1	51.5	51.9	53.3	55.8
Final energy use - Industry (PJ)	165	182	194	206	220	239	257

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		1.18	1.23	1.36	1.42	1.52	1.58
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	8.94	22	22.3	22.8	23.5	24.2	24.8
Heat Pump (%)							
Sales of space heating units - Electric	10.9	16.6	16.4	16.3	16.1	15.6	14.8
Resistance (%)							
Sales of space heating units - Gas (%)	73.8	51.2	50.9	50.7	51.1	51.4	51
Sales of space heating units - Fossil (%)	6.39	10.3	10.4	10.2	9.34	8.82	9.31
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	21.3	36.2	36.3	36.3	36.4	36.4	36.5
Resistance (%)							
Sales of water heating units - Gas Furnace	76.7	61.7	61.6	61.6	61.5	61.4	61.4
(%)							
Sales of water heating units - Other (%)	1.97	2.1	2.11	2.11	2.12	2.12	2.12
Sales of cooking units - Electric	61.2	61.2	61.2	61.2	61.2	61.2	61.2
Resistance (%)							
Sales of cooking units - Gas (%)	38.8	38.8	38.8	38.8	38.8	38.8	38.8
Residential HVAC investment in 2020s vs.		1.22	1.24				
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	3.53	14.1	47	73.9	78.3	78.8	78.8
Heat Pump (%)							
Sales of space heating units - Electric	3.3	4.34	8.76	15.7	20	20.6	20.7
Resistance (%)							
Sales of space heating units - Gas (%)	92.1	81.3	44.1	10.4	1.72	0.57	0.509
Sales of space heating units - Fossil (%)	1.07	0.24	0.141	0.039	0.005	0	0
Sales of water heating units - Electric	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Heat Pump (%)							
Sales of water heating units - Electric	1.46	1.47	1.47	1.48	1.47	1.48	1.47
Resistance (%)							
Sales of water heating units - Gas (%)	98.1	98.1	98.1	98.1	98.1	98.1	98.1
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383
Sales of cooking units - Electric	41.9	44.7	44.7	44.6	44.4	44.5	44.6
Resistance (%)							
Sales of cooking units - Gas (%)	58.1	55.3	55.3	55.4	55.6	55.5	55.4
Commercial HVAC investment in 2020s -		4,185	4,377				
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)	6.2	6.2	6.2	0	0	0	0
Installed thermal - Natural gas (MW)	1,069	1,069	1,069	1,283	1,303	952	1,034
Installed thermal - Nuclear (MW)	600	600	600	600	50	0	0
Installed renewables - Rooftop PV (MW)	393	606	810	1,055	1,347	1,687	2,089
Installed renewables - Solar - Base land	1.71	1.71	1.71	1.71	1.71	1.71	1.71
use assumptions (MW)							
Installed renewables - Wind - Base land	952	952	952	952	8,628	12,410	12,410
use assumptions (MW)							
Installed renewables - Wind - Constrained	0	0	0	0	0	40.5	40.5
land use assumptions (MW)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	4.27	4.27	4.27	4.27	4.27	4.27
Wind - Base land use assumptions (GWh)	3,041	3,041	3,041	3,041	26,585	37,730	37,730
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)	-22		4.29				1.23
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.16		-2.41				-2.53
Business-as-usual carbon sink - Total (Mt CO2e/y)	-23.1		1.88				-1.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-2,216
regeneration (1000 tC02e/y)							
Carbon sink potential - Low - Avoid							-132
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-1,790
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-148
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-1,420
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-284
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-2,977
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-233
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-2,279
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-11,479
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-3,320
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-463
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-3,224
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-217
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-2,839
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-548
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-4,465
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,656
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-4,520
productivity (1000 tCO2e/y)							,

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

Item Copper sink notantial, Mid. All (not	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not							-21,253
counting overlap) (1000 tC02e/y)							
Carbon sink potential - High - Accelerate							-4,42
regeneration (1000 tC02e/y)							70
Carbon sink potential - High - Avoid							-79:
deforestation (1000 tC02e/y)							
Carbon sink potential - High - Extend							-4,659
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-290
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-4,259
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-812
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-5,953
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-3,080
pasture (1000 tC02e/y)							•
Carbon sink potential - High - All (not							-31,032
counting overlap) (1000 tCO2e/y)							- 1,
Carbon sink potential - High - Restore							-6,76
productivity (1000 tC02e/y)							0,10
Land impacted for carbon sink potential -							362
Low - Accelerate regeneration (1000							302
hectares)							
•							10
Land impacted for carbon sink potential -							10
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							046
Land impacted for carbon sink potential -							910
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							53.5
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 -							40.6
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							197
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							15.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,356
Low - Restore productivity (1000							1,000
hectares)							
Land impacted for carbon sink potential -							3,035
Low - Total impacted (over 30 years)							3,038
(1000 hectares)							
•							F / C
Land impacted for carbon sink potential -							543
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							104
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,643
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -		+	+				80.5
Mid - Improve plantations (1000 hectares)							00.0

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
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							58.9
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							295
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							110
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,731
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							5,565
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							724
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							107
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							2,376
High - Extend rotation length (1000							•
hectares)							
Land impacted for carbon sink potential -							107
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 -							77.2
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							394
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							87.5
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,241
High - Restore productivity (1000							_,
hectares)							
Land impacted for carbon sink potential -							6,113
High - Total impacted (over 30 years)							5,.10
(1000 hectares)							