

Net-Zero America - New Hampshire data

October 29, 2021 (updated November 17, 2023)

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

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Table 1: E+ scenario - IMPACTS - Health

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Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		14.4	0.017	0.017	0.016	0.01	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		5.02	2.9	2	1.85	1.17	0.522
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		26.6	25	19	11	4.91	1.78
Mobile - On-Road (deaths)		20.0					0
Premature deaths from air pollution - Gas		1.23	1.13	0.848	0.494	0.229	0.095
Stations (deaths)		1.20	1.10	0.040	0.474	0.227	0.070
Premature deaths from air pollution -		5.44	4.67	3.29	1.88	0.906	0.349
Fuel Comb - Residential - Natural Gas		5.44	4.01	3.29	1.00	0.900	0.349
(deaths)							
		10	1/ 1	0.01	F 0/	0.1	0.618
Premature deaths from air pollution -		18	14.1	9.21	5.04	2.1	0.618
Fuel Comb - Residential - Oil (deaths)					0.501		
Premature deaths from air pollution -		1.76	1.61	1.24	0.791	0.41	0.181
Fuel Comb - Residential - Other (deaths)							
Premature deaths from air pollution -		0.299	0.288	0.275	0.262	0.248	0.232
Fuel Comb - Comm/Institutional - Coal							
(deaths)							
Premature deaths from air pollution -		4.73	4.3	3.45	2.44	1.57	0.881
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							
Premature deaths from air pollution -		12.2	9.78	6.59	3.82	2.47	1.85
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		1.23	1.04	0.857	0.671	0.493	0.323
Fuel Comb - Comm/Institutional - Other		1.23	1.04	0.031	0.011	0.473	0.525
(deaths)							
Premature deaths from air pollution -		0.1	0.05	0.05	0.049	0.05	0.05
		0.1	0.05	0.05	0.049	0.05	0.05
Industrial Processes - Coal Mining							
(deaths)							
Premature deaths from air pollution -		7.54	6.95	6.1	4.75	3.4	2.04
Industrial Processes - Oil & Gas							
Production (deaths)							
Monetary damages from air pollution -		128	0.148	0.148	0.141	0.084	0.004
Fuel Comb - Electric Generation - Coal							
(million \$2019)							
Monetary damages from air pollution -		44.4	25.7	17.7	16.4	10.4	4.62
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		237	222	169	97.6	43.6	15.8
Mobile - On-Road (million \$2019)				.5,	,	.5.5	.5.0
Monetary damages from air pollution -		10.9	10	7.51	4.38	2.02	0.837
Gas Stations (million \$2019)		10.9	10	1.51	4.50	2.02	0.001
Monetary damages from air pollution -		48.2	41.4	29.2	16.6	8.03	3.09
Fuel Comb - Residential - Natural Gas		40.2	41.4	29.2	10.0	6.03	3.09
(million \$2019)		150	105	01./	, , ,	10 (F / O
Monetary damages from air pollution -		159	125	81.6	44.7	18.6	5.48
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		15.6	14.3	11	7.01	3.63	1.61
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		2.65	2.55	2.44	2.32	2.19	2.06
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		41.9	38.1	30.6	21.6	13.9	7.79
Fuel Comb - Comm/Institutional - Natural							,
Gas (million \$2019)							
aac (mmon 42017)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		108	86.6	58.4	33.8	21.9	16.3
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		10.9	9.24	7.58	5.94	4.36	2.86
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		0.878	0.443	0.441	0.436	0.442	0.44
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		67	61.7	54.2	42.2	30.2	18.2
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)		86.2	175	66.9	51.9	38.1	128
By economic sector - Construction (jobs)		1,491	1,414	2,364	1,904	4,477	13,041
By economic sector - Manufacturing (jobs)		702	860	953	841	1,166	2,865
By economic sector - Mining (jobs)		522	395	278	191	130	91.3
By economic sector - Other (jobs)		163	125	348	241	866	2,278
By economic sector - Pipeline (jobs)		86	89	63.9	51.5	40.1	56.1
By economic sector - Professional (jobs)		927	943	1,238	1,124	2,284	5,860
By economic sector - Trade (jobs)		661	598	821	702	1,505	3,845
By economic sector - Utilities (jobs)		1,515	1,704	2,105	2,099	3,772	13,516
By resource sector - Biomass (jobs)		370	483	191	156	139	547
By resource sector - CO2 (jobs)		0	101	0	0	0	196
By resource sector - Coal (jobs)		62.1	0	0	0	0	0
By resource sector - Grid (jobs)		1,615	2,024	2,967	2,887	6,432	27,087
By resource sector - Natural Gas (jobs)		517	450	385	438	335	68.9
By resource sector - Nuclear (jobs)		627	617	607	598	588	579
By resource sector - Oil (jobs)		1,464	1,230	963	743	581	463
By resource sector - Solar (jobs)		1,155	671	2,005	1,116	4,726	10,749
By resource sector - Wind (jobs)		343	728	1,119	1,269	1,476	1,990
By education level - All sectors - High school diploma or less (jobs)		2,542	2,637	3,462	2,985	6,004	17,808
By education level - All sectors - Associates degree or some college (jobs)		1,847	1,897	2,575	2,262	4,585	13,577
By education level - All sectors - Bachelors degree (jobs)		1,372	1,376	1,709	1,518	2,851	7,986
By education level - All sectors - Masters or professional degree (jobs)		340	342	427	383	728	2,031
By education level - All sectors - Doctoral degree (jobs)		52	51.1	64.3	57.1	110	278
Related work experience - All sectors - None (jobs)		873	902	1,185	1,035	2,080	6,153
Related work experience - All sectors - Up to 1 year (jobs)		1,223	1,262	1,660	1,429	2,881	8,363
Related work experience - All sectors - 1 to 4 years (jobs)		2,241	2,291	2,969	2,605	5,129	14,962
Related work experience - All sectors - 4 to 10 years (jobs)		1,432	1,457	1,917	1,689	3,328	9,706
Related work experience - All sectors - Over 10 years (jobs)		383	391	506	448	860	2,497
On-the-Job Training - All sectors - None (jobs)		351	349	458	395	788	2,214
On-the-Job Training - All sectors - Up to 1 year (jobs)		4,106	4,225	5,412	4,736	9,266	26,905

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		1,250	1,279	1,730	1,519	3,060	9,092
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		386	391	558	488	1,029	3,100
years (jobs)							
On-the-Job Training - All sectors - Over 10		58.9	58.8	79.8	68	135	370
years (jobs)							
On-Site or In-Plant Training - All sectors -		1,012	1,032	1,346	1,173	2,320	6,604
None (jobs)							
On-Site or In-Plant Training - All sectors -		3,715	3,816	4,913	4,299	8,437	24,589
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		974	998	1,342	1,176	2,366	7,026
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		402	407	567	497	1,028	3,075
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		48.1	50.1	69.5	61.6	127	386
Over 10 years (jobs)							
Wage income - All (million \$2019)		356	369	480	430	847	2,517

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		32.9	30.2	25.6	21.2	17.8	15.1
Oil consumption - Cumulative (million							783
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		38.6	32.6	26.1	19.7	12.4	8.58
Natural gas consumption - Cumulative							787
(tcf)							
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	93.6	86.6	75.2	60.9	47.9	39.6	35.8
Final energy use - Residential (PJ)	67.8	61.4	54.8	46.6	38.7	33	29.6
Final energy use - Commercial (PJ)	39.2	36.8	35.1	32.8	30.3	28.7	27.8
Final energy use - Industry (PJ)	21.1	20.7	20.2	19.9	19.6	19.6	19.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.537	0.548	1.07	1.14	1.01	1.05
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)	9.27	119	229	613	998	1,305	1,612
Vehicle stocks - LDV – All others (1000	1,344	1,280	1,215	886	556	315	73.1
units)							
Light-duty vehicle capital costs vs. REF -		258	662	1,071	1,624	1,766	1,685
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		0.528		2.3		3.72
units)							
Public EV charging plugs - L2 (1000 units)	0.188		12.7		55.3		89.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.02	11.4	55.4	81.6	85.2	85.5	85.5
Heat Pump (%)							
Sales of space heating units - Electric	2.1	2.36	1.9	0.854	0.641	0.637	0.692
Resistance (%)							
Sales of space heating units - Gas (%)	18.7	10	7.16	1.21	0.152	0.086	0.084
Sales of space heating units - Fossil (%)	75.2	76.2	35.5	16.4	14	13.8	13.7
Sales of water heating units - Electric	0	1.91	15.5	34.6	37.8	38	38.1
Heat Pump (%)							
Sales of water heating units - Electric	25.3	41.2	50.4	60.2	61.8	61.9	61.8
Resistance (%)							
Sales of water heating units - Gas Furnace	51.5	43.4	31.5	5.04	0.297	0	0
(%)							
Sales of water heating units - Other (%)	23.2	13.5	2.63	0.195	0.089	0.089	0.089
Sales of cooking units - Electric	55.6	65	94	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	44.4	35	5.98	0.301	0	0	0
Residential HVAC investment in 2020s vs.		1.15	1.23				
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	3.23	11	39.6	72.4	77.7	77.9	78
Heat Pump (%)							
Sales of space heating units - Electric	1.65	4.4	16.6	21.3	22	22.1	22
Resistance (%)							
Sales of space heating units - Gas (%)	37.7	52.7	37.7	6.03	0.358	0	0
Sales of space heating units - Fossil (%)	57.4	32	6.13	0.259	0	0	0
Sales of water heating units - Electric	2.6	3.52	16	41.1	45.6	45.9	45.9
Heat Pump (%)							
Sales of water heating units - Electric	12.8	12.4	24	48	52.3	52.5	52.5
Resistance (%)							
Sales of water heating units - Gas (%)	77.2	79.9	58.1	9.27	0.548	0	0
Sales of water heating units - Other (%)	7.43	4.15	1.94	1.59	1.57	1.57	1.59
Sales of cooking units - Electric	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Resistance (%)							
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Commercial HVAC investment in 2020s -		2,680	2,926				
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)	459	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,400	1,396	1,396	1,396	800	10	10
Installed thermal - Nuclear (MW)	1,242	1,242	1,242	1,242	1,242	1,242	1,242
Installed renewables - Rooftop PV (MW)	169	294	345	403	470	544	627
Installed renewables - Solar - Base land use assumptions (MW)	0	0	0	1,191	1,268	4,823	12,874
Installed renewables - Wind - Base land use assumptions (MW)	214	356	1,604	1,807	2,141	2,211	2,623
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	0	480	3,074	11,126
Installed renewables - Wind - Constrained land use assumptions (MW)	214	356	1,801	2,259	2,589	2,708	2,911
Capital invested - Solar PV - Base (billion \$2018)		0	0	1.31	0.08	3.49	7.46
Capital invested - Wind - Base (billion \$2018)		0.375	2.99	0.454	0.711	0.14	0.786

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion \$2018)		0	0.656	2.35	0	1.97	6.03
Capital invested - Wind - Constrained (billion \$2018)		0.184	3.52	1.13	0.606	0.256	0.389
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	0.021
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0.027

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

	, -						
Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	2,117	2,253	8,516	22,536
Wind - Base land use assumptions (GWh)	912	1,484	6,279	7,050	8,294	8,554	10,103
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Constrained land use assumptions	0	0	0	0	848	5,395	19,487
(GWh)							
Wind - Constrained land use assumptions	912	1,484	6,986	8,712	9,954	10,392	11,130
(GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	30
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	20.8
						•	

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	1
(quantity)							
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	1
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	1
Conversion capital investment -		0	0	0	0	0	1,591
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	0	0	0	0	69.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	1.88
Annual - BECCS (MMT)		0	0	0	0	0	1.88
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	1.88
Cumulative - BECCS (MMT)		0	0	0	0	0	1.88
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

2020	2025	2030	2035	2040	2045	2050
	0	55.8	55.8	55.8	55.8	55.8
	0	0	0	0	0	180
	0	55.8	55.8	55.8	55.8	236
	0	101	101	101	101	101
	0	0	0	0	0	122
	_					
	0	101	101	101	101	223
	2020	2020 2025 0 0 0 0 0 0	0 55.8 0 0 0 55.8 0 101	0 55.8 55.8 0 0 0 0 0 55.8 55.8 0 101 101 0 0 0	0 55.8 55.8 55.8 0 0 0 0 0 55.8 55.8 55.8 0 101 101 101 0 0 0 0	0 55.8 55.8 55.8 0 0 0 0 0 55.8 55.8 55.8 0 101 101 101 0 0 0 0

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

	-17.4 -78.4 -1,184
	-1,184
	-1,184
	-7.66
	-716
	-31.2
	0
	-16
	-292
	-2,342
	•
	-26
	-274
	-2,133
	,
	-11.2
+	-1,431
	.,
	-60.2
	33.2
+	0
	O

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest							-114
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-579
productivity (1000 tC02e/y)							, ,,,,,
Carbon sink potential - Mid - All (not							-4,629
counting overlap) (1000 tC02e/y)							01-
Carbon sink potential - High - Accelerate							-34.7
regeneration (1000 tC02e/y)							
Carbon sink potential - High - Avoid							-471
deforestation (1000 tC02e/y)							
Carbon sink potential - High - Extend							-3,082
rotation length (1000 tC02e/y)							
Carbon sink potential - High - Improve							-15
plantations (1000 tC02e/y)							
Carbon sink potential - High - Increase							-2,147
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-89.2
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-211
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-6,916
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-866
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							2.84
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							59.8
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							602
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.77
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							4.46
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.04
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							174
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							847
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.26
Mid - Accelerate regeneration (1000							0
hectares)							
Land impacted for carbon sink potential -			+		+		61.8
Mid - Avoid deforestation (over 30 years)							50
	I	I .					

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,087
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							4.17
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							6.47
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							7.52
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							350
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,521
Mid - Total impacted (over 30 years) (1000							,
hectares)							
Land impacted for carbon sink potential -							5.68
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							63.7
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,572
High - Extend rotation length (1000							,-
hectares)							
Land impacted for carbon sink potential -							5.54
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 -		+					8.48
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -		+					0
High - Reforest cropland (1000 hectares)							•
Land impacted for carbon sink potential -							6
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -		+					287
High - Restore productivity (1000							201
hectares)							
Land impacted for carbon sink potential -		+					1,948
High - Total impacted (over 30 years)							1,740
(1000 hectares)							
(1000 Houtar ob)							

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							-36.3
deployment - Cropland measures (1000							
tCO2e/y)							

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

Table 16: E+ scenario - PILLAR 6: Land sink			-	0005	00/0	00/5	
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-1.18
deployment - Permanent conservation							
cover (1000 tC02e/y)							-37.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-37.5
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y) Carbon sink potential - Aggressive							/00
							-68.9
deployment - Cropland measures (1000							
tCO2e/y)							0.07
Carbon sink potential - Aggressive							-2.36
deployment - Permanent conservation							
cover (1000 tC02e/y)							71.0
Carbon sink potential - Aggressive							-71.3
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							20.8
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							2.14
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							22.9
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							39.5
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							4.28
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							43.7
Aggressive deployment - Total (1000							
hectares)							
,		I			<u> </u>		
Table 17: E- scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		14.4	0.017	0.017	0.016	0.01	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		4.9	2.35	0.944	0.403	0.124	0.137
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		27.1	27.5	26.8	24.1	19.2	13.2
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		1.26	1.27	1.23	1.1	0.87	0.594
Stations (deaths)		-		-			
Premature deaths from air pollution -		5.47	5.07	4.54	3.79	2.89	1.95
Fuel Comb - Residential - Natural Gas		5	3.01		S ,	,	, 0
(deaths)							
Premature deaths from air pollution -		18.2	16.7	15.3	13.1	9.92	6.68
Fuel Comb - Residential - Oil (deaths)		10.2	10.1	10.0	10.1	7.72	0.00
Premature deaths from air pollution -		1.77	1.74	1.68	1.53	1.24	0.91
Fuel Comb Decidential Other (deethe)		1.7.7	1.14	1.00	1.55	1.24	0.71

Fuel Comb - Residential - Other (deaths)

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

Table II. L Scenario Irii Acio Ticaltii (Continucuj						
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		0.299	0.288	0.275	0.262	0.248	0.232
Fuel Comb - Comm/Institutional - Coal							
(deaths)							
Premature deaths from air pollution -		4.75	4.69	4.56	4.21	3.63	2.93
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)							
Premature deaths from air pollution -		12.3	10.8	9.27	7.52	6.26	5.16
Fuel Comb - Comm/Institutional - Oil							
(deaths)							
Premature deaths from air pollution -		1.23	1.12	1	0.888	0.772	0.659
Fuel Comb - Comm/Institutional - Other							
(deaths)							
Premature deaths from air pollution -		0.096	0.05	0.05	0.05	0.05	0.048
Industrial Processes - Coal Mining							
(deaths)							
Premature deaths from air pollution -		7.51	6.59	5.38	4.46	3.8	2.73
Industrial Processes - Oil & Gas							
Production (deaths)							
Monetary damages from air pollution -		128	0.148	0.148	0.141	0.084	0.004
Fuel Comb - Electric Generation - Coal							
(million \$2019)							
Monetary damages from air pollution -		43.4	20.8	8.37	3.57	1.1	1.21
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		241	245	239	215	171	117
Mobile - On-Road (million \$2019)							
Monetary damages from air pollution -		11.1	11.3	10.9	9.74	7.7	5.26
Gas Stations (million \$2019)							
Monetary damages from air pollution -		48.5	44.9	40.2	33.6	25.6	17.3
Fuel Comb - Residential - Natural Gas							
(million \$2019)							
Monetary damages from air pollution -		161	148	136	116	87.9	59.2
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		15.7	15.4	14.9	13.5	11	8.07
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		2.65	2.55	2.44	2.32	2.19	2.06
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		42	41.5	40.3	37.3	32.2	25.9
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		109	95.9	82	66.6	55.4	45.7
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		10.9	9.91	8.89	7.86	6.83	5.83
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		0.851	0.444	0.445	0.443	0.443	0.426
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		66.7	58.5	47.8	39.6	33.7	24.3
Industrial Processes - Oil & Gas							
Production (million \$2019)							

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		105	135	51.4	33	29.9	128
By economic sector - Construction (jobs)		1,477	1,393	2,048	1,762	5,033	15,294

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

Table 18: E- Scendino - IMPAG 13 - Jobs (Con	шиеиј						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing		712	862	874	820	1,432	3,621
(jobs)							
By economic sector - Mining (jobs)		526	412	321	245	181	124
By economic sector - Other (jobs)		162	122	299	223	957	2,452
By economic sector - Pipeline (jobs)		86.5	98.7	69.2	62.3	54.7	84.9
By economic sector - Professional (jobs)		929	875	1,102	1,051	2,534	6,710
By economic sector - Trade (jobs)		660	599	775	702	1,697	4,363
By economic sector - Utilities (jobs)		1,481	1,645	1,727	1,794	4,224	16,767
By resource sector - Biomass (jobs)		398	362	171	139	127	530
By resource sector - CO2 (jobs)		0	174	0	0	0	337
By resource sector - Coal (jobs)		62.1	0	0	0	0	0
By resource sector - Grid (jobs)		1,542	1,709	2,275	2,453	7,346	33,808
By resource sector - Natural Gas (jobs)		517	544	288	249	361	97.7
By resource sector - Nuclear (jobs)		627	617	607	598	588	579
By resource sector - Oil (jobs)		1,476	1,297	1,138	974	810	628
By resource sector - Solar (jobs)		1,162	681	1,729	1,046	5,216	10,982
By resource sector - Wind (jobs)		353	758	1,059	1,234	1,693	2,583
By education level - All sectors - High		2,542	2,562	3,044	2,770	6,800	21,198
school diploma or less (jobs)		,-	,	-,-	,	, , , , ,	, -
By education level - All sectors -		1,837	1,857	2,246	2,078	5,182	16,166
Associates degree or some college (jobs)		,	,	, -	, -	-, -	-,
By education level - All sectors -		1,369	1,343	1,536	1,432	3,220	9,464
Bachelors degree (jobs)			·	,	,		•
By education level - All sectors - Masters		339	331	382	359	818	2,396
or professional degree (jobs)							•
By education level - All sectors - Doctoral		52.1	49	58.4	54.4	122	321
degree (jobs)							
Related work experience - All sectors -		872	878	1,040	956	2,351	7,316
None (jobs)							,
Related work experience - All sectors - Up		1,224	1,222	1,465	1,331	3,256	9,901
to 1 year (jobs)							
Related work experience - All sectors - 1		2,235	2,232	2,623	2,423	5,799	17,793
to 4 years (jobs)							•
Related work experience - All sectors - 4		1,426	1,426	1,689	1,566	3,761	11,554
to 10 years (jobs)							
Related work experience - All sectors -		382	383	448	417	975	2,980
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		351	341	410	372	889	2,605
(jobs)							
On-the-Job Training - All sectors - Up to 1		4,104	4,105	4,795	4,418	10,485	31,972
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		1,243	1,253	1,509	1,396	3,458	10,842
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		383	384	481	443	1,158	3,688
years (jobs)							
On-the-Job Training - All sectors - Over 10		58.8	58.3	71.1	63.9	152	437
years (jobs)							
On-Site or In-Plant Training - All sectors -		1,011	1,005	1,191	1,092	2,618	7,809
None (jobs)							
On-Site or In-Plant Training - All sectors -		3,711	3,712	4,349	4,008	9,547	29,236
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		970	976	1,173	1,083	2,675	8,377
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		399	399	493	454	1,159	3,661
4 to 10 years (jobs)							•
On-Site or In-Plant Training - All sectors -		47.7	49	59.9	55.9	143	462
Over 10 years (jobs)							
Wage income - All (million \$2019)		355	359	424	399	957	2,999

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	93.7	87.4	79.2	72.1	66.4	59.8	52
Final energy use - Residential (PJ)	67.8	61.6	57.1	53.2	48.5	43.3	38.2
Final energy use - Commercial (PJ)	39.2	36.9	35.8	34.9	33.7	32.5	31.4
Final energy use - Industry (PJ)	21.1	20.7	20.4	20.3	20.3	20.2	20

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.401	0.397	0.601	0.621	0.904	0.955
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)	7.18	39.4	71.7	221	371	701	1,032
Vehicle stocks - LDV – All others (1000 units)	1,349	1,349	1,349	1,280	1,211	933	655
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	41.9	87.7	296	932	1,358
Public EV charging plugs - DC Fast (1000 units)	0.06		0.165		0.854		2.38
Public EV charging plugs - L2 (1000 units)	0.188		3.97		20.5		57.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.02	3.88	8.07	20.5	41.9	60	68.2
Heat Pump (%)							
Sales of space heating units - Electric	2.1	2.38	2.37	2.3	1.88	1.38	1.1
Resistance (%)							
Sales of space heating units - Gas (%)	18.7	10.2	9.97	9.04	6.81	4.15	2.55
Sales of space heating units - Fossil (%)	75.2	83.5	79.6	68.2	49.4	34.5	28.2
Sales of water heating units - Electric	0	0.469	1.77	5.89	14.5	24.1	29.3
Heat Pump (%)							
Sales of water heating units - Electric	25.3	39.9	40.7	43.4	48.7	54	56.8
Resistance (%)							
Sales of water heating units - Gas Furnace	51.5	43.9	42.9	39.1	29.7	17.8	10.8
(%)							
Sales of water heating units - Other (%)	23.2	15.7	14.7	11.6	7.09	4.11	3.08
Sales of cooking units - Electric	55.4	56.6	60.7	71.4	86.4	95.6	98.8
Resistance (%)							
Sales of cooking units - Gas (%)	44.6	43.4	39.3	28.6	13.6	4.4	1.18
Residential HVAC investment in 2020s vs.		1.15	1.3				
REF - Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.23	7.44	10.2	18.5	35	52.2	61.5
Heat Pump (%)							
Sales of space heating units - Electric	1.65	2.12	3.22	6.62	12.2	16.4	17.9
Resistance (%)							
Sales of space heating units - Gas (%)	37.7	53.3	51.4	46.8	35.8	21.6	13.2
Sales of space heating units - Fossil (%)	57.4	37.1	35.2	28.1	17	9.78	7.36
Sales of water heating units - Electric	2.6	2.83	4	7.92	17.2	28.8	35.5
Heat Pump (%)							
Sales of water heating units - Electric	12.8	11.7	12.6	16.6	25.4	36.2	42.6
Resistance (%)							
Sales of water heating units - Gas (%)	77.2	80.9	79.2	71.8	54.5	32.8	19.8
Sales of water heating units - Other (%)	7.43	4.56	4.2	3.64	2.86	2.25	2.09

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Resistance (%)							
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Commercial HVAC investment in 2020s -		2,680	2,929				
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)	459	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,400	1,396	790	790	790	0	5
Installed thermal - Nuclear (MW)	1,242	1,242	1,242	1,242	1,242	1,242	1,242

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-17.4
Carbon sink potential - Low - Avoid							-78.4
deforestation (1000 tCO2e/y)							10.4
Carbon sink potential - Low - Extend							-1,184
rotation length (1000 tCO2e/y)							•
Carbon sink potential - Low - Improve							-7.66
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-716
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-31.2
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-16
pasture (1000 tC02e/y)							
Carbon sink potential - Low - Restore							-292
productivity (1000 tC02e/y)							0.070
Carbon sink potential - Low - All (not							-2,342
counting overlap) (1000 tCO2e/y) Carbon sink potential - Mid - Accelerate							-26
regeneration (1000 tC02e/y)							-20
Carbon sink potential - Mid - Avoid							-274
deforestation (1000 tC02e/y)							-214
Carbon sink potential - Mid - Extend							-2,133
rotation length (1000 tCO2e/y)							2,100
Carbon sink potential - Mid - Improve							-11.2
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-1,431
retention of HWP (1000 tCO2e/y)							,
Carbon sink potential - Mid - Increase							-60.2
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-114
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-579
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-4,629
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-34.7
regeneration (1000 tC02e/y)							, = 4
Carbon sink potential - High - Avoid							-471
deforestation (1000 tCO2e/y)							

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

Item Carbon sink potential - High - Extend	2020	2025	2030	2035	2040	2045	2050 -3,082
rotation length (1000 tCO2e/y)							-5,002
Carbon sink potential - High - Improve							-15
plantations (1000 tCO2e/y)							-10
Carbon sink potential - High - Increase							-2,147
retention of HWP (1000 tC02e/y)							-2,141
Carbon sink potential - High - Increase							-89.2
trees outside forests (1000 tCO2e/y)							-07.2
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-211
pasture (1000 tCO2e/y)							-21
Carbon sink potential - High - All (not							-6,916
							-0,910
counting overlap) (1000 tC02e/y)							0//
Carbon sink potential - High - Restore							-866
productivity (1000 tCO2e/y)							0.07
Land impacted for carbon sink potential -							2.84
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							59.8
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							602
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.77
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							C
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							4.46
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							C
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.04
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							174
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							847
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.26
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							61.8
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,087
Mid - Extend rotation length (1000							.,00
hectares)							
Land impacted for carbon sink potential -		+					4.17
Mid - Improve plantations (1000 hectares)							7.11
Land impacted for carbon sink potential -	-	-	-		-		(
Mid - Increase retention of HWP (1000							,
hectares)							
Land impacted for carbon sink potential -							6.47
Mid - Increase trees outside forests (1000							0.47
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 -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							7.52
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							350
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,521
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							5.68
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							63.7
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,572
High - Extend rotation length (1000							•
hectares)							
Land impacted for carbon sink potential -							5.54
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 -							8.48
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							_
Land impacted for carbon sink potential -							6
High - Reforest pasture (1000 hectares)							· ·
Land impacted for carbon sink potential -							287
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,948
High - Total impacted (over 30 years)							1,7 10
(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							-36.3
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-1.18
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-37.5
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-68.9
deployment - Cropland measures (1000							
tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-2.36
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-71.3
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							20.8
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							2.14
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							22.9
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							39.5
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							4.28
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							43.7
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)		14.4	0.017	0.017	0.016	0.01	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		4.67	2.59	1.46	1.17	0.417	0.144
Premature deaths from air pollution - Mobile - On-Road (deaths)		26.6	25	19	11	4.91	1.78
Premature deaths from air pollution - Gas Stations (deaths)		1.23	1.13	0.848	0.494	0.229	0.095
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		5.44	4.67	3.29	1.88	0.906	0.349
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		18	14.1	9.21	5.04	2.1	0.618
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.76	1.61	1.24	0.791	0.41	0.181
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.299	0.288	0.275	0.262	0.248	0.232
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.73	4.3	3.45	2.44	1.57	0.881
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		12.2	9.78	6.59	3.82	2.47	1.85
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.23	1.04	0.857	0.671	0.493	0.323

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Coal Mining		0.108	0.05	0.05	0.049	0.05	0.046
(deaths) Premature deaths from air pollution -		7.37	6.81	5.59	3.98	2.28	0.239
Industrial Processes - Oil & Gas Production (deaths)							
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		128	0.148	0.148	0.141	0.084	0.004
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		41.4	22.9	12.9	10.4	3.69	1.27
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		237	222	169	97.6	43.6	15.8
Monetary damages from air pollution - Gas Stations (million \$2019)		10.9	10	7.51	4.38	2.02	0.837
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		48.2	41.4	29.2	16.6	8.03	3.09
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		159	125	81.6	44.7	18.6	5.48
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		15.6	14.3	11	7.01	3.63	1.61
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.65	2.55	2.44	2.32	2.19	2.06
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		41.9	38.1	30.6	21.6	13.9	7.79
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		108	86.6	58.4	33.8	21.9	16.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		10.9	9.24	7.58	5.94	4.36	2.86
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.95	0.443	0.441	0.435	0.442	0.409
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		65.4	60.4	49.6	35.3	20.2	2.12

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		86.7	180	66.5	42.4	34.2	125
By economic sector - Construction (jobs)		1,500	2,007	3,391	2,582	9,144	14,749
By economic sector - Manufacturing		720	940	1,305	1,064	2,073	3,579
(jobs)							
By economic sector - Mining (jobs)		520	391	268	175	108	2.74
By economic sector - Other (jobs)		164	258	562	343	1,646	2,118
By economic sector - Pipeline (jobs)		84.8	74.8	58.8	44.4	31.6	3.88
By economic sector - Professional (jobs)		918	1,209	1,686	1,491	4,331	6,628
By economic sector - Trade (jobs)		654	758	1,103	906	2,794	4,100
By economic sector - Utilities (jobs)		1,518	1,839	2,592	2,711	8,450	17,279
By resource sector - Biomass (jobs)		337	508	179	138	127	551
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		62.1	0	0	0	0	0
By resource sector - Grid (jobs)		1,628	2,386	3,959	4,155	16,204	35,597

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		504	434	341	386	298	41.1
By resource sector - Nuclear (jobs)		627	617	607	598	588	341
By resource sector - Oil (jobs)		1,464	1,221	943	696	488	0.005
By resource sector - Solar (jobs)		1,182	1,707	3,501	1,623	8,497	8,450
By resource sector - Wind (jobs)		361	785	1,502	1,762	2,410	3,604
By education level - All sectors - High school diploma or less (jobs)		2,550	3,224	4,665	3,882	12,122	20,741
By education level - All sectors - Associates degree or some college (jobs)		1,853	2,329	3,483	2,969	9,296	15,900
By education level - All sectors - Bachelors degree (jobs)		1,371	1,633	2,239	1,943	5,568	9,277
By education level - All sectors - Masters or professional degree (jobs)		340	409	560	492	1,421	2,355
By education level - All sectors - Doctoral degree (jobs)		51.7	62.9	85.1	73.2	205	311
Related work experience - All sectors - None (jobs)		875	1,098	1,591	1,346	4,195	7,169
Related work experience - All sectors - Up to 1 year (jobs)		1,225	1,554	2,246	1,859	5,749	9,663
Related work experience - All sectors - 1 to 4 years (jobs)		2,245	2,769	3,959	3,377	10,269	17,457
Related work experience - All sectors - 4 to 10 years (jobs)		1,435	1,767	2,562	2,197	6,680	11,362
Related work experience - All sectors - Over 10 years (jobs)		384	469	673	579	1,719	2,934
On-the-Job Training - All sectors - None (jobs)		351	429	614	510	1,544	2,524
On-the-Job Training - All sectors - Up to 1 year (jobs)		4,113	5,095	7,218	6,124	18,470	31,332
On-the-Job Training - All sectors - 1 to 4 years (jobs)		1,255	1,567	2,330	1,990	6,218	10,675
On-the-Job Training - All sectors - 4 to 10 years (jobs)		387	493	761	647	2,118	3,632
On-the-Job Training - All sectors - Over 10 years (jobs)		59.2	73.2	109	88.1	262	422
On-Site or In-Plant Training - All sectors - None (jobs)		1,014	1,260	1,807	1,520	4,588	7,626
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		3,721	4,607	6,555	5,564	16,856	28,659
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		978	1,221	1,807	1,538	4,802	8,239
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		404	507	768	655	2,104	3,603
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		48.3	61.8	94.5	81.6	262	458
Wage income - All (million \$2019)		356	443	636	556	1,700	2,952

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	93.6	86.6	75.2	60.9	47.9	39.6	35.8
Final energy use - Residential (PJ)	67.8	61.4	54.8	46.6	38.7	33	29.6
Final energy use - Commercial (PJ)	39.2	36.8	35.1	32.8	30.3	28.7	27.8
Final energy use - Industry (PJ)	21.1	20.7	20.2	19.9	19.6	19.6	19.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.537	0.548	1.07	1.14	1.01	1.05
Cumulative 5-yr (billion \$2018)							

Table 31: <i>E+RE+ scenario -</i>	PILLAR 1: Efficiency	/Electrification -	Transportation
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Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	9.27	119	229	613	998	1,305	1,612
Vehicle stocks - LDV – All others (1000	1,344	1,280	1,215	886	556	315	73.1
units)							
Light-duty vehicle capital costs vs. REF -		258	662	1,071	1,624	1,766	1,685
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		0.528		2.3		3.72
units)							
Public EV charging plugs - L2 (1000 units)	0.188		12.7		55.3		89.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.02	11.4	55.4	81.6	85.2	85.5	85.5
Heat Pump (%)							
Sales of space heating units - Electric	2.1	2.36	1.9	0.854	0.641	0.637	0.692
Resistance (%)							
Sales of space heating units - Gas (%)	18.7	10	7.16	1.21	0.152	0.086	0.084
Sales of space heating units - Fossil (%)	75.2	76.2	35.5	16.4	14	13.8	13.7
Sales of water heating units - Electric	0	1.91	15.5	34.6	37.8	38	38.1
Heat Pump (%)							
Sales of water heating units - Electric	25.3	41.2	50.4	60.2	61.8	61.9	61.8
Resistance (%)							
Sales of water heating units - Gas Furnace	51.5	43.4	31.5	5.04	0.297	0	0
(%)							
Sales of water heating units - Other (%)	23.2	13.5	2.63	0.195	0.089	0.089	0.089
Sales of cooking units - Electric	55.6	65	94	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	44.4	35	5.98	0.301	0	0	0
Residential HVAC investment in 2020s vs.		1.15	1.23				
REF - Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.23	11	39.6	72.4	77.7	77.9	78
Heat Pump (%)							
Sales of space heating units - Electric	1.65	4.4	16.6	21.3	22	22.1	22
Resistance (%)							
Sales of space heating units - Gas (%)	37.7	52.7	37.7	6.03	0.358	0	0
Sales of space heating units - Fossil (%)	57.4	32	6.13	0.259	0	0	0
Sales of water heating units - Electric	2.6	3.52	16	41.1	45.6	45.9	45.9
Heat Pump (%)							
Sales of water heating units - Electric	12.8	12.4	24	48	52.3	52.5	52.5
Resistance (%)							
Sales of water heating units - Gas (%)	77.2	79.9	58.1	9.27	0.548	0	0
Sales of water heating units - Other (%)	7.43	4.15	1.94	1.59	1.57	1.57	1.59
Sales of cooking units - Electric	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Resistance (%)							
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Commercial HVAC investment in 2020s -		2,680	2,926				
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)	459	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,400	1,396	1,396	1,396	800	10	10

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	1,242	1,242	1,242	1,242	1,242	1,242	0
Installed renewables - Rooftop PV (MW)	169	294	345	403	470	544	627
Installed renewables - Solar - Base land	0	0	721	2,901	2,901	8,772	14,113
use assumptions (MW)							
Installed renewables - Wind - Base land	214	356	1,604	1,807	2,141	2,211	2,660
use assumptions (MW)							
Installed renewables - Solar -	0	0	0	981	1,394	9,663	17,327
Constrained land use assumptions (MW)							
Installed renewables - Wind - Constrained	241	383	1,828	2,286	2,616	2,735	3,022
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	0.863	2.4	0	5.76	4.95
\$2018)							
Capital invested - Wind - Base (billion		0.375	2.99	0.454	0.711	0.14	0.856
\$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)	0	0	1,284	5,181	5,181	15,450	24,705
Wind - Base land use assumptions (GWh)	912	1,484	6,279	7,050	8,294	8,554	10,237
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	0	0	0	3,477	4,932	33,814	60,293
Wind - Constrained land use assumptions (GWh)	1,824	2,969	13,972	17,425	19,907	20,785	22,875
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-17.4
Carbon sink potential - Low - Avoid deforestation (1000 tC02e/y)							-78.4
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,184
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-7.66
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-716
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-31.2
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-16
Carbon sink potential - Low - Restore productivity (1000 tC02e/y)							-292
Carbon sink potential - Low - All (not counting overlap) (1000 tC02e/y)							-2,342
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-26
Carbon sink potential - Mid - Avoid deforestation (1000 tC02e/y)							-274
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,133

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve							-11.2
plantations (1000 tCO2e/y)							4 / 04
Carbon sink potential - Mid - Increase							-1,431
retention of HWP (1000 tCO2e/y)							-60.2
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-60.2
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							U
Carbon sink potential - Mid - Reforest							-114
pasture (1000 tCO2e/y)							-114
Carbon sink potential - Mid - Restore							-579
productivity (1000 tC02e/y)							-517
Carbon sink potential - Mid - All (not							-4,629
counting overlap) (1000 tCO2e/y)							-4,027
Carbon sink potential - High - Accelerate							-34.7
regeneration (1000 tCO2e/y)							04.1
Carbon sink potential - High - Avoid							-471
deforestation (1000 tC02e/y)							711
Carbon sink potential - High - Extend							-3,082
rotation length (1000 tC02e/y)							-5,002
Carbon sink potential - High - Improve							-15
plantations (1000 tCO2e/y)							10
Carbon sink potential - High - Increase							-2,147
retention of HWP (1000 tCO2e/y)							-2,141
Carbon sink potential - High - Increase							-89.2
trees outside forests (1000 tC02e/y)							07.2
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							·
Carbon sink potential - High - Reforest							-211
pasture (1000 tC02e/y)							
Carbon sink potential - High - All (not							-6,916
counting overlap) (1000 tCO2e/y)							0,7.0
Carbon sink potential - High - Restore							-866
productivity (1000 tC02e/y)							
Land impacted for carbon sink potential -							2.84
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							59.8
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							602
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.77
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							O
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							4.46
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.04
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							174
Low - Restore productivity (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	205
and impacted for carbon sink potential -							84
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.2
Mid - Accelerate regeneration (1000							
nectares)							
Land impacted for carbon sink potential -							61.
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							1.00
Land impacted for carbon sink potential -							1,08
Mid - Extend rotation length (1000							
hectares)							, ,
Land impacted for carbon sink potential -							4.1
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							
Mid - Increase retention of HWP (1000							
hectares)							6.4
Land impacted for carbon sink potential -							0.4
Mid - Increase trees outside forests (1000							
hectares) Land impacted for carbon sink potential -							
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							7.5
Mid - Reforest pasture (1000 hectares)							7.0
Land impacted for carbon sink potential -							35
Mid - Restore productivity (1000							00
hectares)							
Land impacted for carbon sink potential -							1,52
Mid - Total impacted (over 30 years) (1000							1,02
hectares)							
Land impacted for carbon sink potential -							5.6
High - Accelerate regeneration (1000							0.0
hectares)							
Land impacted for carbon sink potential -							63
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,57
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							5.5
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							8.4
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -			T				
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -			T	T			28
High - Restore productivity (1000							
nectares)							
Land impacted for carbon sink potential -							1,94
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							-36.3
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-1.18
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-37.5
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-68.9
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-2.36
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-71.3
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							20.8
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							2.14
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							22.9
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							•
energy grasses (1000 hectares)							
Land impacted for carbon sink -							39.5
Aggressive deployment - Cropland							07.0
measures (1000 hectares)							
Land impacted for carbon sink -							4.28
Aggressive deployment - Permanent							-7.20
conservation cover (1000 hectares)							
Land impacted for carbon sink -			+				43.7
Aggressive deployment - Total (1000							40.1
hectares)							
ποσιαί σο							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		14.4	0.017	0.017	0.016	0.01	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		4.94	2.85	3.16	2.44	1.23	0.279
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		26.6	25	19	11	4.91	1.78
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		1.23	1.13	0.848	0.494	0.229	0.095
Stations (deaths)							

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

Item Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -	2020	5.44	4.67	3.29	1.88	0.906	0.349
Fuel Comb - Residential - Natural Gas (deaths)							
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		18	14.1	9.21	5.04	2.1	0.618
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.76	1.61	1.24	0.791	0.41	0.181
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.299	0.288	0.275	0.262	0.248	0.232
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.73	4.3	3.45	2.44	1.57	0.881
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		12.2	9.78	6.59	3.82	2.47	1.85
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.23	1.04	0.857	0.671	0.493	0.323
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.092	0.05	0.05	0.049	0.05	0.046
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		7.66	7.36	7.19	6.28	5.29	3.98
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		128	0.148	0.148	0.141	0.084	0.004
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		43.7	25.2	28	21.7	10.9	2.47
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		237	222	169	97.6	43.6	15.8
Monetary damages from air pollution - Gas Stations (million \$2019)		10.9	10	7.51	4.38	2.02	0.837
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		48.2	41.4	29.2	16.6	8.03	3.09
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		159	125	81.6	44.7	18.6	5.48
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		15.6	14.3	11	7.01	3.63	1.61
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.65	2.55	2.44	2.32	2.19	2.06
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		41.9	38.1	30.6	21.6	13.9	7.79
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		108	86.6	58.4	33.8	21.9	16.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		10.9	9.24	7.58	5.94	4.36	2.86
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.808	0.442	0.441	0.435	0.442	0.409

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		68.1	65.3	63.8	55.8	47	35.4
Industrial Processes - Oil & Gas							
Production (million \$2019)							

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

Table 39: E+RE- Scenario - IMPACTS - Jobs							
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		98.6	141	47.2	38.9	35.9	131
By economic sector - Construction (jobs)		1,523	1,329	1,555	1,512	1,383	2,248
By economic sector - Manufacturing		824	656	692	583	466	853
(jobs)					212	170	
By economic sector - Mining (jobs)		543	414	299	210	150	105
By economic sector - Other (jobs)		165	114	188	162	169	385
By economic sector - Pipeline (jobs)		87.3	103	70.1	60.3	50.6	89.5
By economic sector - Professional (jobs)		929	821	873	1,014	863	1,534
By economic sector - Trade (jobs)		674	574	608	604	542	868
By economic sector - Utilities (jobs)		1,603	1,699	1,939	2,980	2,019	3,714
By resource sector - Biomass (jobs)		345	362	162	146	140	542
By resource sector - CO2 (jobs)		0	196	0	0	0	380
By resource sector - Coal (jobs)		152	129	122	116	111	42.6
By resource sector - Grid (jobs)		1,746	1,693	2,192	2,511	2,172	2,804
By resource sector - Natural Gas (jobs)		531	590	381	347	439	166
By resource sector - Nuclear (jobs)		627	617	878	2,071	929	2,709
By resource sector - Oil (jobs)		1,463	1,230	963	742	591	500
By resource sector - Solar (jobs)		1,114	513	975	656	665	2,083
By resource sector - Wind (jobs)		468	520	597	575	632	698
By education level - All sectors - High		2,679	2,444	2,599	2,868	2,316	4,011
school diploma or less (jobs)							
By education level - All sectors -		1,942	1,770	1,928	2,177	1,765	3,026
Associates degree or some college (jobs)							
By education level - All sectors -		1,423	1,275	1,356	1,639	1,236	2,225
Bachelors degree (jobs)							
By education level - All sectors - Masters		350	316	338	419	315	575
or professional degree (jobs)							
By education level - All sectors - Doctoral		52.5	46.4	49.7	62.4	47	88.9
degree (jobs)							
Related work experience - All sectors -		916	841	895	1,006	812	1,404
None (jobs)							
Related work experience - All sectors - Up		1,284	1,157	1,242	1,390	1,109	1,976
to 1 year (jobs)							
Related work experience - All sectors - 1		2,347	2,132	2,276	2,615	2,064	3,595
to 4 years (jobs)							
Related work experience - All sectors - 4		1,497	1,360	1,465	1,690	1,337	2,319
to 10 years (jobs)		.	.				
Related work experience - All sectors -		402	362	393	463	356	631
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		365	324	351	411	316	576
(jobs)							
On-the-Job Training - All sectors - Up to 1		4,307	3,902	4,148	4,746	3,734	6,578
year (jobs)		,	-, -	,	, -	-, -	-,-
On-the-Job Training - All sectors - 1 to 4		1,311	1,199	1,303	1,486	1,194	2,045
years (jobs)		,-	,	,	,	.	,
On-the-Job Training - All sectors - 4 to 10		402	373	409	455	382	633
years (jobs)							
On-the-Job Training - All sectors - Over 10		61.7	54.1	59.7	67.7	52.5	95.4
years (jobs)							
On-Site or In-Plant Training - All sectors -		1,057	953	1,021	1,179	924	1,654
None (jobs)		.,	, 30	.,	.,,		.,00 1
On-Site or In-Plant Training - All sectors -		3,897	3,532	3,765	4,309	3,393	5,961
Up to 1 year (jobs)		0,071	0,502	5,100	.,507	0,070	3,701

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors -		1,023	933	1,012	1,147	922	1,580
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		418	388	421	474	392	653
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		50.5	47	51	55.7	47.4	77.6
Over 10 years (jobs)							
Wage income - All (million \$2019)		372	344	373	444	351	626

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	93.6	86.6	75.2	60.9	47.9	39.6	35.8
Final energy use - Residential (PJ)	67.8	61.4	54.8	46.6	38.7	33	29.6
Final energy use - Commercial (PJ)	39.2	36.8	35.1	32.8	30.3	28.7	27.8
Final energy use - Industry (PJ)	21.1	20.7	20.2	19.9	19.6	19.6	19.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.537	0.548	1.07	1.14	1.01	1.05
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)	9.27	119	229	613	998	1,305	1,612
Vehicle stocks - LDV – All others (1000	1,344	1,280	1,215	886	556	315	73.1
units)							
Light-duty vehicle capital costs vs. REF -		258	662	1,071	1,624	1,766	1,685
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		0.528		2.3		3.72
units)							
Public EV charging plugs - L2 (1000 units)	0.188		12.7		55.3		89.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.02	11.4	55.4	81.6	85.2	85.5	85.5
Heat Pump (%)							
Sales of space heating units - Electric	2.1	2.36	1.9	0.854	0.641	0.637	0.692
Resistance (%)							
Sales of space heating units - Gas (%)	18.7	10	7.16	1.21	0.152	0.086	0.084
Sales of space heating units - Fossil (%)	75.2	76.2	35.5	16.4	14	13.8	13.7
Sales of water heating units - Electric	0	1.91	15.5	34.6	37.8	38	38.1
Heat Pump (%)							
Sales of water heating units - Electric	25.3	41.2	50.4	60.2	61.8	61.9	61.8
Resistance (%)							
Sales of water heating units - Gas Furnace	51.5	43.4	31.5	5.04	0.297	0	0
(%)							
Sales of water heating units - Other (%)	23.2	13.5	2.63	0.195	0.089	0.089	0.089
Sales of cooking units - Electric	55.6	65	94	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	44.4	35	5.98	0.301	0	0	0
Residential HVAC investment in 2020s vs.		1.15	1.23				
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	3.23	11	39.6	72.4	77.7	77.9	78
Heat Pump (%)							
Sales of space heating units - Electric	1.65	4.4	16.6	21.3	22	22.1	22
Resistance (%)							
Sales of space heating units - Gas (%)	37.7	52.7	37.7	6.03	0.358	0	0
Sales of space heating units - Fossil (%)	57.4	32	6.13	0.259	0	0	0
Sales of water heating units - Electric	2.6	3.52	16	41.1	45.6	45.9	45.9
Heat Pump (%)							
Sales of water heating units - Electric	12.8	12.4	24	48	52.3	52.5	52.5
Resistance (%)							
Sales of water heating units - Gas (%)	77.2	79.9	58.1	9.27	0.548	0	0
Sales of water heating units - Other (%)	7.43	4.15	1.94	1.59	1.57	1.57	1.59
Sales of cooking units - Electric	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Resistance (%)							
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Commercial HVAC investment in 2020s -		2,680	2,926				
Cumulative 5-yr (million \$2018)							

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

2035	2212		
2000	2040	2045	2050
346	346	346	0
795	800	10	10
1,356	1,961	1,961	2,751
403	470	544	627
384	384	384	855
953	953	1,185	1,573
86.5	654	654	654
1,151	1,151	1,274	1,752
0	0	0	0
0.424	0	0	0.436
0	0	0.47	0.738
0	0.589	0	0
0	0	0.248	0.912
	346 795 1,356 403 384 953 86.5 1,151 0 0.424	346 346 795 800 1,356 1,961 403 470 384 384 953 953 86.5 654 1,151 1,151 0 0 0.424 0 0 0 0 0.589	346 346 346 795 800 10 1,356 1,961 1,961 403 470 544 384 384 384 953 953 1,185 86.5 654 654 1,151 1,151 1,274 0 0 0 0.424 0 0 0 0.47 0 0 0.589 0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	0	0	683	683	683	1,516
Wind - Base land use assumptions (GWh)	912	1,344	3,818	3,818	3,818	4,703	6,164
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Constrained land use assumptions	0	0	152	152	1,157	1,157	1,157
(GWh)							
Wind - Constrained land use assumptions	912	1,344	4,552	4,552	4,552	5,008	6,803
(GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							

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

Table 47: E+RE- SCENDINO - PILLAR 6: LUNC			0000	2005	2010	00/5	
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-17.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-78.4
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-1,184
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-7.66
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-716
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-31.2
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-16
pasture (1000 tC02e/y)							
Carbon sink potential - Low - Restore							-292
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-2,342
counting overlap) (1000 tCO2e/y)							2,0 .2
Carbon sink potential - Mid - Accelerate							-26
regeneration (1000 tC02e/y)							20
Carbon sink potential - Mid - Avoid							-274
deforestation (1000 tCO2e/y)							-214
Carbon sink potential - Mid - Extend							-2,133
rotation length (1000 tC02e/y)							-2,133
Carbon sink potential - Mid - Improve							-11.2
plantations (1000 tCO2e/y)							-11.2
Carbon sink potential - Mid - Increase							1 / 01
							-1,431
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-60.2
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							0
cropland (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-114
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-579
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-4,629
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-34.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-471
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-3,082
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-15
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-2,147
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-89.2
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							Ŭ
Carbon sink potential - High - Reforest							-211
pasture (1000 tC02e/y)							411
Carbon sink potential - High - All (not			-			+	-6,916
counting overlap) (1000 tC02e/y)							0,710
Carbon sink potential - High - Restore			-				-866
productivity (1000 tCO2e/y)							-000
productivity (1000 to028/y)							

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 - Accelerate regeneration (1000							2.84
hectares) Land impacted for carbon sink potential -							59.8
Low - Avoid deforestation (over 30 years)							37.0
(1000 hectares)							
Land impacted for carbon sink potential -							602
Low - Extend rotation length (1000							002
hectares)							
Land impacted for carbon sink potential -							2.77
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential - Low - Increase trees outside forests							4.46
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							U
Land impacted for carbon sink potential -							1.04
Low - Reforest pasture (1000 hectares)							1.0-7
Land impacted for carbon sink potential -							174
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							847
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.26
Mid - Accelerate regeneration (1000							
hectares)							(1.0
Land impacted for carbon sink potential -							61.8
Mid - Avoid deforestation (over 30 years) (1000 hectares)							
Land impacted for carbon sink potential -							1,087
Mid - Extend rotation length (1000							1,001
hectares)							
Land impacted for carbon sink potential -							4.17
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							6.47
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares) Land impacted for carbon sink potential -							7.52
Mid - Reforest pasture (1000 hectares)							7.52
Land impacted for carbon sink potential -							350
Mid - Restore productivity (1000							330
hectares)							
Land impacted for carbon sink potential -							1,521
Mid - Total impacted (over 30 years) (1000							.,
hectares)							
Land impacted for carbon sink potential -							5.68
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							63.7
High - Avoid deforestation (over 30 years)							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,572
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							5.54
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 -							8.48
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							6
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							287
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,948
High - Total impacted (over 30 years)							
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-36.3
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-1.18
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-37.5
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-68.9
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-2.36
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-71.3
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							20.8
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							2.14
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							22.9
deployment - Total (1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							39.5
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							4.28
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							43.7
Aggressive deployment - Total (1000							
hectares)							

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

Table 49: E-B+ Scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		14.4	0.017	0.017	0.016	0.01	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		4.92	2.22	1.11	0.86	0.523	0.197
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		27.1	27.5	26.8	24.1	19.2	13.2
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		1.26	1.27	1.23	1.1	0.87	0.594
Stations (deaths)							
Premature deaths from air pollution -		5.47	5.07	4.54	3.79	2.89	1.95
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		18.2	16.7	15.3	13.1	9.92	6.68
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		1.77	1.74	1.68	1.53	1.24	0.91
Fuel Comb - Residential - Other (deaths)							0.,.
Premature deaths from air pollution -		0.299	0.288	0.275	0.262	0.248	0.232
Fuel Comb - Comm/Institutional - Coal		0.277	0.200	0.210	0.202	0.240	0.202
(deaths)							
Premature deaths from air pollution -		4.75	4.69	4.56	4.21	3.63	2.93
Fuel Comb - Comm/Institutional - Natural		4.13	4.07	4.50	4.21	3.03	2.70
Gas (deaths)							
Premature deaths from air pollution -		12.3	10.8	9.27	7.52	6.26	5.16
Fuel Comb - Comm/Institutional - Oil		12.5	10.0	7.21	1.52	0.20	3.10
(deaths)							
Premature deaths from air pollution -		1.23	1.12	1	0.888	0.772	0.659
Fuel Comb - Comm/Institutional - Other		1.23	1.12	1	0.000	0.772	0.639
(deaths)		0.000	0.05	0.05	0.05	0.051	0.05
Premature deaths from air pollution -		0.099	0.05	0.05	0.05	0.051	0.05
Industrial Processes - Coal Mining							
(deaths)		7.54	(50				0.70
Premature deaths from air pollution -		7.51	6.59	5.38	4.46	3.8	2.73
Industrial Processes - Oil & Gas							
Production (deaths)							
Monetary damages from air pollution -		128	0.148	0.148	0.141	0.084	0.004
Fuel Comb - Electric Generation - Coal							
(million \$2019)							
Monetary damages from air pollution -		43.5	19.6	9.81	7.62	4.64	1.74
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		241	245	239	215	171	117
Mobile - On-Road (million \$2019)							
Monetary damages from air pollution -		11.1	11.3	10.9	9.74	7.7	5.26
Gas Stations (million \$2019)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		48.5	44.9	40.2	33.6	25.6	17.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		161	148	136	116	87.9	59.2
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		15.7	15.4	14.9	13.5	11	8.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.65	2.55	2.44	2.32	2.19	2.06
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		42	41.5	40.3	37.3	32.2	25.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		109	95.9	82	66.6	55.4	45.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		10.9	9.91	8.89	7.86	6.83	5.83
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.875	0.444	0.445	0.443	0.449	0.444
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		66.7	58.5	47.8	39.6	33.7	24.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		96.1	135	50.3	37.2	30.9	233
By economic sector - Construction (jobs)		1,479	1,404	1,938	1,602	3,619	12,737
By economic sector - Manufacturing		709	865	816	664	1,031	2,978
(jobs)							
By economic sector - Mining (jobs)		525	412	322	251	181	121
By economic sector - Other (jobs)		162	123	274	200	662	2,164
By economic sector - Pipeline (jobs)		86.1	99.2	69.7	63.9	54.3	84.5
By economic sector - Professional (jobs)		927	882	1,052	952	1,865	5,859
By economic sector - Trade (jobs)		660	603	743	651	1,255	3,768
By economic sector - Utilities (jobs)		1,482	1,654	1,691	1,670	3,196	13,388
By resource sector - Biomass (jobs)		382	362	170	156	143	1,099
By resource sector - CO2 (jobs)		0	178	0	0	0	346
By resource sector - Coal (jobs)		62.1	0	0	0	0	0
By resource sector - Grid (jobs)		1,546	1,721	2,204	2,217	5,255	26,668
By resource sector - Natural Gas (jobs)		512	543	292	252	356	91.8
By resource sector - Nuclear (jobs)		627	617	607	598	588	579
By resource sector - Oil (jobs)		1,477	1,297	1,138	1,000	813	613
By resource sector - Solar (jobs)		1,161	678	1,554	930	3,531	10,139
By resource sector - Wind (jobs)		361	781	990	939	1,208	1,798
By education level - All sectors - High		2,534	2,577	2,910	2,522	4,995	17,685
school diploma or less (jobs)							
By education level - All sectors -		1,835	1,868	2,146	1,880	3,795	13,409
Associates degree or some college (jobs)							
By education level - All sectors -		1,367	1,350	1,476	1,311	2,403	7,943
Bachelors degree (jobs)							
By education level - All sectors - Masters		339	332	367	329	610	2,019
or professional degree (jobs)							
By education level - All sectors - Doctoral		52	49.3	56.1	50	91.4	278
degree (jobs)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors -		870	883	996	871	1,729	6,103
None (jobs)		1.000	1.000	1.000	1.000	0.004	0.047
Related work experience - All sectors - Up		1,220	1,229	1,399	1,209	2,391	8,314
to 1 year (jobs)		0.000	0.045	0.547	0.000		1/ 000
Related work experience - All sectors - 1		2,232	2,245	2,514	2,209	4,280	14,832
to 4 years (jobs)		1 / 05	1/0/	1 (10	1 / 0 /	0.770	0.700
Related work experience - All sectors - 4		1,425	1,434	1,618	1,424	2,773	9,609
to 10 years (jobs) Related work experience - All sectors -		381	385	430	378	701	2,475
Over 10 years (jobs)		361	365	430	316	721	2,415
On-the-Job Training - All sectors - None		350	343	392	340	657	2,196
(jobs)		330	343	372	340	031	2,170
On-the-Job Training - All sectors - Up to 1		4,094	4,128	4,592	4,023	7,742	26,746
year (jobs)		1,071	1,120	1,072	1,020	.,	20,110
On-the-Job Training - All sectors - 1 to 4		1,242	1,261	1,444	1,267	2,537	8,976
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		383	386	460	403	846	3,050
years (jobs)							
On-the-Job Training - All sectors - Over 10		58.7	58.6	67.7	57.6	112	366
years (jobs)							
On-Site or In-Plant Training - All sectors -		1,009	1,011	1,139	992	1,929	6,549
None (jobs)							
On-Site or In-Plant Training - All sectors -		3,703	3,732	4,165	3,651	7,048	24,430
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		969	982	1,122	983	1,964	6,942
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		399	402	471	414	849	3,031
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		47.7	49.3	57.3	50.6	105	382
Over 10 years (jobs)			0.41		0.15	700	0.46=
Wage income - All (million \$2019)		354	361	407	365	709	2,497

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	93.7	87.4	79.2	72.1	66.4	59.8	52
Final energy use - Residential (PJ)	67.8	61.6	57.1	53.2	48.5	43.3	38.2
Final energy use - Commercial (PJ)	39.2	36.9	35.8	34.9	33.7	32.5	31.4
Final energy use - Industry (PJ)	21.1	20.7	20.4	20.3	20.3	20.2	20

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

•	,		,				
Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.401	0.397	0.601	0.621	0.904	0.955
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)	7.18	39.4	71.7	221	371	701	1,032
Vehicle stocks - LDV – All others (1000	1,349	1,349	1,349	1,280	1,211	933	655
units)							
Light-duty vehicle capital costs vs. REF -		0	41.9	87.7	296	932	1,358
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.06		0.165		0.854		2.38
units)							
Public EV charging plugs - L2 (1000 units)	0.188		3.97		20.5		57.2

Table 54: E-B+ scenario	- PTI I AR 1. Efficiency	//Flectrification .	- Residential
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Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	4.02	3.88	8.07	20.5	41.9	60	68.2
Heat Pump (%)							
Sales of space heating units - Electric	2.1	2.38	2.37	2.3	1.88	1.38	1.1
Resistance (%)							
Sales of space heating units - Gas (%)	18.7	10.2	9.97	9.04	6.81	4.15	2.55
Sales of space heating units - Fossil (%)	75.2	83.5	79.6	68.2	49.4	34.5	28.2
Sales of water heating units - Electric	0	0.469	1.77	5.89	14.5	24.1	29.3
Heat Pump (%)							
Sales of water heating units - Electric	25.3	39.9	40.7	43.4	48.7	54	56.8
Resistance (%)							
Sales of water heating units - Gas Furnace	51.5	43.9	42.9	39.1	29.7	17.8	10.8
(%)							
Sales of water heating units - Other (%)	23.2	15.7	14.7	11.6	7.09	4.11	3.08
Sales of cooking units - Electric	55.4	56.6	60.7	71.4	86.4	95.6	98.8
Resistance (%)							
Sales of cooking units - Gas (%)	44.6	43.4	39.3	28.6	13.6	4.4	1.18
Residential HVAC investment in 2020s vs.		1.15	1.3				
REF - Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	3.23	7.44	10.2	18.5	35	52.2	61.5
Heat Pump (%)							
Sales of space heating units - Electric	1.65	2.12	3.22	6.62	12.2	16.4	17.9
Resistance (%)							
Sales of space heating units - Gas (%)	37.7	53.3	51.4	46.8	35.8	21.6	13.2
Sales of space heating units - Fossil (%)	57.4	37.1	35.2	28.1	17	9.78	7.36
Sales of water heating units - Electric	2.6	2.83	4	7.92	17.2	28.8	35.5
Heat Pump (%)							
Sales of water heating units - Electric	12.8	11.7	12.6	16.6	25.4	36.2	42.6
Resistance (%)							
Sales of water heating units - Gas (%)	77.2	80.9	79.2	71.8	54.5	32.8	19.8
Sales of water heating units - Other (%)	7.43	4.56	4.2	3.64	2.86	2.25	2.09
Sales of cooking units - Electric	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Resistance (%)							
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Commercial HVAC investment in 2020s -		2,680	2,929				
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)	459	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	1,400	1,396	790	790	790	5	5
Installed thermal - Nuclear (MW)	1,242	1,242	1,242	1,242	1,242	1,242	1,242
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	0	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	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	3,152
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		0	0	0	0	0	264

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	4.05
Annual - BECCS (MMT)		0	0	0	0	0	4.05
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	4.05
Cumulative - BECCS (MMT)		0	0	0	0	0	4.05
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	55.8	55.8	55.8	55.8	55.8
Spur (km)		0	0	0	0	0	180
All (km)		0	55.8	55.8	55.8	55.8	236
Cumulative investment - Trunk (million \$2018)		0	101	101	101	101	101
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	151
Cumulative investment - All (million \$2018)		0	101	101	101	101	252

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

Iable 62: E-B+ scenario - PILLAR 6: Land :	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate	2020	2020	2000	2000	20.0	20.0	-17.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-78.4
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-1,184
rotation length (1000 tCO2e/y)							.,
Carbon sink potential - Low - Improve							-7.66
plantations (1000 tC02e/y)							1.00
Carbon sink potential - Low - Increase							-716
retention of HWP (1000 tCO2e/y)							-110
Carbon sink potential - Low - Increase							-31.2
•							-31.2
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-16
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-292
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-2,342
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-26
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-274
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-2,133
rotation length (1000 tCO2e/y)							_,
Carbon sink potential - Mid - Improve							-11.2
plantations (1000 tCO2e/y)							11.2
Carbon sink potential - Mid - Increase							-1,431
retention of HWP (1000 tCO2e/y)							-1,401
Carbon sink potential - Mid - Increase							-60.2
							-60.2
trees outside forests (1000 tC02e/y)							0
Carbon sink potential - Mid - Reforest							U
cropland (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-114
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-579
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-4,629
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-34.7
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-471
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-3,082
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-15
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-2,147
retention of HWP (1000 tCO2e/y)							2,1-1
Carbon sink potential - High - Increase							-89.2
trees outside forests (1000 tC02e/y)							-09.2
							0
Carbon sink potential - High - Reforest							U
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-211
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-6,916
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-866
productivity (1000 tCO2e/y)	1	1	1		1	1	000

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000							2.84
hectares)							
Land impacted for carbon sink potential -							59.8
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							602
Low - Extend rotation length (1000							
hectares)							2.77
Land impacted for carbon sink potential - Low - Improve plantations (1000							2.11
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							·
hectares)							
Land impacted for carbon sink potential -							4.46
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential -							1.04
Low - Reforest pasture (1000 hectares) Land impacted for carbon sink potential -							174
Low - Restore productivity (1000							174
hectares)							
Land impacted for carbon sink potential -							847
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4.26
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							61.8
Mid - Avoid deforestation (over 30 years)							
(1000 hectares) Land impacted for carbon sink potential -							1,087
Mid - Extend rotation length (1000							1,067
hectares)							
Land impacted for carbon sink potential -							4.17
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							6.47
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential -							7.52
Mid - Reforest pasture (1000 hectares)							1.02
Land impacted for carbon sink potential -							350
Mid - Restore productivity (1000							000
hectares)							
Land impacted for carbon sink potential -							1,521
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							5.68
High - Accelerate regeneration (1000							
hectares)							, o =
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years)							63.7
		1					

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,572
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							5.54
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 -							8.48
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							6
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							287
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,948
High - Total impacted (over 30 years)							
(1000 hectares)							

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

2020	2025	2030	2035	2040	2045	2050
						0
						-36.3
						-1.18
						0
						0
						-37.5
						0
						-68.9
						-2.36
						0
						_
						0
						· ·
						-71.3

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate							(
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							20.8
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							2.14
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							(
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							0.27
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							23.5
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							(
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							97.4
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							4.28
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							(
Aggressive deployment - Cropland to							
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							0.27
Aggressive deployment - Pasture to							0
energy crops (1000 hectares)							
Land impacted for carbon sink -							10:
Aggressive deployment - Total (1000							
hectares)							
	I	l .			I	I	
able 64: REF scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	205
Premature deaths from air pollution -		47.4	32.4	30.5	29.9	29.4	25.
Fuel Comb - Electric Generation - Coal							

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		47.4	32.4	30.5	29.9	29.4	25.3
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		3.72	3.11	3.99	4.21	4.06	3.86
Premature deaths from air pollution - Mobile - On-Road (deaths)		27.1	27.9	28.5	29.3	30	30.8
Premature deaths from air pollution - Gas Stations (deaths)		1.25	1.28	1.31	1.34	1.37	1.39
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		5.46	5.36	5.51	5.65	5.71	5.66
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		17.7	13.7	8.73	5.09	2.96	1.87
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.74	1.67	1.57	1.5	1.45	1.42
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.312	0.315	0.316	0.316	0.315	0.313

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

Table 04: NET decitatio Introduction (et	-					
Item	2020 2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -	4.82	4.96	4.9	4.8	4.86	5.09
Fuel Comb - Comm/Institutional - Natural						
Gas (deaths)						
Premature deaths from air pollution -	12.3	10.5	8.16	5.58	4.15	3.37
Fuel Comb - Comm/Institutional - Oil						
(deaths)						
Premature deaths from air pollution -	1.28	1.33	1.37	1.4	1.43	1.45
Fuel Comb - Comm/Institutional - Other						
(deaths)						
Premature deaths from air pollution -	0.192	0.14	0.117	0.113	0.11	0.105
Industrial Processes - Coal Mining						
(deaths)						
Premature deaths from air pollution -	7.57	8.17	8.49	8.14	8.2	7.89
Industrial Processes - Oil & Gas						
Production (deaths)						
Monetary damages from air pollution -	420	288	270	265	261	224
Fuel Comb - Electric Generation - Coal						
(million \$2019)						
Monetary damages from air pollution -	32.9	27.6	35.4	37.3	36	34.2
Fuel Comb - Electric Generation - Natural						
Gas (million \$2019)						
Monetary damages from air pollution -	241	248	254	260	267	274
Mobile - On-Road (million \$2019)						
Monetary damages from air pollution -	11.1	11.4	11.6	11.9	12.1	12.3
Gas Stations (million \$2019)						
Monetary damages from air pollution -	48.4	47.5	48.8	50.1	50.6	50.2
Fuel Comb - Residential - Natural Gas						
(million \$2019)						
Monetary damages from air pollution -	156	122	77.3	45.1	26.2	16.5
Fuel Comb - Residential - Oil (million						
\$2019)						
Monetary damages from air pollution -	15.5	14.8	13.9	13.3	12.9	12.6
Fuel Comb - Residential - Other (million						
\$2019)						
Monetary damages from air pollution -	2.77	2.79	2.8	2.8	2.79	2.77
Fuel Comb - Comm/Institutional - Coal		,		0	,	
(million \$2019)						
Monetary damages from air pollution -	42.7	43.9	43.4	42.5	43	45.1
Fuel Comb - Comm/Institutional - Natural		.0.7		0		
Gas (million \$2019)						
Monetary damages from air pollution -	109	93.3	72.2	49.4	36.8	29.9
Fuel Comb - Comm/Institutional - Oil	107	70.0	12.2	77.7	00.0	27.7
(million \$2019)						
Monetary damages from air pollution -	11.4	11.8	12.1	12.4	12.6	12.9
Fuel Comb - Comm/Institutional - Other	11.4	11.0	12.1	12.4	12.0	12.7
(million \$2019)						
Monetary damages from air pollution -	1.7	1.23	1.04	0.994	0.973	0.924
Industrial Processes - Coal Mining	1.6	1.23	1.04	0.774	0.713	0.724
(million \$2019)						
Monetary damages from air pollution -	67.2	72.6	75.4	72.3	72.8	70.1
Industrial Processes - Oil & Gas	01.2	12.0	15.4	12.3	12.0	۲۵.۱
Production (million \$2019)						

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		91.2	81.7	80.7	65.7	65.7	71.2
By economic sector - Construction (jobs)		933	1,201	1,253	1,248	1,187	1,415
By economic sector - Manufacturing		527	573	739	533	514	708
(jobs)							
By economic sector - Mining (jobs)		561	459	378	316	269	217

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

Table 05. NET Section 10 1717 ACTO 3005	(continucu)						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		46.4	106	117	128	133	256
By economic sector - Pipeline (jobs)		87.6	89.2	89.8	87.9	89.7	91.1
By economic sector - Professional (jobs)		731	803	801	811	801	913
By economic sector - Trade (jobs)		560	578	554	548	531	616
By economic sector - Utilities (jobs)		1,574	1,599	1,657	1,611	1,459	1,232
By resource sector - Biomass (jobs)		352	329	306	273	280	284
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		222	209	198	188	180	69
By resource sector - Grid (jobs)		1,692	1,723	1,852	1,662	1,391	1,248
By resource sector - Natural Gas (jobs)		526	546	550	625	585	338
By resource sector - Nuclear (jobs)		627	617	607	598	588	579
By resource sector - Oil (jobs)		1,485	1,320	1,194	1,121	1,071	1,037
By resource sector - Solar (jobs)			493	527	552	571	1,386
By resource sector - Wind (jobs)		207	252	436	329	384	578
By education level - All sectors - High		2,081	2,259	2,349	2,199	2,073	2,289
school diploma or less (jobs)							
By education level - All sectors -		1,512	1,650	1,722	1,630	1,535	1,681
Associates degree or some college (jobs)							
By education level - All sectors -		1,182	1,230	1,247	1,179	1,118	1,200
Bachelors degree (jobs)							
By education level - All sectors - Masters		293	305	308	295	281	302
or professional degree (jobs)							
By education level - All sectors - Doctoral		42.8	45.3	44.9	44.1	42.9	47.7
degree (jobs)							
Related work experience - All sectors -		724	781	809	765	722	790
None (jobs)					1010		
Related work experience - All sectors - Up		987	1,074	1,115	1,042	987	1,108
to 1 year (jobs)		1.00/	0.011	0.070	1055	10//	
Related work experience - All sectors - 1		1,884	2,011	2,070	1,955	1,846	2,004
to 4 years (jobs)		110/	1.000	1.000	1.050	1100	1.070
Related work experience - All sectors - 4		1,194	1,282	1,322	1,253	1,182	1,278
to 10 years (jobs)		322	343	٥٦٦	333	314	340
Related work experience - All sectors - Over 10 years (jobs)		322	343	355	333	314	340
On-the-Job Training - All sectors - None		287	308	314	297	282	315
(jobs)		201	308	314	291	202	315
On-the-Job Training - All sectors - Up to 1		3,442	3,667	3,785	3,550	3,356	3,675
year (jobs)		3,442	3,001	3,100	3,550	3,336	3,013
On-the-Job Training - All sectors - 1 to 4		1,028	1,119	1,162	1,104	1,038	1,125
years (jobs)		1,020	1,112	1,102	1,104	1,030	1,120
On-the-Job Training - All sectors - 4 to 10		308	345	356	348	327	351
years (jobs)		300	343	330	340	321	331
On-the-Job Training - All sectors - Over 10		45.3	50.3	52.7	49.1	46.7	53.4
years (jobs)		40.0	30.5	32.1	47.1	40.1	33.4
On-Site or In-Plant Training - All sectors -		829	892	920	867	822	911
None (jobs)		027	072	720	001	022	711
On-Site or In-Plant Training - All sectors -		3,114	3,322	3,428	3,219	3,040	3,324
Up to 1 year (jobs)		5,	0,022	0, .20	0,217	0,010	0,02 :
On-Site or In-Plant Training - All sectors -		802	872	905	858	807	877
1 to 4 years (jobs)		002	0.2	,00		30.	0
On-Site or In-Plant Training - All sectors -		326	361	371	361	339	363
4 to 10 years (jobs)		520	50.	5	301	33,	230
On-Site or In-Plant Training - All sectors -		39.1	43.3	45.5	43.6	40.9	44.2
Over 10 years (jobs)		5 7		.5.5			· ··-
Wage income - All (million \$2019)		302	325	338	325	311	337

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	93.6	87.4	79.7	74.8	74.3	76.1	78.5

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

Item	2020	2025	2030	2035	2040	2045	2050
	67.8	61.9	58	55.1	52.9	51.1	49.7
Final energy use - Residential (PJ)		_			_	_	
Final energy use - Commercial (PJ)	39.2	37.6	37.4	36.9	36.4	36.8	38
Final energy use - Industry (PJ)	21.1	21.5	21.9	22.8	23.8	24.9	25.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		0.457	0.459	0.61	0.629	0.612	0.627
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	3.84	6.34	6.59	6.97	7.07	7.14	7.27
Heat Pump (%)							
Sales of space heating units - Electric	2.1	2.29	2.33	2.38	2.34	2.25	2.16
Resistance (%)							
Sales of space heating units - Gas (%)	18.7	16.9	40.9	57.3	58.3	58.5	58.4
Sales of space heating units - Fossil (%)	75.3	74.5	50.1	33.3	32.3	32.1	32.2
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	25.3	39.6	39.4	39.4	39.3	39.3	39.2
Resistance (%)							
Sales of water heating units - Gas Furnace	51.5	44.3	44.5	44.5	44.6	44.7	44.8
(%)							
Sales of water heating units - Other (%)	23.2	16.1	16.1	16	16	16	16
Sales of cooking units - Electric	55	55	55	55	55	55	55
Resistance (%)							
Sales of cooking units - Gas (%)	45	45	45	45	45	45	45
Residential HVAC investment in 2020s vs.		1.13	1.17				
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	3.23	13	41.2	64.3	67.9	68.2	68.3
Heat Pump (%)							
Sales of space heating units - Electric	1.65	2.61	7.4	19.7	29.9	31.7	31.7
Resistance (%)							
Sales of space heating units - Gas (%)	37.7	48.8	26.5	6.29	0.795	0.043	0
Sales of space heating units - Fossil (%)	57.4	35.6	25	9.75	1.4	0.11	0
Sales of water heating units - Electric	2.6	2.39	2.36	2.36	2.34	2.37	2.37
Heat Pump (%)							
Sales of water heating units - Electric	12.8	11.3	11	11.3	11.2	11.1	11.2
Resistance (%)							
Sales of water heating units - Gas (%)	77.2	81.6	82.1	81.9	81.9	82.2	82.2
Sales of water heating units - Other (%)	7.43	4.63	4.47	4.42	4.51	4.27	4.25
Sales of cooking units - Electric	36.9	39	38.6	38.5	38.3	38.5	38.4
Resistance (%)							
Sales of cooking units - Gas (%)	63.1	61	61.4	61.5	61.7	61.5	61.6
Commercial HVAC investment in 2020s -		2,647	2,721				
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)	559	559	559	559	559	559	0
Installed thermal - Natural gas (MW)	1,400	1,396	1,396	1,396	795	10	10
Installed thermal - Nuclear (MW)	1,242	1,242	1,242	1,242	1,242	1,242	1,242
Installed renewables - Rooftop PV (MW)	169	294	345	403	470	544	627

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

	-			-			
Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Wind - Base land	356	356	426	426	426	575	795
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)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	1,484	1,484	1,762	1,762	1,762	2,344	3,212
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)	1.14		-4.14				-3.7
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.584		-1.05				-1.09
Business-as-usual carbon sink - Total (Mt CO2e/y)	0.556		-5.19				-4.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-17.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-78.4
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-1,184
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-7.66
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-716
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-31.2
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-16
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-292
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-2,342
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-26
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-274
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-2,133
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-11.2
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-1,431
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-60.2
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-114
pasture (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Restore							-579
productivity (1000 tC02e/y)							
Carbon sink potential - Mid - All (not							-4,629
counting overlap) (1000 tC02e/y)							0/7
Carbon sink potential - High - Accelerate							-34.7
regeneration (1000 tC02e/y)							-471
Carbon sink potential - High - Avoid							-4/1
deforestation (1000 tC02e/y)							0.000
Carbon sink potential - High - Extend							-3,082
rotation length (1000 tC02e/y)							-15
Carbon sink potential - High - Improve							-15
plantations (1000 tC02e/y) Carbon sink potential - High - Increase							-2,147
retention of HWP (1000 tC02e/y)							-2,147
Carbon sink potential - High - Increase							-89.2
trees outside forests (1000 tC02e/y)							-69.2
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							U
Carbon sink potential - High - Reforest							-211
pasture (1000 tCO2e/y)							-211
Carbon sink potential - High - All (not							-6,916
counting overlap) (1000 tC02e/y)							-0,910
Carbon sink potential - High - Restore							-866
productivity (1000 tCO2e/y)							-000
Land impacted for carbon sink potential -							2.84
							2.04
Low - Accelerate regeneration (1000 hectares)							
Land impacted for carbon sink potential -							59.8
Low - Avoid deforestation (over 30 years)							39.0
(1000 hectares)							
Land impacted for carbon sink potential -							602
Low - Extend rotation length (1000							602
hectares)							
Land impacted for carbon sink potential -							2.77
Low - Improve plantations (1000							2.11
hectares)							
Land impacted for carbon sink potential -	+						0
Low - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							4.46
Low - Increase trees outside forests							4.40
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							U
Land impacted for carbon sink potential -	+						1.04
Low - Reforest pasture (1000 hectares)							1.04
Land impacted for carbon sink potential -							174
Low - Restore productivity (1000							114
hectares)							
Land impacted for carbon sink potential -							847
Low - Total impacted (over 30 years)							041
(1000 hectares)							
Land impacted for carbon sink potential -							4.26
Mid - Accelerate regeneration (1000							4.20
hectares)							
Land impacted for carbon sink potential -	+	+					61.8
Mid - Avoid deforestation (over 30 years)							01.0
(1000 hectares)							
Land impacted for carbon sink potential -	-	+	-				1,087
Mid - Extend rotation length (1000							1,001
hectares)							
nootal ooj							

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

Iable 73: REF scenario - PILLAR 6: Land s Item	2020	2025	euj 2030	2035	2040	2045	2050
Land impacted for carbon sink potential -	2020	2023	2030	2033	2040	2043	4.17
Mid - Improve plantations (1000 hectares)							7.11
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							·
hectares)							
Land impacted for carbon sink potential -							6.47
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							7.52
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							350
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							1,521
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							5.68
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							63.7
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,572
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							5.54
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 -							8.48
High - Increase trees outside forests							0.40
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							Ū
Land impacted for carbon sink potential -							6
High - Reforest pasture (1000 hectares)							Ü
Land impacted for carbon sink potential -							287
High - Restore productivity (1000							20.
hectares)							
Land impacted for carbon sink potential -							1,948
High - Total impacted (over 30 years)							.,, .0
(1000 hectares)							
_ `		l .					