

# Net-Zero America - Washington data

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

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Table 1: E+ scenario - IMPACTS - Health

Table 1: E+ scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		7.18	0.008	0.008	0.006	0.004	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		6.69	3.97	3.51	3.4	2.84	2.28
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		125	121	95.3	57	26.7	10.7
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		7.1	6.76	5.26	3.18	1.55	0.706
Stations (deaths)							
Premature deaths from air pollution -		17.4	14	9.21	4.86	2.13	0.726
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		3.18	2.53	1.75	1.07	0.567	0.245
Fuel Comb - Residential - Oil (deaths)							
Premature deaths from air pollution -		1.74	1.51	1.17	0.828	0.546	0.373
Fuel Comb - Residential - Other (deaths)					0.020	0.0.0	0.010
Premature deaths from air pollution -		0.114	0.113	0.111	0.108	0.105	0.101
Fuel Comb - Comm/Institutional - Coal		0.114	0.110	0.111	0.100	0.100	0.101
(deaths)							
Premature deaths from air pollution -		16.2	15.4	12	8	4.83	2.55
Fuel Comb - Comm/Institutional - Natural		10.2	15.4	12	0	4.00	2.00
Gas (deaths)							
Premature deaths from air pollution -		0.36	0.297	0.241	0.189	0.139	0.093
Fuel Comb - Comm/Institutional - Oil		0.36	0.291	0.241	0.109	0.139	0.093
(deaths)							
		1.0/	1.07	0.005	0.701	0.550	0.372
Premature deaths from air pollution -		1.24	1.07	0.905	0.731	0.552	0.372
Fuel Comb - Comm/Institutional - Other							
(deaths)		0.17	0.00	0.010	0.017	0.01/	0.01/
Premature deaths from air pollution -		0.16	0.02	0.019	0.017	0.016	0.016
Industrial Processes - Coal Mining							
(deaths)		45.7	45.0	47.5	44 (	0.05	
Premature deaths from air pollution -		15.7	15.3	14.5	11.6	8.95	5.75
Industrial Processes - Oil & Gas							
Production (deaths)							
Monetary damages from air pollution -		63.6	0.071	0.07	0.053	0.033	0
Fuel Comb - Electric Generation - Coal							
(million \$2019)							
Monetary damages from air pollution -		59.3	35.2	31.1	30.1	25.2	20.2
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		1,113	1,077	847	507	238	95
Mobile - On-Road (million \$2019)							
Monetary damages from air pollution -		62.9	59.8	46.5	28.2	13.8	6.25
Gas Stations (million \$2019)							
Monetary damages from air pollution -		155	124	81.6	43.1	18.8	6.43
Fuel Comb - Residential - Natural Gas							
(million \$2019)							
Monetary damages from air pollution -		28.2	22.4	15.5	9.51	5.03	2.17
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		15.4	13.4	10.4	7.33	4.83	3.3
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		1.01	1	0.982	0.958	0.929	0.895
Fuel Comb - Comm/Institutional - Coal			.	5.,02	5.755	5.,2,	2.070
(million \$2019)							
Monetary damages from air pollution -		144	137	106	70.8	42.8	22.6
Fuel Comb - Comm/Institutional - Natural		1-7-7	.51	.50	10.0	72.0	22.0
Gas (million \$2019)							
GGG (111111011 #2017)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		3.19	2.63	2.14	1.67	1.23	0.822
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)							
Monetary damages from air pollution -		10.9	9.48	8.01	6.47	4.88	3.29
Fuel Comb - Comm/Institutional - Other							
(million \$2019)							
Monetary damages from air pollution -		1.41	0.176	0.166	0.149	0.14	0.137
Industrial Processes - Coal Mining							
(million \$2019)							
Monetary damages from air pollution -		140	136	129	103	79.5	51
Industrial Processes - Oil & Gas							
Production (million \$2019)							

Table 2: E+ scenario - IMPACTS - Jobs

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Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		125	284	128	99.8	154	650
By economic sector - Construction (jobs)		10,004	13,174	16,688	18,593	20,263	27,400
By economic sector - Manufacturing		2,853	4,122	4,551	4,452	4,191	5,144
(jobs)							
By economic sector - Mining (jobs)		2,249	1,645	1,105	712	448	269
By economic sector - Other (jobs)		1,263	1,591	2,065	2,576	3,057	5,022
By economic sector - Pipeline (jobs)		418	361	502	229	169	210
By economic sector - Professional (jobs)		4,930	7,144	9,136	11,380	13,451	19,002
By economic sector - Trade (jobs)		3,601	4,466	5,448	6,633	7,821	11,248
By economic sector - Utilities (jobs)		5,361	9,672	12,915	14,191	15,466	19,773
By resource sector - Biomass (jobs)		537	784	364	301	562	2,777
By resource sector - CO2 (jobs)		0	0	1,741	53.5	90	814
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		7,219	16,364	21,247	25,819	28,448	36,083
By resource sector - Natural Gas (jobs)		2,549	2,064	2,014	1,796	1,380	1,366
By resource sector - Nuclear (jobs)		606	596	346	0.015	0.019	0.038
By resource sector - Oil (jobs)		6,006	4,868	3,624	2,612	1,888	1,284
By resource sector - Solar (jobs)		8,316	7,934	9,168	10,070	10,937	19,893
By resource sector - Wind (jobs)		5,473	9,850	14,034	18,214	21,716	26,503
By education level - All sectors - High		12,952	17,786	21,848	24,200	26,473	36,168
school diploma or less (jobs)			.				·
By education level - All sectors -		9,543	13,395	16,877	18,961	20,966	28,518
Associates degree or some college (jobs)							
By education level - All sectors -		6,455	8,733	10,670	12,063	13,451	18,339
Bachelors degree (jobs)							
By education level - All sectors - Masters		1,601	2,205	2,722	3,141	3,553	4,886
or professional degree (jobs)							
By education level - All sectors - Doctoral		254	342	421	500	577	808
degree (jobs)							
Related work experience - All sectors -		4,410	6,112	7,590	8,483	9,362	12,830
None (jobs)							
Related work experience - All sectors - Up		6,214	8,509	10,434	11,670	12,855	17,713
to 1 year (jobs)							
Related work experience - All sectors - 1		11,109	15,300	18,909	21,210	23,456	31,961
to 4 years (jobs)							
Related work experience - All sectors - 4		7,201	9,956	12,413	13,935	15,418	20,911
to 10 years (jobs)							
Related work experience - All sectors -		1,870	2,582	3,192	3,567	3,929	5,303
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		1,746	2,329	2,846	3,200	3,550	4,901
(jobs)							
On-the-Job Training - All sectors - Up to 1		20,156	27,704	34,000	38,091	42,075	57,568
year (jobs)							

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Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,458	9,018	11,344	12,693	13,998	18,936
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,137	3,002	3,848	4,331	4,799	6,504
On-the-Job Training - All sectors - Over 10 years (jobs)		308	407	500	549	598	809
On-Site or In-Plant Training - All sectors - None (jobs)		5,062	6,920	8,543	9,609	10,656	14,623
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,295	25,160	30,921	34,619	38,216	52,230
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,011	6,975	8,736	9,766	10,758	14,572
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,178	3,034	3,862	4,335	4,798	6,493
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		258	371	475	535	592	802
Wage income - All (million \$2019)		1,949	2,740	3,444	3,914	4,387	6,040

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		135	119	96.2	74.7	57.8	41.8
Oil consumption - Cumulative (million							2,955
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		238	201	161	121	76.3	52.9
Natural gas consumption - Cumulative							4,854
(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)	656	650	592	519	454	412	391
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146
Final energy use - Industry (PJ)	342	354	359	361	368	377	387

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.77	3.88	6.5	6.9	5.9	6.14
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)	284	851	1,418	3,404	5,389	6,976	8,562
Vehicle stocks - LDV – All others (1000 units)	7,140	6,798	6,457	4,705	2,954	1,671	388
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	14	25.2	47.6	59.1	60.7	60.7	60.6
Heat Pump (%)							
Sales of space heating units - Electric	35.6	41	35.5	30.7	30	30.2	30.3
Resistance (%)							
Sales of space heating units - Gas (%)	41.5	20.6	6.9	1.33	0.7	0.659	0.662
Sales of space heating units - Fossil (%)	8.89	13.2	9.93	8.85	8.62	8.41	8.39
Sales of water heating units - Electric	0	6.87	37.5	47.6	48.6	48.6	48.6
Heat Pump (%)							
Sales of water heating units - Electric	45.5	59.1	48.2	46.1	46.1	46.1	46.1
Resistance (%)							
Sales of water heating units - Gas Furnace	47.5	28.5	9.06	0.967	0.047	0	0
(%)							
Sales of water heating units - Other (%)	6.95	5.52	5.27	5.27	5.28	5.27	5.28
Sales of cooking units - Electric	70.6	76.8	96	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	29.4	23.2	3.96	0.2	0	0	0
Residential HVAC investment in 2020s vs.		4.12	4.1				
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	2.72	15.7	39.9	56.5	59	59.1	59.1
Heat Pump (%)							
Sales of space heating units - Electric	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Resistance (%)							
Sales of space heating units - Gas (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Heat Pump (%)							
Sales of water heating units - Electric	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Resistance (%)							
Sales of water heating units - Gas (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
Sales of cooking units - Electric	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s -		22,776	24,705				
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)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,741	2,659	2,659	4,235	4,299	4,391	5,265
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	0	0.006	0.013	0.027
Installed renewables - Rooftop PV (MW)	1,788	2,755	3,680	4,796	6,121	7,666	9,495
Installed renewables - Solar - Base land use assumptions (MW)	695	695	695	695	695	695	695
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,388	3,866	4,313	4,773	5,279	5,320
Installed renewables - Solar - Constrained land use assumptions (MW)	674	674	674	674	674	674	674
Installed renewables - Wind - Constrained land use assumptions (MW)	3,421	3,421	4,686	6,666	14,261	20,324	21,419
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)		0	0.826	0.787	0.706	0.738	0.057

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)		0.2	0	0	0	0	0
Capital invested - Wind - Constrained (billion \$2018)		0	2.11	3.35	11.6	9.51	1.16
Capital invested - Biomass power plant (billion \$2018)	0	0.003	0.249	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0.008	0.044
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0.02	0.172

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

	,						
Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,419	1,419	1,419	1,419	1,419	1,419	1,419
Wind - Base land use assumptions (GWh)	11,561	11,561	13,217	14,787	16,215	17,781	17,905
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Constrained land use assumptions	1,371	1,371	1,371	1,371	1,371	1,371	1,371
(GWh)							
Wind - Constrained land use assumptions	11,682	11,682	15,810	21,726	43,208	59,787	62,739
(GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Biomass power plant (GWh)	0	6.64	495	495	495	495	495
Biomass w/ccu power plant (GWh)	0	0	0	0	0	22.3	216
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	7.51	51.1
	•			•	•		

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu	0	0	0	0	0	1	2
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	0	0	1	2
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	1	8
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu	0	0	0	0	0	1	3
(quantity)							
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	1	1
Conversion capital investment -		3.83	277	22.3	0	927	8,114
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		49.2	148	149	149	200	644

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	3.35	3.32	4.6	15
Annual - BECCS (MMT)		0	0	0	0	1.17	11.5
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	3.35	6.67	11.3	26.3
Cumulative - BECCS (MMT)		0	0	0	0	1.17	12.7
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	675	675	675	675
Spur (km)		0	0	101	101	344	1,526
All (km)		0	0	776	776	1,019	2,201
Cumulative investment - Trunk (million \$2018)		0	0	1,702	1,702	1,702	1,702
Cumulative investment - Spur (million \$2018)		0	0	99.8	99.3	246	1,036
Cumulative investment - All (million \$2018)		0	0	1,802	1,801	1,948	2,738

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-1,087
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-317
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,647
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-2,076
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-9,930
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-377
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-7,491
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-188
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,869
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-26,982
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-1,629
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,111
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-6,570
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-3,042
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-19,860
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-728
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-11,236
cropland (1000 tCO2e/y)							•

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest						T	-1,332
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-3,707
productivity (1000 tCO2e/y)							/ 0.01/
Carbon sink potential - Mid - All (not							-49,216
counting overlap) (1000 tC02e/y)							0.170
Carbon sink potential - High - Accelerate							-2,170
regeneration (1000 tC02e/y)							100/
Carbon sink potential - High - Avoid							-1,904
deforestation (1000 tC02e/y)							0.101
Carbon sink potential - High - Extend							-9,494
rotation length (1000 tC02e/y)							/ 000
Carbon sink potential - High - Improve							-4,080
plantations (1000 tC02e/y)							00700
Carbon sink potential - High - Increase							-29,790
retention of HWP (1000 tC02e/y)							4.070
Carbon sink potential - High - Increase							-1,078
trees outside forests (1000 tC02e/y)							44.004
Carbon sink potential - High - Reforest							-14,981
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-2,477
pasture (1000 tC02e/y)							
Carbon sink potential - High - All (not							-71,521
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-5,545
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							178
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							242
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,855
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							752
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 -							53.9
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							495
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							12.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,112
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,699
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							266
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							250
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)			1				

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							3,348
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,131
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 -							78.2
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							743
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							88.2
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,240
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							8,144
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							355
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							258
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,841
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,503
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 -							102
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							990
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							70.4
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,838
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,959
High - Total impacted (over 30 years)							•
(1000 hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,027
deployment - Cropland measures (1000							
tCO2e/y)							

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

lable 16: E+ scenario - PILLAR 6: Land sink			иеај				
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							-73.6
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,101
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,981
deployment - Cropland measures (1000							
tC02e/y)							
Carbon sink potential - Aggressive							-147
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive		+					-2,129
							-2,127
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							1,458
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							117
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,575
deployment - Total (1000 hectares)							1,010
Land impacted for carbon sink -						<del></del>	0
·							U
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,798
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							235
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							3,033
Aggressive deployment - Total (1000							-,
hectares)							
nectal coj							
Table 17: F cooperie IMPACTO Health							
Table 17: E- scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		7.18	0.008	0.008	0.006	0.004	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		7.04	3.76	2.59	1.98	1.6	1.65
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		127	134	135	125	103	72.9
Mobile - On-Road (deaths)		121	134	100	123	100	12.7
		7.05	7.50	75/	4.00	F 71	
Premature deaths from air pollution - Gas		7.25	7.58	7.56	6.98	5.71	4.04
Stations (deaths)							
Premature deaths from air pollution -		17.6	15.6	13.4	10.6	7.74	5.02
Fuel Comb - Residential - Natural Gas							
(deaths)							
Premature deaths from air pollution -		3.23	2.98	2.8	2.46	1.88	1.26
Fuel Comb - Residential - Oil (deaths)							
Dramature deaths from air pollution -		176	172	1 67	15/	1 27	0.08

1.76

1.72

1.67

1.54

1.27

Premature deaths from air pollution -

Fuel Comb - Residential - Other (deaths)

0.98

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

Table II. L Scenario In Aoro Ticaltii (	continucuj						
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		0.114	0.113	0.111	0.108	0.105	0.101
Fuel Comb - Comm/Institutional - Coal							
(deaths)		1/ /	177	10.0	17.0	1/ /	11.0
Premature deaths from air pollution -		16.4	17.7	18.2	17.2	14.6	11.2
Fuel Comb - Comm/Institutional - Natural							
Gas (deaths)  Premature deaths from air pollution -	-	0.36	0.319	0.284	0.251	0.219	0.189
Fuel Comb - Comm/Institutional - Oil		0.36	0.319	0.284	0.251	0.219	0.189
(deaths)							
Premature deaths from air pollution -	<del>                                     </del>	1.24	1.15	1.06	0.966	0.864	0.758
Fuel Comb - Comm/Institutional - Other		2-	0	1.00	0.700	0.004	0.100
(deaths)							
Premature deaths from air pollution -		0.15	0.02	0.02	0.019	0.016	0.01
Industrial Processes - Coal Mining							
(deaths)							
Premature deaths from air pollution -		15.7	14.8	13.4	12.2	11.2	8.05
Industrial Processes - Oil & Gas							
Production (deaths)							
Monetary damages from air pollution -		63.6	0.071	0.07	0.053	0.033	0
Fuel Comb - Electric Generation - Coal							
(million \$2019)							
Monetary damages from air pollution -		62.4	33.3	23	17.6	14.2	14.7
Fuel Comb - Electric Generation - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		1,133	1,189	1,198	1,115	917	648
Mobile - On-Road (million \$2019)							
Monetary damages from air pollution -		64.2	67.1	66.9	61.8	50.6	35.8
Gas Stations (million \$2019)		157	100	110	0/.0	(0.4	// -
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas		156	138	118	94.3	68.6	44.5
(million \$2019)							
Monetary damages from air pollution -		28.6	26.4	24.8	21.8	16.7	11.1
Fuel Comb - Residential - Oil (million		20.0	20.4	24.0	21.0	10.1	11.1
\$2019)							
Monetary damages from air pollution -		15.6	15.2	14.8	13.6	11.2	8.68
Fuel Comb - Residential - Other (million							
\$2019)							
Monetary damages from air pollution -		1.01	1	0.982	0.958	0.929	0.895
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)							
Monetary damages from air pollution -		145	157	161	152	129	99.6
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)							
Monetary damages from air pollution -		3.19	2.82	2.51	2.22	1.94	1.67
Fuel Comb - Comm/Institutional - Oil							
(million \$2019)		10.0	10.0		0.55	7,5	. 74
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other		10.9	10.2	9.4	8.55	7.65	6.71
(million \$2019)  Monetary damages from air pollution -	<del>                                     </del>	1.33	0.18	0.178	0.17	0.142	0.092
Industrial Processes - Coal Mining		1.33	0.16	0.176	0.17	0.142	0.092
(million \$2019)							
Monetary damages from air pollution -	+	139	132	119	108	99.4	71.5
Industrial Processes - Oil & Gas		107	102	117	100	//	11.0
Production (million \$2019)							

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		152	321	131	92.4	182	650
By economic sector - Construction (jobs)		9,925	13,317	16,154	17,774	22,499	31,560

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

Table 18: E- Scellullo - IMPAG13 - Jubs (cui	шиеиј						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing		2,875	4,260	4,171	4,331	5,216	6,185
(jobs)							
By economic sector - Mining (jobs)		2,267	1,713	1,287	945	669	417
By economic sector - Other (jobs)		1,258	1,606	1,984	2,499	3,234	5,422
By economic sector - Pipeline (jobs)		420	361	673	279	244	337
By economic sector - Professional (jobs)		4,927	7,285	8,698	11,008	14,850	21,930
By economic sector - Trade (jobs)		3,603	4,580	5,345	6,584	8,683	12,936
By economic sector - Utilities (jobs)		5,107	9,627	11,687	12,705	17,845	23,665
By resource sector - Biomass (jobs)		578	863	436	389	776	2,684
By resource sector - CO2 (jobs)		0	0	2,985	91.7	154	1,396
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		6,660	16,308	17,762	22,782	32,850	43,096
By resource sector - Natural Gas (jobs)		2,549	1,936	1,673	1,697	1,725	1,451
By resource sector - Nuclear (jobs)		606	596	346	0.017	0.023	0.05
By resource sector - Oil (jobs)		6,063	5,158	4,384	3,611	2,871	2,009
By resource sector - Solar (jobs)		8,343	7,967	8,996	9,935	11,061	19,922
By resource sector - Wind (jobs)		5,638	10,242	13,549	17,712	23,985	32,546
By education level - All sectors - High		12,842	18,047	20,861	23,091	29,957	41,963
school diploma or less (jobs)		,5	.5,5	20,00.	20,071	_,,,,,,	,,,,,
By education level - All sectors -		9,440	13,559	16,057	18,017	23,636	33,164
Associates degree or some college (jobs)		7,	.0,007	.5,55.	.5,5	20,000	33,13
By education level - All sectors -		6,410	8,875	10,211	11,606	15,195	21,362
Bachelors degree (jobs)		,	5,515	,	.,,,,,,	,	,
By education level - All sectors - Masters		1,590	2,240	2,597	3,017	3,992	5,681
or professional degree (jobs)		,,,,,	_,_ : -	_,_,	5,511	7,11	-,
By education level - All sectors - Doctoral		254	348	406	486	642	933
degree (jobs)							
Related work experience - All sectors -		4,368	6,197	7,244	8,088	10,575	14,894
None (jobs)		,	-,	,	-,	, -	, -
Related work experience - All sectors - Up		6,170	8,642	9,958	11,161	14,501	20,492
to 1 year (jobs)		, .		,	, -	,	-,
Related work experience - All sectors - 1		11,011	15,521	18,044	20,268	26,496	37,175
to 4 years (jobs)		,-	-,-	-,-	,	, -	
Related work experience - All sectors - 4		7,133	10,090	11,847	13,296	17,401	24,356
to 10 years (jobs)		.					•
Related work experience - All sectors -		1,853	2,619	3,038	3,405	4,449	6,187
Over 10 years (jobs)							
On-the-Job Training - All sectors - None		1,735	2,366	2,731	3,079	3,994	5,667
(jobs)							
On-the-Job Training - All sectors - Up to 1		19,997	28,133	32,434	36,447	47,582	66,879
year (jobs)							
On-the-Job Training - All sectors - 1 to 4		6,387	9,126	10,808	12,059	15,789	22,055
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		2,110	3,031	3,677	4,104	5,385	7,565
years (jobs)							
On-the-Job Training - All sectors - Over 10		307	413	481	528	673	938
years (jobs)							
On-Site or In-Plant Training - All sectors -		5,027	7,025	8,168	9,201	11,999	16,954
None (jobs)							
On-Site or In-Plant Training - All sectors -		18,143	25,541	29,491	33,107	43,221	60,692
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		4,958	7,062	8,325	9,286	12,142	16,963
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		2,152	3,066	3,696	4,118	5,392	7,559
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		255	375	451	506	668	935
Over 10 years (jobs)							
Wage income - All (million \$2019)		1,929	2,777	3,282	3,730	4,956	7,035

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	657	654	611	573	544	510	470
Final energy use - Residential (PJ)	246	227	207	188	169	150	133
Final energy use - Commercial (PJ)	160	163	165	166	164	162	160
Final energy use - Industry (PJ)	342	355	361	367	376	385	395

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.95	2.96	4.08	4.22	5.76	6.07
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)	220	385	551	1,319	2,086	3,785	5,484
Vehicle stocks - LDV – All others (1000 units)	7,169	7,169	7,169	6,800	6,431	4,956	3,481
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	239	450	1,569	4,778	7,016
Public EV charging plugs - DC Fast (1000 units)	0.551		1.02		3.86		10.1
Public EV charging plugs - L2 (1000 units)	2.37		24.5		92.8		244

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	14	21.3	23.9	31.4	44.1	54.1	58.4
Heat Pump (%)							
Sales of space heating units - Electric	35.6	41.8	41.1	39.2	35.8	32.7	31
Resistance (%)							
Sales of space heating units - Gas (%)	41.5	23	21.5	17	9.58	4.03	1.76
Sales of space heating units - Fossil (%)	8.89	13.8	13.5	12.4	10.6	9.24	8.81
Sales of water heating units - Electric	0	1.23	4.71	14.8	30.9	42.3	46.7
Heat Pump (%)							
Sales of water heating units - Electric	45.5	61.3	60	56.4	51	47.6	46.5
Resistance (%)							
Sales of water heating units - Gas Furnace	47.5	31.9	29.8	23.3	12.8	4.87	1.59
(%)							
Sales of water heating units - Other (%)	6.95	5.56	5.52	5.49	5.39	5.31	5.28
Sales of cooking units - Electric	70.4	71.2	73.9	81.1	91	97.1	99.2
Resistance (%)							
Sales of cooking units - Gas (%)	29.6	28.8	26.1	18.9	9.03	2.91	0.784
Residential HVAC investment in 2020s vs.		4.1	4.04				
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	2.72	11.9	14.6	22.8	37.2	49.8	55.8
Heat Pump (%)							
Sales of space heating units - Electric	18.3	13.9	15.8	21.6	30.6	36.8	39.3
Resistance (%)							
Sales of space heating units - Gas (%)	79	74.3	69.5	55.6	32.2	13.3	4.9
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric	1.12	2.39	6.84	19.8	40.6	55.7	61.7
Heat Pump (%)							
Sales of water heating units - Electric	3.42	3.14	5.18	11.2	21.3	29.5	33.1
Resistance (%)							
Sales of water heating units - Gas (%)	94.6	93.8	87.3	68.4	37.5	14.2	4.65
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric	27.5	31	36.1	49.7	68.6	80.2	84.3
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Commercial HVAC investment in 2020s -		22,723	24,348				
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)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,745	2,659	2,659	3,254	3,569	5,123	4,999
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	0	0.007	0.016	0.035

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-1,087
regeneration (1000 tCO2e/y)							•
Carbon sink potential - Low - Avoid							-317
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,647
rotation length (1000 tCO2e/y)							,
Carbon sink potential - Low - Improve							-2,076
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-9,930
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-377
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-7,491
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-188
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,869
productivity (1000 tCO2e/y)							•
Carbon sink potential - Low - All (not							-26,982
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-1,629
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,111
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-6,570
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-3,042
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-19,860
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-728
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-11,236
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,332
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-3,707
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-49,216
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-2,170
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,904
deforestation (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend							-9,494
rotation length (1000 tC02e/y)							/ 000
Carbon sink potential - High - Improve							-4,080
plantations (1000 tCO2e/y)							00700
Carbon sink potential - High - Increase							-29,790
retention of HWP (1000 tC02e/y)							4.070
Carbon sink potential - High - Increase							-1,078
trees outside forests (1000 tC02e/y)							44.004
Carbon sink potential - High - Reforest							-14,981
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-2,477
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-71,521
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-5,545
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							178
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							242
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,855
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							752
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 -							53.9
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							495
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							12.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,112
Low - Restore productivity (1000							.,
hectares)							
Land impacted for carbon sink potential -							4,699
Low - Total impacted (over 30 years)							.,0,,
(1000 hectares)							
Land impacted for carbon sink potential -							266
Mid - Accelerate regeneration (1000							200
hectares)							
Land impacted for carbon sink potential -	+					+	250
Mid - Avoid deforestation (over 30 years)							200
(1000 hectares)							
Land impacted for carbon sink potential -							3,348
Mid - Extend rotation length (1000							3,340
hectares)							
Land impacted for carbon sink potential -							1,131
							1,131
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 -							78.2
Mid - Increase trees outside forests (1000							
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 -							743
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							88.2
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,240
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							8,144
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							355
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							258
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,841
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,503
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 -							102
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							990
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							70.4
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,838
High - Restore productivity (1000							•
hectares)							
Land impacted for carbon sink potential -							9,959
High - Total impacted (over 30 years)							,,

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							-1,027
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-73.6
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-1,101
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,981
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							-147
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-2,129
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,458
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							117
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,575
deployment - Total (1000 hectares)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,798
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							235
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							3,033
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)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.23	2.96	1.9	1.73	1.47	0.472
Premature deaths from air pollution - Mobile - On-Road (deaths)		125	121	95.3	57	26.7	10.7
Premature deaths from air pollution - Gas Stations (deaths)		7.1	6.76	5.26	3.18	1.55	0.706
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	14	9.21	4.86	2.13	0.726
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.18	2.53	1.75	1.07	0.567	0.245
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.74	1.51	1.17	0.828	0.546	0.373
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.114	0.113	0.111	0.108	0.105	0.101
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	15.4	12	8	4.83	2.55
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.36	0.297	0.241	0.189	0.139	0.093
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.24	1.07	0.905	0.731	0.552	0.372

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.183	0.02	0.019	0.017	0.016	0.004
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.5	15.1	13.6	10.1	6.44	1.03
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		63.6	0.071	0.07	0.053	0.033	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		55.2	26.2	16.9	15.4	13	4.18
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,113	1,077	847	507	238	95
Monetary damages from air pollution - Gas Stations (million \$2019)		62.9	59.8	46.5	28.2	13.8	6.25
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		155	124	81.6	43.1	18.8	6.43
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		28.2	22.4	15.5	9.51	5.03	2.17
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		15.4	13.4	10.4	7.33	4.83	3.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.01	1	0.982	0.958	0.929	0.895
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		144	137	106	70.8	42.8	22.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		3.19	2.63	2.14	1.67	1.23	0.822
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		10.9	9.48	8.01	6.47	4.88	3.29
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.61	0.177	0.164	0.147	0.137	0.037
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		138	134	121	89.8	57.2	9.15

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		126	261	125	84.1	134	648
By economic sector - Construction (jobs)		10,072	12,256	18,017	23,344	29,139	45,677
By economic sector - Manufacturing		3,156	4,083	5,509	6,176	6,476	10,700
(jobs)							
By economic sector - Mining (jobs)		2,237	1,618	1,045	623	290	17.4
By economic sector - Other (jobs)		1,273	1,545	2,272	3,056	3,979	7,751
By economic sector - Pipeline (jobs)		410	350	260	180	102	24
By economic sector - Professional (jobs)		5,003	6,929	10,701	14,958	20,089	32,195
By economic sector - Trade (jobs)		3,629	4,343	6,200	8,411	11,220	18,618
By economic sector - Utilities (jobs)		5,223	7,381	13,283	18,474	24,121	35,916
By resource sector - Biomass (jobs)		490	737	335	275	496	2,851
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		6,928	11,713	23,908	34,123	45,335	68,554

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

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Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		2,466	2,075	1,837	1,563	1,235	1,101
By resource sector - Nuclear (jobs)		606	351	0	0	0	0
By resource sector - Oil (jobs)		6,007	4,817	3,512	2,362	1,227	2.34
By resource sector - Solar (jobs)		8,509	8,180	9,306	10,458	11,467	27,404
By resource sector - Wind (jobs)		6,025	10,892	18,513	26,525	35,791	51,634
By education level - All sectors - High		13,084	16,173	23,725	30,778	38,667	61,500
school diploma or less (jobs)							
By education level - All sectors -		9,643	12,175	18,406	24,301	30,918	48,958
Associates degree or some college (jobs)							
By education level - All sectors -		6,527	8,054	11,774	15,522	19,851	31,381
Bachelors degree (jobs)							
By education level - All sectors - Masters		1,617	2,037	3,027	4,056	5,264	8,346
or professional degree (jobs)				.=0			
By education level - All sectors - Doctoral		257	327	479	649	852	1,360
degree (jobs)			F F F O	0.040	10.01/	10.710	01.001
Related work experience - All sectors -		4,449	5,552	8,249	10,816	13,719	21,831
None (jobs)			7.011	11 / 00	1/ 000	10.700	
Related work experience - All sectors - Up		6,290	7,811	11,433	14,890	18,783	30,086
to 1 year (jobs)  Related work experience - All sectors - 1		11,220	10.050	20,665	27,139	34,490	F/ /10
to 4 years (jobs)		11,220	13,958	20,665	21,139	34,490	54,618
Related work experience - All sectors - 4		7,274	9,089	13,564	17,873	22,747	35,854
to 10 years (jobs)		1,214	9,069	13,364	11,013	22,141	33,034
Related work experience - All sectors -		1,894	2,357	3,499	4,588	5,812	9,156
Over 10 years (jobs)		1,074	2,001	3,477	4,500	3,012	7,100
On-the-Job Training - All sectors - None		1,765	2,154	3,120	4,077	5,170	8,286
(jobs)		1,100	2,.0 .	0,.20	.,0	0,0	0,200
On-the-Job Training - All sectors - Up to 1		20,386	25,339	37,261	48,754	61,796	98,297
year (jobs)		, , , , , ,	.,		-, -	, -	-,
On-the-Job Training - All sectors - 1 to 4		6,517	8,179	12,328	16,250	20,649	32,505
years (jobs)				-		-	•
On-the-Job Training - All sectors - 4 to 10		2,146	2,715	4,154	5,524	7,065	11,078
years (jobs)							
On-the-Job Training - All sectors - Over 10		314	381	546	701	871	1,380
years (jobs)							
On-Site or In-Plant Training - All sectors -		5,126	6,380	9,382	12,311	15,640	24,918
None (jobs)							
On-Site or In-Plant Training - All sectors -		18,495	22,974	33,843	44,289	56,128	89,206
Up to 1 year (jobs)							
On-Site or In-Plant Training - All sectors -		5,058	6,328	9,498	12,490	15,845	24,986
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		2,188	2,749	4,171	5,529	7,060	11,057
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		260	335	516	686	877	1,379
Over 10 years (jobs)							
Wage income - All (million \$2019)		1,965	2,486	3,756	5,013	6,472	10,340

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	656	650	592	519	454	412	391
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146
Final energy use - Industry (PJ)	342	354	359	361	368	377	387

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.77	3.88	6.5	6.9	5.9	6.14
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)	284	851	1,418	3,404	5,389	6,976	8,562
Vehicle stocks - LDV – All others (1000 units)	7,140	6,798	6,457	4,705	2,954	1,671	388
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381

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

2020	2025	2030	2035	2040	2045	2050
14	25.2	47.6	59.1	60.7	60.7	60.6
35.6	41	35.5	30.7	30	30.2	30.3
41.5	20.6	6.9	1.33	0.7	0.659	0.662
8.89	13.2	9.93	8.85	8.62	8.41	8.39
0	6.87	37.5	47.6	48.6	48.6	48.6
45.5	59.1	48.2	46.1	46.1	46.1	46.1
47.5	28.5	9.06	0.967	0.047	0	0
6.95	5.52	5.27	5.27	5.28	5.27	5.28
70.6	76.8	96	99.8	100	100	100
29.4	23.2	3.96	0.2	0	0	0
	4.12	4.1				
	14 35.6 41.5 8.89 0 45.5 47.5 6.95 70.6	14 25.2  35.6 41  41.5 20.6  8.89 13.2  0 6.87  45.5 59.1  47.5 28.5  6.95 5.52  70.6 76.8  29.4 23.2	14     25.2     47.6       35.6     41     35.5       41.5     20.6     6.9       8.89     13.2     9.93       0     6.87     37.5       45.5     59.1     48.2       47.5     28.5     9.06       6.95     5.52     5.27       70.6     76.8     96       29.4     23.2     3.96	14     25.2     47.6     59.1       35.6     41     35.5     30.7       41.5     20.6     6.9     1.33       8.89     13.2     9.93     8.85       0     6.87     37.5     47.6       45.5     59.1     48.2     46.1       47.5     28.5     9.06     0.967       6.95     5.52     5.27     5.27       70.6     76.8     96     99.8       29.4     23.2     3.96     0.2	14       25.2       47.6       59.1       60.7         35.6       41       35.5       30.7       30         41.5       20.6       6.9       1.33       0.7         8.89       13.2       9.93       8.85       8.62         0       6.87       37.5       47.6       48.6         45.5       59.1       48.2       46.1       46.1         47.5       28.5       9.06       0.967       0.047         6.95       5.52       5.27       5.27       5.28         70.6       76.8       96       99.8       100         29.4       23.2       3.96       0.2       0	14       25.2       47.6       59.1       60.7       60.7         35.6       41       35.5       30.7       30       30.2         41.5       20.6       6.9       1.33       0.7       0.659         8.89       13.2       9.93       8.85       8.62       8.41         0       6.87       37.5       47.6       48.6       48.6         45.5       59.1       48.2       46.1       46.1       46.1         47.5       28.5       9.06       0.967       0.047       0         6.95       5.52       5.27       5.27       5.28       5.27         70.6       76.8       96       99.8       100       100         29.4       23.2       3.96       0.2       0       0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	2.72	15.7	39.9	56.5	59	59.1	59.1
Heat Pump (%)							
Sales of space heating units - Electric	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Resistance (%)							
Sales of space heating units - Gas (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Heat Pump (%)							
Sales of water heating units - Electric	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Resistance (%)							
Sales of water heating units - Gas (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
Sales of cooking units - Electric	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s -		22,776	24,705				
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)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,745	2,659	3,241	4,967	5,031	5,123	4,999

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	1,200	1,200	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	1,788	2,755	3,680	4,796	6,121	7,666	9,495
Installed renewables - Solar - Base land	695	695	695	695	695	695	7,872
use assumptions (MW)							
Installed renewables - Wind - Base land	3,388	3,388	3,907	4,687	6,452	9,543	17,222
use assumptions (MW)							
Installed renewables - Solar -	696	696	696	696	696	696	12,340
Constrained land use assumptions (MW)							
Installed renewables - Wind - Constrained	3,865	3,865	5,134	13,313	29,611	58,766	97,172
land use assumptions (MW)							
Installed renewables - Offshore Wind -	0	0	0	0	0	0	0
Constrained land use assumptions (MW)							
Capital invested - Solar PV - Base (billion		0	0	0	0	0	6.65
\$2018)							
Capital invested - Wind - Base (billion		0	0.898	1.32	2.71	4.51	10.6
\$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,419	1,419	1,419	1,419	1,419	1,419	15,515
Wind - Base land use assumptions (GWh)	11,561	11,561	13,355	15,953	21,315	30,373	52,064
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	2,837	2,837	2,837	2,837	2,837	2,837	48,345
Wind - Constrained land use assumptions (GWh)	23,634	23,634	31,885	78,964	166,657	311,488	472,062
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							-1,087
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-317
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,647
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-2,076
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-9,930
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-377
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-7,491
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-188
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,869
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-26,982
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-1,629
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,111
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-6,570
rotation length (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve							-3,042
plantations (1000 tC02e/y)							40.07.0
Carbon sink potential - Mid - Increase							-19,860
retention of HWP (1000 tC02e/y)							-728
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-128
Carbon sink potential - Mid - Reforest							-11,236
cropland (1000 tCO2e/y)							-11,230
Carbon sink potential - Mid - Reforest							-1,332
pasture (1000 tC02e/y)							1,002
Carbon sink potential - Mid - Restore							-3,707
productivity (1000 tCO2e/y)							0,101
Carbon sink potential - Mid - All (not							-49,216
counting overlap) (1000 tCO2e/y)							,
Carbon sink potential - High - Accelerate							-2,170
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,904
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-9,494
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-4,080
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-29,790
retention of HWP (1000 tC02e/y)							4.070
Carbon sink potential - High - Increase							-1,078
trees outside forests (1000 tC02e/y)							1/ 001
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest							-2,477
pasture (1000 tC02e/y)							-2,411
Carbon sink potential - High - All (not							-71,521
counting overlap) (1000 tCO2e/y)							-11,021
Carbon sink potential - High - Restore							-5,545
productivity (1000 tCO2e/y)							0,0 .0
Land impacted for carbon sink potential -							178
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							242
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,855
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							752
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 -							53.9
Low - Increase trees outside forests							33.7
(1000 hectares)							
Land impacted for carbon sink potential -							495
Low - Reforest cropland (1000 hectares)							470
Land impacted for carbon sink potential -							12.2
Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential -							1,112
Low - Restore productivity (1000							.,
hectares)							

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

Table 36: E+RE+ scenario - PILLAR 6: Land Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							4,699
Low - Total impacted (over 30 years)							.,
(1000 hectares)							
Land impacted for carbon sink potential -							266
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							250
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,348
Mid - Extend rotation length (1000							0,010
hectares)							
Land impacted for carbon sink potential -						+	1,131
Mid - Improve plantations (1000 hectares)							1,101
Land impacted for carbon sink potential -			+				0
Mid - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							78.2
Mid - Increase trees outside forests (1000							10.2
•							
hectares)  Land impacted for carbon sink potential -							743
							743
Mid - Reforest cropland (1000 hectares)							00.0
Land impacted for carbon sink potential -							88.2
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,240
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							8,144
Mid - Total impacted (over 30 years) (1000							
hectares)							
Land impacted for carbon sink potential -							355
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							258
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,841
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,503
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 -							102
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -			+				990
High - Reforest cropland (1000 hectares)							,,,
Land impacted for carbon sink potential -			+				70.4
High - Reforest pasture (1000 hectares)							10.4
Land impacted for carbon sink potential -			+				1,838
High - Restore productivity (1000							1,038
hectares)							
-							0.050
Land impacted for carbon sink potential -							9,959
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 tC02e/y)							
Carbon sink potential - Moderate							-1,027
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-73.6
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,101
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-1,981
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-147
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-2,129
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,458
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							117
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,575
deployment - Total (1000 hectares)							.,
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							·
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,798
Aggressive deployment - Cropland							2,170
measures (1000 hectares)							
Land impacted for carbon sink -							235
Aggressive deployment - Permanent							200
conservation cover (1000 hectares)							
Land impacted for carbon sink -							3,033
Aggressive deployment - Total (1000							3,033
hectares)							
Herral es)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		7.18	0.008	0.008	0.006	0.004	0
Fuel Comb - Electric Generation - Coal							
(deaths)							
Premature deaths from air pollution -		6.53	3.13	3.7	4.37	2.73	1.29
Fuel Comb - Electric Generation - Natural							
Gas (deaths)							
Premature deaths from air pollution -		125	121	95.3	57	26.7	10.7
Mobile - On-Road (deaths)							
Premature deaths from air pollution - Gas		7.1	6.76	5.26	3.18	1.55	0.706
Stations (deaths)							

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

Item Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas		17.4	14	9.21	4.86	2.13	0.726
(deaths)  Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.18	2.53	1.75	1.07	0.567	0.245
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.74	1.51	1.17	0.828	0.546	0.373
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.114	0.113	0.111	0.108	0.105	0.101
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	15.4	12	8	4.83	2.55
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.36	0.297	0.241	0.189	0.139	0.093
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.24	1.07	0.905	0.731	0.552	0.372
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.136	0.02	0.019	0.017	0.016	0.004
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.9	15.9	16.1	14	12	9.14
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		63.6	0.071	0.07	0.053	0.033	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		57.8	27.7	32.8	38.7	24.2	11.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,113	1,077	847	507	238	95
Monetary damages from air pollution - Gas Stations (million \$2019)		62.9	59.8	46.5	28.2	13.8	6.25
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		155	124	81.6	43.1	18.8	6.43
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		28.2	22.4	15.5	9.51	5.03	2.17
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		15.4	13.4	10.4	7.33	4.83	3.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		1.01	1	0.982	0.958	0.929	0.895
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		144	137	106	70.8	42.8	22.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		3.19	2.63	2.14	1.67	1.23	0.822
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		10.9	9.48	8.01	6.47	4.88	3.29
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.2	0.175	0.165	0.148	0.14	0.036

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		141	141	143	124	106	81.2
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)		143	340	126	92.2	163	652
By economic sector - Construction (jobs)		9,994	11,073	13,294	13,802	13,716	17,984
By economic sector - Manufacturing		3,094	3,311	3,499	3,533	2,761	3,286
(jobs)		0.074	4.75	1.150	7//	510	0.54
By economic sector - Mining (jobs)		2,261	1,665	1,150	766	510	351
By economic sector - Other (jobs)		1,253	1,407	1,678	2,055	2,365	3,938
By economic sector - Pipeline (jobs)		426	375	739	289	243	371
By economic sector - Professional (jobs)		4,823	5,765	6,207	7,415	8,107	11,221
By economic sector - Trade (jobs)		3,548	3,803	4,018	4,640	5,049	7,074
By economic sector - Utilities (jobs)		5,640	7,679	10,181	10,616	9,640	11,019
By resource sector - Biomass (jobs)		501	873	433	345	639	2,710
By resource sector - CO2 (jobs)		0	0	3,373	104	174	1,577
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		7,851	12,437	14,597	19,231	17,327	17,991
By resource sector - Natural Gas (jobs)		2,600	2,195	2,206	2,087	1,652	2,093
By resource sector - Nuclear (jobs)		606	596	346	0.028	0.043	0.668
By resource sector - Oil (jobs)		6,004	4,868	3,624	2,612	1,940	1,505
By resource sector - Solar (jobs)		8,538	7,842	8,769	9,682	10,732	19,592
By resource sector - Wind (jobs)		4,982	6,607	7,546	9,149	10,090	10,428
By education level - All sectors - High		13,147	14,937	17,253	18,068	17,630	23,224
school diploma or less (jobs)		,	,			,	,
By education level - All sectors -		9,674	11,096	13,157	13,911	13,688	17,899
Associates degree or some college (jobs)		,-	,	-, -	-,	,,,,,,,	, -
By education level - All sectors -		6,504	7,275	8,144	8,672	8,629	11,305
Bachelors degree (jobs)		,,,,,	, -	-,	-,-	, ,	,
By education level - All sectors - Masters		1,607	1,827	2,036	2,217	2,249	2,977
or professional degree (jobs)		,,,,,,	,,,,,	_,,,,,	_,	_,	_,
By education level - All sectors - Doctoral		251	283	304	340	360	492
degree (jobs)							
Related work experience - All sectors -		4,470	5,111	5,960	6,275	6,177	8,167
None (jobs)		.,	7,	5,755	5,215	7,	-,
Related work experience - All sectors - Up		6,289	7,132	8,136	8,623	8,510	11,359
to 1 year (jobs)		0,207	1,102	0,.00	0,020	0,010	11,007
Related work experience - All sectors - 1		11,244	12,765	14,694	15,543	15,316	20,059
to 4 years (jobs)		,2	12,100	11,071	10,0 10	10,010	20,007
Related work experience - All sectors - 4		7,282	8,268	9,633	10,160	10,007	13,026
to 10 years (jobs)		1,202	0,200	7,000	10,100	10,001	10,020
Related work experience - All sectors -		1,896	2,143	2,471	2,607	2,546	3,286
Over 10 years (jobs)		1,070	2,0	2,	2,001	2,010	0,200
On-the-Job Training - All sectors - None	+	1,759	1,956	2,210	2,345	2,341	3,136
(jobs)		1,107	1,700	2,210	2,040	2,041	0,100
On-the-Job Training - All sectors - Up to 1		20,413	23,153	26,394	27,969	27,545	36,308
year (jobs)		20,410	20,100	20,074	21,707	21,040	00,000
On-the-Job Training - All sectors - 1 to 4	+	6,543	7,481	8,872	9,319	9,137	11,849
years (jobs)		0,040	1,401	0,012	7,017	2,101	11,047
On-the-Job Training - All sectors - 4 to 10		2,156	2,488	3,023	3,170	3,137	4,082
years (jobs)		2,100	2,400	0,020	0,110	0,101	4,002
On-the-Job Training - All sectors - Over 10		311	341	394	405	396	522
years (jobs)		311	341	374	403	370	322
On-Site or In-Plant Training - All sectors -	+	5,112	5,775	6,610	7,001	6,955	9,238
None (jobs)		٥,١١٧	3,113	0,010	1,001	0,700	7,230
On-Site or In-Plant Training - All sectors -	+	18,532	21,022	24,039	25,454	25,040	32,941
Up to 1 year (jobs)		10,332	21,022	24,037	20,404	25,040	32,741
υριυ ι γεαι (Ιυμδ)							

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors -		5,079	5,797	6,838	7,189	7,042	9,148
1 to 4 years (jobs)							
On-Site or In-Plant Training - All sectors -		2,197	2,519	3,035	3,173	3,134	4,070
4 to 10 years (jobs)							
On-Site or In-Plant Training - All sectors -		262	306	371	392	385	500
Over 10 years (jobs)							
Wage income - All (million \$2019)		1,972	2,280	2,674	2,862	2,852	3,762

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	656	650	592	519	454	412	391
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146
Final energy use - Industry (PJ)	342	354	359	361	368	377	387

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.77	3.88	6.5	6.9	5.9	6.14
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)	284	851	1,418	3,404	5,389	6,976	8,562
Vehicle stocks - LDV – All others (1000 units)	7,140	6,798	6,457	4,705	2,954	1,671	388
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	14	25.2	47.6	59.1	60.7	60.7	60.6
Heat Pump (%)							
Sales of space heating units - Electric	35.6	41	35.5	30.7	30	30.2	30.3
Resistance (%)							
Sales of space heating units - Gas (%)	41.5	20.6	6.9	1.33	0.7	0.659	0.662
Sales of space heating units - Fossil (%)	8.89	13.2	9.93	8.85	8.62	8.41	8.39
Sales of water heating units - Electric	0	6.87	37.5	47.6	48.6	48.6	48.6
Heat Pump (%)							
Sales of water heating units - Electric	45.5	59.1	48.2	46.1	46.1	46.1	46.1
Resistance (%)							
Sales of water heating units - Gas Furnace	47.5	28.5	9.06	0.967	0.047	0	0
(%)							
Sales of water heating units - Other (%)	6.95	5.52	5.27	5.27	5.28	5.27	5.28
Sales of cooking units - Electric	70.6	76.8	96	99.8	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	29.4	23.2	3.96	0.2	0	0	0
Residential HVAC investment in 2020s vs.		4.12	4.1				
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	2.72	15.7	39.9	56.5	59	59.1	59.1
Heat Pump (%)							
Sales of space heating units - Electric	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Resistance (%)							
Sales of space heating units - Gas (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Heat Pump (%)							
Sales of water heating units - Electric	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Resistance (%)							
Sales of water heating units - Gas (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
Sales of cooking units - Electric	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s -		22,776	24,705				
Cumulative 5-yr (million \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,717	2,469	2,469	2,987	2,322	1,631	4,997
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	0	0.012	0.028	0.316
Installed renewables - Rooftop PV (MW)	1,788	2,755	3,680	4,796	6,121	7,666	9,495
Installed renewables - Solar - Base land use assumptions (MW)	695	695	695	695	695	1,080	1,080
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,459	3,739	3,866	4,313	4,567	4,567
Installed renewables - Solar - Constrained land use assumptions (MW)	1,234	1,561	1,561	1,561	3,042	3,744	3,744
Installed renewables - Wind - Constrained land use assumptions (MW)	3,459	3,508	4,255	4,686	6,919	10,482	10,482
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0.377	0
Capital invested - Wind - Base (billion \$2018)		0.134	0.485	0.205	0.75	0.37	0
Capital invested - Solar PV - Constrained (billion \$2018)		0.437	0	0	1.54	0.688	0
Capital invested - Wind - Constrained (billion \$2018)		0.094	1.29	0.695	3.43	5.19	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)	1,419	1,419	1,419	1,419	1,419	2,177	2,177
Wind - Base land use assumptions (GWh)	11,561	11,817	12,794	13,217	14,787	15,576	15,576
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Constrained land use assumptions	2,487	3,131	3,131	3,131	6,048	7,413	7,413
(GWh)							
Wind - Constrained land use assumptions	11,817	11,993	14,463	15,810	22,465	32,717	32,717
(GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							

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

Iable 47: E+RE- scenario - PILLAR 6: Land Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate	2020	2020	2000	2000	20.0	20.0	-1,087
regeneration (1000 tCO2e/y)							.,
Carbon sink potential - Low - Avoid							-317
deforestation (1000 tCO2e/y)							· · · ·
Carbon sink potential - Low - Extend							-3,647
rotation length (1000 tC02e/y)							0,0 11
Carbon sink potential - Low - Improve							-2,076
plantations (1000 tC02e/y)							2,010
Carbon sink potential - Low - Increase							-9,930
retention of HWP (1000 tCO2e/y)							-7,700
Carbon sink potential - Low - Increase							-377
trees outside forests (1000 tCO2e/y)							-311
							7 / 01
Carbon sink potential - Low - Reforest							-7,491
cropland (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-188
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,869
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-26,982
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-1,629
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,111
deforestation (1000 tCO2e/y)							•
Carbon sink potential - Mid - Extend							-6,570
rotation length (1000 tCO2e/y)							-,
Carbon sink potential - Mid - Improve							-3,042
plantations (1000 tCO2e/y)							-5,042
Carbon sink potential - Mid - Increase							-19,860
retention of HWP (1000 tCO2e/y)							-17,000
							-728
Carbon sink potential - Mid - Increase							-128
trees outside forests (1000 tC02e/y)							11.007
Carbon sink potential - Mid - Reforest							-11,236
cropland (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-1,332
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-3,707
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-49,216
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-2,170
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,904
deforestation (1000 tC02e/y)							•
Carbon sink potential - High - Extend							-9,494
rotation length (1000 tCO2e/y)							,
Carbon sink potential - High - Improve							-4,080
plantations (1000 tC02e/y)							1,000
Carbon sink potential - High - Increase							-29,790
retention of HWP (1000 tCO2e/y)							-27,170
Carbon sink potential - High - Increase							-1,078
trees outside forests (1000 tCO2e/y)							-1,010
							1/ 001
Carbon sink potential - High - Reforest							-14,981
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-2,477
pasture (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-71,521
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-5,545
Gai bull silik putelitiai - nigii - kestul e	l l		1	, i			0,0.0

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

2020	2025	2030	2035	2040	2045	2050
						178
						242
						242
						1,855
						752
						.02
						0
						U
						53.9
						495
						12.2
						1,112
						4,699
						266
						250
						3,348
						3,340
						1,131
						•
						0
						78.2
						7/0
						743
						88.2
						00.2
						2,240
						2,240
						8,144
						355
						258

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 -							4,841
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,503
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 -							102
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							990
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							70.4
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,838
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							9,959
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							-1,027
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-73.6
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-1,101
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-1,981
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-147
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-2,129
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,458
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							117
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,575
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 -							2,798
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							235
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							3,033
Aggressive deployment - Total (1000							
hectares)							

Table 49: E-B+ scenario - IMPACTS - Health							
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.81	3.58	2.73	2.6	2.21	1.96
Premature deaths from air pollution - Mobile - On-Road (deaths)		127	134	135	125	103	72.9
Premature deaths from air pollution - Gas Stations (deaths)		7.25	7.58	7.56	6.98	5.71	4.04
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.6	15.6	13.4	10.6	7.74	5.02
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.23	2.98	2.8	2.46	1.88	1.26
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.76	1.72	1.67	1.54	1.27	0.98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.114	0.113	0.111	0.108	0.105	0.101
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.4	17.7	18.2	17.2	14.6	11.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.36	0.319	0.284	0.251	0.219	0.189
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.24	1.15	1.06	0.966	0.864	0.758
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.158	0.02	0.02	0.019	0.018	0.017
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.7	14.8	13.4	12.2	11.2	8.05
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		63.6	0.071	0.07	0.053	0.033	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		60.3	31.8	24.2	23.1	19.6	17.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,133	1,189	1,198	1,115	917	648
Monetary damages from air pollution - Gas Stations (million \$2019)		64.2	67.1	66.9	61.8	50.6	35.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		156	138	118	94.3	68.6	44.5
Fuel Comb - Residential - Natural Gas							
(million \$2019)							
Monetary damages from air pollution -		28.6	26.4	24.8	21.8	16.7	11.1
Fuel Comb - Residential - Oil (million							
\$2019)							
Monetary damages from air pollution -		15.6	15.2	14.8	13.6	11.2	8.68
Fuel Comb - Residential - Other (million							
\$2019)		1.01		0.000	0.050	0.000	0.005
Monetary damages from air pollution -		1.01	I	0.982	0.958	0.929	0.895
Fuel Comb - Comm/Institutional - Coal							
(million \$2019)		1/ 5	157	1/1	150	100	00.7
Monetary damages from air pollution -		145	157	161	152	129	99.6
Fuel Comb - Comm/Institutional - Natural							
Gas (million \$2019)  Monetary damages from air pollution -		3.19	2.82	2.51	2.22	1.94	1.67
Fuel Comb - Comm/Institutional - Oil		3.19	2.62	2.51	2.22	1.94	1.07
(million \$2019)							
Monetary damages from air pollution -		10.9	10.2	9.4	8.55	7.65	6.71
Fuel Comb - Comm/Institutional - Other		10.9	10.2	9.4	0.00	1.65	0.71
(million \$2019)							
Monetary damages from air pollution -		1.4	0.179	0.178	0.172	0.162	0.15
Industrial Processes - Coal Mining		1.4	0.117	0.110	0.112	0.102	0.10
(million \$2019)							
Monetary damages from air pollution -		139	132	119	108	99.4	71.5
Industrial Processes - Oil & Gas		107	102	/	.00	//	1 1.5
Production (million \$2019)							

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		140	239	96.3	187	554	533
By economic sector - Construction (jobs)		9,974	13,448	15,721	15,433	18,431	26,127
By economic sector - Manufacturing		2,892	4,279	3,850	3,424	4,206	5,167
(jobs)							
By economic sector - Mining (jobs)		2,263	1,712	1,291	978	671	401
By economic sector - Other (jobs)		1,263	1,618	1,943	2,276	2,821	4,808
By economic sector - Pipeline (jobs)		417	361	685	287	243	334
By economic sector - Professional (jobs)		4,961	7,298	8,379	9,547	12,542	17,453
By economic sector - Trade (jobs)		3,620	4,617	5,198	5,824	7,297	10,537
By economic sector - Utilities (jobs)		5,132	9,717	11,209	10,323	13,770	18,902
By resource sector - Biomass (jobs)		555	642	326	783	2,563	2,513
By resource sector - CO2 (jobs)		0	0	3,064	94.1	158	1,433
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		6,721	16,461	16,700	18,122	25,182	33,896
By resource sector - Natural Gas (jobs)		2,518	1,942	1,716	1,704	1,428	1,564
By resource sector - Nuclear (jobs)		606	596	346	0.016	0.021	0.051
By resource sector - Oil (jobs)		6,063	5,158	4,384	3,743	2,894	1,935
By resource sector - Solar (jobs)		8,336	7,958	8,889	9,695	10,680	19,863
By resource sector - Wind (jobs)		5,763	10,533	12,947	14,138	17,628	23,058
By education level - All sectors - High		12,887	18,113	20,125	19,885	24,854	34,500
school diploma or less (jobs)							
By education level - All sectors -		9,483	13,655	15,499	15,390	19,273	27,097
Associates degree or some college (jobs)							
By education level - All sectors -		6,438	8,920	9,851	9,983	12,559	17,328
Bachelors degree (jobs)							
By education level - All sectors - Masters		1,598	2,250	2,505	2,597	3,307	4,587
or professional degree (jobs)							
By education level - All sectors - Doctoral		255	350	392	424	541	750
degree (jobs)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - None (jobs)		4,385	6,225	6,992	6,956	8,743	12,210
Related work experience - All sectors - Up to 1 year (jobs)		6,194	8,671	9,601	9,628	12,101	16,835
Related work experience - All sectors - 1 to 4 years (jobs)		11,056	15,600	17,413	17,405	21,814	30,341
Related work experience - All sectors - 4 to 10 years (jobs)		7,165	10,156	11,438	11,385	14,242	19,839
Related work experience - All sectors - Over 10 years (jobs)		1,861	2,636	2,929	2,906	3,634	5,036
On-the-Job Training - All sectors - None (jobs)		1,742	2,378	2,639	2,665	3,329	4,653
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,075	28,247	31,267	31,344	39,435	54,663
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,415	9,191	10,439	10,302	12,846	17,999
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,120	3,056	3,561	3,514	4,371	6,175
On-the-Job Training - All sectors - Over 10 years (jobs)		308	416	465	454	553	772
On-Site or In-Plant Training - All sectors - None (jobs)		5,048	7,058	7,882	7,918	9,928	13,852
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,215	25,653	28,436	28,459	35,770	49,621
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,979	7,110	8,039	7,942	9,905	13,859
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,162	3,090	3,579	3,530	4,388	6,167
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		256	378	436	431	543	762
Wage income - All (million \$2019)		1,937	2,792	3,167	3,197	4,069	5,729

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	657	654	611	573	544	510	470
Final energy use - Residential (PJ)	246	227	207	188	169	150	133
Final energy use - Commercial (PJ)	160	163	165	166	164	162	160
Final energy use - Industry (PJ)	342	355	361	367	376	385	395

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		2.95	2.96	4.08	4.22	5.76	6.07

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	220	385	551	1,319	2,086	3,785	5,484
Vehicle stocks - LDV – All others (1000 units)	7,169	7,169	7,169	6,800	6,431	4,956	3,481
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	239	450	1,569	4,778	7,016
Public EV charging plugs - DC Fast (1000 units)	0.551		1.02		3.86		10.1
Public EV charging plugs - L2 (1000 units)	2.37		24.5		92.8		244

Table 54: E-B+ scenario -	DTI I AR 1. Efficiency/	Electrification -	. Residential
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Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	14	21.3	23.9	31.4	44.1	54.1	58.4
Heat Pump (%)							
Sales of space heating units - Electric	35.6	41.8	41.1	39.2	35.8	32.7	31
Resistance (%)							
Sales of space heating units - Gas (%)	41.5	23	21.5	17	9.58	4.03	1.76
Sales of space heating units - Fossil (%)	8.89	13.8	13.5	12.4	10.6	9.24	8.81
Sales of water heating units - Electric	0	1.23	4.71	14.8	30.9	42.3	46.7
Heat Pump (%)							
Sales of water heating units - Electric	45.5	61.3	60	56.4	51	47.6	46.5
Resistance (%)							
Sales of water heating units - Gas Furnace	47.5	31.9	29.8	23.3	12.8	4.87	1.59
(%)							
Sales of water heating units - Other (%)	6.95	5.56	5.52	5.49	5.39	5.31	5.28
Sales of cooking units - Electric	70.4	71.2	73.9	81.1	91	97.1	99.2
Resistance (%)							
Sales of cooking units - Gas (%)	29.6	28.8	26.1	18.9	9.03	2.91	0.784
Residential HVAC investment in 2020s vs.		4.1	4.04				
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	2.72	11.9	14.6	22.8	37.2	49.8	55.8
Heat Pump (%)							
Sales of space heating units - Electric	18.3	13.9	15.8	21.6	30.6	36.8	39.3
Resistance (%)							
Sales of space heating units - Gas (%)	79	74.3	69.5	55.6	32.2	13.3	4.9
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric	1.12	2.39	6.84	19.8	40.6	55.7	61.7
Heat Pump (%)							
Sales of water heating units - Electric	3.42	3.14	5.18	11.2	21.3	29.5	33.1
Resistance (%)							
Sales of water heating units - Gas (%)	94.6	93.8	87.3	68.4	37.5	14.2	4.65
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
Sales of cooking units - Electric	27.5	31	36.1	49.7	68.6	80.2	84.3
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Commercial HVAC investment in 2020s -		22,723	24,348				
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)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,744	2,659	2,600	3,431	3,569	3,661	5,305
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	0	0.007	0.015	0.034
Capital invested - Biomass power plant (billion \$2018)	0	0.004	0.227	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0.008	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0.063	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	7.38	452	452	452	452	452
Biomass w/ccu power plant (GWh)	0	0	0	0	70.4	70.4	70.4
Biomass w/ccu allam power plant (GWh)	0	0	0	0	8.4	8.4	8.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu	0	0	0	0	1	1	1
(quantity)							
Number of facilities - Allam power w ccu	0	0	0	0	1	1	1
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	1	6	7
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu	0	0	0	0	1	1	1
(quantity)							
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment -		4.26	253	26.4	1,350	5,424	624
Cumulative 5-yr (million \$2018)							
Biomass purchases (million \$2018/y)		63.7	192	194	290	684	729

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	3.35	5.03	12.1	13
Annual - BECCS (MMT)		0	0	0	1.71	8.69	9.49
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	3.35	8.38	20.5	33.5
Cumulative - BECCS (MMT)		0	0	0	1.71	10.4	19.9
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	675	675	675	675
Spur (km)		0	0	101	309	811	1,013
All (km)		0	0	776	984	1,486	1,688
Cumulative investment - Trunk (million \$2018)		0	0	1,702	1,702	1,702	1,702
Cumulative investment - Spur (million \$2018)		0	0	98.6	233	611	741
Cumulative investment - All (million \$2018)		0	0	1,800	1,935	2,313	2,443

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-1,087
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-317
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,647
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-2,076
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-9,930
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-377
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-7,491
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-188
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,869
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-26,982
counting overlap) (1000 tC02e/y)							
Carbon sink potential - Mid - Accelerate							-1,629
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,111
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-6,570
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-3,042
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-19,860
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-728
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-11,236
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-1,332
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-3,707
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-49,216
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Accelerate							-2,170
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,904
deforestation (1000 tC02e/y)							
Carbon sink potential - High - Extend							-9,494
rotation length (1000 tC02e/y)							
Carbon sink potential - High - Improve							-4,080
plantations (1000 tC02e/y)							
Carbon sink potential - High - Increase							-29,790
retention of HWP (1000 tC02e/y)							
Carbon sink potential - High - Increase							-1,078
trees outside forests (1000 tC02e/y)							
Carbon sink potential - High - Reforest							-14,981
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-2,477
pasture (1000 tC02e/y)							
Carbon sink potential - High - All (not							-71,521
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-5,545
productivity (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							178
Low - Accelerate regeneration (1000 hectares)							
Land impacted for carbon sink potential -							242
Low - Avoid deforestation (over 30 years)							2-12
(1000 hectares)							
Land impacted for carbon sink potential -							1,855
Low - Extend rotation length (1000							
hectares)							750
Land impacted for carbon sink potential - Low - Improve plantations (1000							752
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							53.9
Low - Increase trees outside forests							
(1000 hectares)  Land impacted for carbon sink potential -							495
Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential -							12.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,112
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							4,699
Low - Total impacted (over 30 years) (1000 hectares)							
Land impacted for carbon sink potential -							266
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							250
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							0.07.0
Land impacted for carbon sink potential - Mid - Extend rotation length (1000							3,348
hectares)							
Land impacted for carbon sink potential -							1,131
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							70.0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000							78.2
hectares)							
Land impacted for carbon sink potential -							743
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							88.2
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,240
Mid - Restore productivity (1000 hectares)							
Land impacted for carbon sink potential -							8,144
Mid - Total impacted (over 30 years) (1000							0,144
hectares)							
Land impacted for carbon sink potential -							355
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years)							258
		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 -							4,841
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,503
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 -							102
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							990
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							70.4
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,838
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -						T	9,959
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
						-0.035
						-1,027
						-73.6
						0
						0
						-1,101
						•
						-0.035
						-1,981
						, -
						-147
						0
						_
						0
						·
						-2,129
						_,,
	2020	2020 2025	2020 2025 2030	2020 2025 2030 2035	2020 2025 2030 2035 2040	2020 2025 2030 2035 2040 2045

Item	2020	2025	2030	2035	2040	2045	2050
and impacted for carbon sink - Moderate							0.062
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
and impacted for carbon sink - Moderate							1,458
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							117
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							0.016
deployment - Cropland to woody energy							
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							2.8
deployment - Pasture to energy crops							
(1000 hectares)							
Land impacted for carbon sink - Moderate							1,578
deployment - Total (1000 hectares)							, -
Land impacted for carbon sink -							0.06
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							6,909
Aggressive deployment - Cropland							-7.
measures (1000 hectares)							
Land impacted for carbon sink -							23
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							0.016
Aggressive deployment - Cropland to							0.01
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							2.8
Aggressive deployment - Pasture to							2.0
energy crops (1000 hectares)							
Land impacted for carbon sink -							7,146
Aggressive deployment - Total (1000							1,140
hectares)							
nectares							
oble ( / DEF georgeic IMPACTO Usalth							
able 64: REF scenario - IMPACTS - Health	0000	000= 1	0000	000-	00:0	00:-	
Item	2020	2025	2030	2035	2040	2045	205

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		30.6	22	4.05	3.18	2.91	2.73
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		8.21	8.13	8.52	6.89	6.26	6.49
Premature deaths from air pollution - Mobile - On-Road (deaths)		127	135	143	152	161	171
Premature deaths from air pollution - Gas Stations (deaths)		7.22	7.64	8.03	8.48	8.92	9.35
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	15.8	14.3	13.5	13.2	13.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.17	2.7	2.13	1.61	1.22	0.974
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.74	1.73	1.77	1.86	1.94	2.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.119	0.124	0.127	0.131	0.134	0.136

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

Tuble 04: NET occitatio Intrinoro medici (ec	-					
Item	2020 2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -	16.4	17.8	18.3	19.2	21	23.6
Fuel Comb - Comm/Institutional - Natural						
Gas (deaths)						
Premature deaths from air pollution -	0.376	0.377	0.383	0.392	0.402	0.413
Fuel Comb - Comm/Institutional - Oil						
(deaths)						
Premature deaths from air pollution -	1.29	1.36	1.44	1.52	1.6	1.67
Fuel Comb - Comm/Institutional - Other						
(deaths)						
Premature deaths from air pollution -	0.428	0.285	0.223	0.213	0.206	0.194
Industrial Processes - Coal Mining						
(deaths)						
Premature deaths from air pollution -	15.8	17.1	18	17.8	18.2	17.4
Industrial Processes - Oil & Gas						
Production (deaths)						
Monetary damages from air pollution -	271	195	35.9	28.1	25.7	24.2
Fuel Comb - Electric Generation - Coal						
(million \$2019)						
Monetary damages from air pollution -	72.7	72	75.4	61	55.4	57.5
Fuel Comb - Electric Generation - Natural						
Gas (million \$2019)						
Monetary damages from air pollution -	1,130	1,203	1,275	1,353	1,434	1,517
Mobile - On-Road (million \$2019)						
Monetary damages from air pollution -	63.9	67.7	71.1	75.1	79	82.8
Gas Stations (million \$2019)						
Monetary damages from air pollution -	154	140	127	119	117	116
Fuel Comb - Residential - Natural Gas						
(million \$2019)						
Monetary damages from air pollution -	28.1	24	18.9	14.3	10.8	8.63
Fuel Comb - Residential - Oil (million						
\$2019)						
Monetary damages from air pollution -	15.4	15.3	15.7	16.4	17.2	18
Fuel Comb - Residential - Other (million						
\$2019)						
Monetary damages from air pollution -	1.06	1.09	1.13	1.16	1.18	1.21
Fuel Comb - Comm/Institutional - Coal						
(million \$2019)						
Monetary damages from air pollution -	146	157	162	170	186	209
Fuel Comb - Comm/Institutional - Natural						
Gas (million \$2019)						
Monetary damages from air pollution -	3.33	3.34	3.39	3.47	3.56	3.66
Fuel Comb - Comm/Institutional - Oil						
(million \$2019)						
Monetary damages from air pollution -	11.4	12.1	12.8	13.5	14.1	14.8
Fuel Comb - Comm/Institutional - Other						
(million \$2019)						
Monetary damages from air pollution -	3.78	2.52	1.97	1.88	1.82	1.71
Industrial Processes - Coal Mining						
(million \$2019)						
Monetary damages from air pollution -	140	152	160	158	161	155
Industrial Processes - Oil & Gas						
Production (million \$2019)						
(						

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		132	119	117	95.5	95.3	103
By economic sector - Construction (jobs)		4,244	8,397	9,225	11,196	11,188	14,918
By economic sector - Manufacturing		1,713	2,262	2,803	3,073	2,466	2,681
(jobs)							
By economic sector - Mining (jobs)		2,298	1,855	1,512	1,250	1,065	909

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

Table 65. REF SCEITUTTO - IMPACTS - JUDS (	continueuj						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		218	1,169	1,414	1,777	2,016	3,597
By economic sector - Pipeline (jobs)		428	435	436	421	429	432
By economic sector - Professional (jobs)		2,527	4,032	4,544	5,752	6,108	8,425
By economic sector - Trade (jobs)		2,201	3,080	3,318	3,995	4,277	6,106
By economic sector - Utilities (jobs)		4,196	4,669	5,530	7,655	6,734	7,109
By resource sector - Biomass (jobs)		511	478	444	397	406	413
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		5,308	6,129	7,603	12,354	11,137	11,435
By resource sector - Natural Gas (jobs)		2,605	2,660	2,931	2,822	2,566	2,750
By resource sector - Nuclear (jobs)		606	596	587	340	0.02	0.02
By resource sector - Oil (jobs)		6,133	5,324	4,742	4,422	4,228	4,093
By resource sector - Solar (jobs)			7,424	8,539	9,376	10,167	19,124
By resource sector - Wind (jobs)		2,697	3,407	4,055	5,502	5,875	6,464
By education level - All sectors - High		7,385	10,976	12,183	14,793	14,368	18,447
school diploma or less (jobs)							
By education level - All sectors -		5,407	8,062	9,059	11,177	10,926	14,147
Associates degree or some college (jobs)							
By education level - All sectors -		4,036	5,424	5,948	7,161	7,009	8,975
Bachelors degree (jobs)							
By education level - All sectors - Masters		986	1,343	1,479	1,804	1,790	2,326
or professional degree (jobs)							
By education level - All sectors - Doctoral		145	211	231	278	285	385
degree (jobs)							
Related work experience - All sectors -		2,563	3,744	4,175	5,110	4,997	6,461
None (jobs)							
Related work experience - All sectors - Up		3,454	5,236	5,816	7,045	6,882	8,970
to 1 year (jobs)							
Related work experience - All sectors - 1		6,594	9,395	10,420	12,697	12,404	15,939
to 4 years (jobs)							
Related work experience - All sectors - 4		4,229	6,069	6,743	8,241	8,045	10,308
to 10 years (jobs)							
Related work experience - All sectors -		1,118	1,572	1,747	2,122	2,051	2,602
Over 10 years (jobs)			1 /==	1.100	1015	1015	
On-the-Job Training - All sectors - None		1,003	1,473	1,620	1,945	1,915	2,527
(jobs)		11.000	1= 001	10.07/			
On-the-Job Training - All sectors - Up to 1		11,939	17,021	18,874	22,908	22,336	28,728
year (jobs)		0.400		( 00 (	7500	7.010	0.07/
On-the-Job Training - All sectors - 1 to 4		3,692	5,456	6,096	7,502	7,312	9,376
years (jobs)		1150	1.010	0.005	0.500	0.400	
On-the-Job Training - All sectors - 4 to 10		1,159	1,810	2,025	2,523	2,489	3,223
years (jobs)		4.5	050	205	207	20.1	
On-the-Job Training - All sectors - Over 10		165	258	285	337	326	425
years (jobs)		0.007		. 70.	F 704	5 (00	
On-Site or In-Plant Training - All sectors -		2,894	4,257	4,724	5,721	5,609	7,317
None (jobs)		10.000	45 / 50	474.5	00.000	00.007	0/ 00/
On-Site or In-Plant Training - All sectors -		10,829	15,459	17,145	20,833	20,304	26,094
Up to 1 year (jobs)		0.075	/ 007	/ 700	E 0.07	F / F-7	7057
On-Site or In-Plant Training - All sectors -		2,875	4,237	4,729	5,807	5,657	7,257
1 to 4 years (jobs)		1.01/	10/5	0.055	0.577	0.507	0.000
On-Site or In-Plant Training - All sectors -		1,216	1,845	2,055	2,544	2,504	3,222
4 to 10 years (jobs)		4/5	040	0.7	010	007	
On-Site or In-Plant Training - All sectors -		145	219	247	310	304	389
Over 10 years (jobs)		11/1	1///	1.070	0.001	0.000	0.070
Wage income - All (million \$2019)		1,161	1,666	1,872	2,321	2,292	2,962

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

••							
Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	656	659	625	605	608	624	642

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

The state of the s			•	-			
Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	246	227	210	196	186	179	172
Final energy use - Commercial (PJ)	160	165	169	173	178	188	201
Final energy use - Industry (PJ)	342	367	387	404	428	457	490

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.38	3.44	3.99	4.11	3.95	4.04
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	12.4	29.8	30.5	31.7	33.2	35.3	38.5
Heat Pump (%)							
Sales of space heating units - Electric	36.2	36.9	36.4	35.6	34.5	32.5	29.2
Resistance (%)							
Sales of space heating units - Gas (%)	42.3	20.7	21.6	21.9	21.7	21.7	21.7
Sales of space heating units - Fossil (%)	9.05	12.7	11.5	10.8	10.6	10.5	10.6
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	45.5	61.7	61.7	61.6	61.6	61.6	61.6
Resistance (%)							
Sales of water heating units - Gas Furnace	47.5	32.7	32.8	32.8	32.8	32.8	32.8
(%)							
Sales of water heating units - Other (%)	6.95	5.57	5.55	5.6	5.61	5.61	5.61
Sales of cooking units - Electric	70.2	70.2	70.2	70.2	70.2	70.2	70.2
Resistance (%)							
Sales of cooking units - Gas (%)	29.8	29.8	29.8	29.8	29.8	29.8	29.8
Residential HVAC investment in 2020s vs.		4.1	3.83				
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	2.72	21.4	53.8	64.1	65.2	65.3	65.3
Heat Pump (%)							
Sales of space heating units - Electric	18.3	16.1	25.2	30.3	33.5	33.9	34
Resistance (%)							
Sales of space heating units - Gas (%)	79	62.5	21	5.54	1.3	0.744	0.697
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric	1.12	0.821	0.82	0.824	0.831	0.834	0.834
Heat Pump (%)							
Sales of water heating units - Electric	3.42	2.42	2.42	2.44	2.44	2.44	2.44
Resistance (%)							
Sales of water heating units - Gas (%)	94.6	96.1	96.1	96.1	96.1	96.1	96.1
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
Sales of cooking units - Electric	27.5	29	29	29	29	28.9	28.9
Resistance (%)							
Sales of cooking units - Gas (%)	72.5	71	71	71	71	71.1	71.1
Commercial HVAC investment in 2020s -		22,575	23,159				
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)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,737	2,659	2,659	3,670	2,865	2,393	2,986
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	1,200	0	0.009	0.016
Installed renewables - Rooftop PV (MW)	1,788	2,755	3,680	4,796	6,121	7,666	9,495

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

	,	•	, , , ,	,			
Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Base land use assumptions (MW)	567	567	567	567	567	567	567
Installed renewables - Wind - Base land	3,388	3,388	3,388	3,388	3,702	3,776	3,776
use assumptions (MW)	0,000	0,000	0,000	0,000	0,102	0,110	0,110
Installed renewables - Solar -	128	128	128	128	128	128	128
Constrained land use assumptions (MW)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,419	1,419	1,419	1,419	1,419	1,419	1,419
Wind - Base land use assumptions (GWh)	11,561	11,561	11,561	11,561	12,666	12,919	12,919
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)	-27.2		-5.37				-4.47
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-8.11		-13.6				-14.3
Business-as-usual carbon sink - Total (Mt CO2e/y)	-35.3		-19				-18.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate							-1,087
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-317
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,647
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-2,076
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-9,930
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-377
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-7,491
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-188
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,869
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-26,982
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-1,629
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-1,111
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-6,570
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-3,042
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-19,860
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-728
trees outside forests (1000 tCO2e/y)							

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

Item Copper sink potential, Mid. Referent	2020	2025	2030	2035	2040	2045	2050 -11,236
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest							-1,332
pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore							-3,707
productivity (1000 tCO2e/y)							-3,101
Carbon sink potential - Mid - All (not							-49,216
counting overlap) (1000 tCO2e/y)							77,210
Carbon sink potential - High - Accelerate							-2,170
regeneration (1000 tCO2e/y)							2,110
Carbon sink potential - High - Avoid							-1,904
deforestation (1000 tCO2e/y)							.,, , , , .
Carbon sink potential - High - Extend							-9,494
rotation length (1000 tCO2e/y)							,, ., .
Carbon sink potential - High - Improve							-4,080
plantations (1000 tCO2e/y)							.,
Carbon sink potential - High - Increase							-29,790
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,078
trees outside forests (1000 tCO2e/y)							.,
Carbon sink potential - High - Reforest							-14,981
cropland (1000 tCO2e/y)							, -
Carbon sink potential - High - Reforest							-2,477
pasture (1000 tC02e/y)							•
Carbon sink potential - High - All (not							-71,521
counting overlap) (1000 tCO2e/y)							•
Carbon sink potential - High - Restore							-5,545
productivity (1000 tCO2e/y)							•
Land impacted for carbon sink potential -							178
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							242
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,855
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							752
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 -							53.9
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							495
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							12.2
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,112
Low - Restore productivity (1000							
hectares)							, ,,,,
Land impacted for carbon sink potential -							4,699
Low - Total impacted (over 30 years)							
(1000 hectares)							2//
Land impacted for carbon sink potential -							266
Mid - Accelerate regeneration (1000							
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							250
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,348
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,131
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 -							78.2
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							743
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							88.2
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							2,240
Mid - Restore productivity (1000							
hectares)							0.17.7
Land impacted for carbon sink potential -							8,144
Mid - Total impacted (over 30 years) (1000							
hectares)							055
Land impacted for carbon sink potential -							355
High - Accelerate regeneration (1000							
hectares) Land impacted for carbon sink potential -							258
High - Avoid deforestation (over 30 years)							256
(1000 hectares)							
Land impacted for carbon sink potential -							4,841
High - Extend rotation length (1000							4,04
hectares)							
Land impacted for carbon sink potential -							1,503
High - Improve plantations (1000							1,000
hectares)							
Land impacted for carbon sink potential -							C
High - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							102
High - Increase trees outside forests							102
(1000 hectares)							
Land impacted for carbon sink potential -							990
High - Reforest cropland (1000 hectares)							,,,
Land impacted for carbon sink potential -							70.4
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,838
High - Restore productivity (1000							.,000
hectares)							
Land impacted for carbon sink potential -							9,959
High - Total impacted (over 30 years)							.,. 57
(1000 hectares)							