

# Net-Zero America - arkansas state report

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These data underlie graphs and tables presented in the Princeton Net-Zero America study:

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#### Notes

- These data are all data from the study available at <a href="https://netzeroamerica.prince-ton.edu">https://netzeroamerica.prince-ton.edu</a>.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one "no new policies" reference scenario. In this document, state-level results are grouped by scenario. For some scenarios, the study generated national, but not statelevel results.
- Within results for a given scenario, data tables are organized into corresponding sections of the full net-zero study (e.g., Pillar 1, Pillar 2, etc.)
- For Pillar 6 (Land sinks), values shown are maximum carbon storage potentials.

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		10,539	12,307				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Resistance (%)							
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Sales of space heating units - Electric	2.92	27.3	77.1	91.1	92.3	92.3	92.3
Heat Pump (%)							
Sales of space heating units - Electric	2.74	4.44	4.73	6.05	6.35	6.37	6.39
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	94.3	68.3	18.2	2.83	1.38	1.34	1.33
(%)							
Sales of water heating units - Electric	0.08	10.7	56.3	66.5	66.9	66.9	66.9
Heat Pump (%)							
Sales of water heating units - Electric	2.31	8.07	26.9	31.1	31.3	31.3	31.3
Resistance (%)							
Sales of water heating units - Gas Furnace	96.5	79.4	15	0.632	0	0	0
(%)							
Sales of water heating units - Other (%)	1.07	1.78	1.78	1.78	1.79	1.79	1.8

Table 2: E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.42	2.48	3.87	4.09	4.01	4.2
Cumulative 5-yr (billion \$2018)							

Table 3: E+ scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	90	90.4	87	81.6	77.4	76.4	78.1
Final energy use - Industry (PJ)	236	242	246	246	250	250	255
Final energy use - Residential (PJ)	123	117	108	95.6	85.1	78.9	76.1
Final energy use - Transportation (PJ)	324	303	265	220	179	155	146

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		2.31	2.82				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	52.7	62.8	93.6	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	47.3	37.2	6.37	0.321	0	0	0
Sales of space heating units - Electric	11.9	27.2	74.3	84.8	85.3	85.2	85.2
Heat Pump (%)							
Sales of space heating units - Electric	34.9	33.8	14.2	9.82	9.65	9.82	9.86
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	11.9	5.59	4.18	4.11	4.04	4.03
Sales of space heating units - Gas (%)	45.1	27.1	5.9	1.18	0.978	0.957	0.954
Sales of water heating units - Electric	0	11.3	59.7	70.6	71.1	71.1	71.1
Heat Pump (%)							
Sales of water heating units - Electric	44.5	51.9	32.1	27.6	27.4	27.4	27.4
Resistance (%)							
Sales of water heating units - Gas Furnace	53.7	35.3	6.65	0.277	0	0	0
(%)							
Sales of water heating units - Other (%)	1.86	1.52	1.52	1.49	1.49	1.5	1.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		542	1,384	2,253	3,409	3,714	3,539
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.043		1.12		5.01		8.11
units)							
Public EV charging plugs - L2 (1000 units)	0.243		26.9		120		195
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.81	2.04	1.36	0.439	0.079	0.013	0
Vehicle sales - Light-duty - EV (%)	3.04	12.5	42.3	80.1	96.1	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.3	81	53.1	18.2	3.51	0.597	0
Vehicle sales - Light-duty - hybrid (%)	3.57	3.93	2.92	1.11	0.266	0.056	0
Vehicle sales - Light-duty - hydrogen FC	0.112	0.354	0.224	0.071	0.014	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.113	0.11	0.074	0.026	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 6: E+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0.022	0	0	0.032
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	4.37	0	0.029
Capital invested - Solar PV - Base (billion \$2018)		1.14	0.219	3.29	4.23	0.151	0
Capital invested - Solar PV - Constrained (billion \$2018)		0.354	1.18	3.58	3.11	0.641	0
Capital invested - Wind - Base (billion \$2018)		3.48	8.29	10.5	12.8	10.5	21.2
Capital invested - Wind - Constrained (billion \$2018)		7.97	11.9	18.7	25.5	0.59	24.8
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	14.5	25.5	37.9	57.4	85.2	121	168
Installed renewables - Solar - Base land use assumptions (MW)	210	1,211	1,425	4,924	9,694	9,874	9,874
Installed renewables - Solar - Constrained land use assumptions (MW)	200	200	1,662	6,579	9,762	10,100	10,100
Installed renewables - Wind - Base land use assumptions (MW)	84.5	2,450	8,676	17,144	27,980	37,359	57,370
Installed renewables - Wind - Constrained land use assumptions (MW)	541	5,494	14,552	29,653	56,618	57,141	79,791

Table 7: E+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	21.7	21.7	21.7	53.4
Biomass w/ccu power plant (GWh)	0	0	0	0	4,907	4,907	4,940
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	409	2,043	2,391	8,094	15,883	16,176	16,176
Solar - Constrained land use assumptions	390	390	2,766	10,770	15,974	16,525	16,525
(GWh)							
Wind - Base land use assumptions (GWh)	315	8,268	28,699	57,011	91,910	120,376	180,483
Wind - Constrained land use assumptions	1,989	19,254	49,424	95,999	169,988	171,818	245,945
(GWh)							

Table 8: E+ scenario - PILLAR 3: Clean fuels - Bioenergy

Table 6: Er decitario Tilerin 6: eleatifae		<u> </u>					
Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)		0	0	79.9	391	858	1,068
Conversion capital investment -		0	0	1,551	6,476	8,924	4,059
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	1	1	1	2
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	1	4	14	17
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	2
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	0	4	4	5
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	1	1	1	2
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

Table 9: E+ scenario - PILLAR 4: CCUS - CO2 capture

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	1.95	9.81	21.3	26.4
Annual - BECCS (MMT)		0	0	1.95	9.81	21.3	26.4
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	1.95	11.8	33	59.5
Cumulative - BECCS (MMT)		0	0	1.95	11.8	33	59.5
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0

Table 10: E+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	39.8	140	420	894	1,699
Cumulative investment - All (million \$2018)		0	244	540	812	1,335	2,026
Cumulative investment - Spur (million \$2018)		0	0	50.8	323	846	1,537
Cumulative investment - Trunk (million \$2018)		0	244	489	489	489	489
Spur (km)		0	0	60.8	341	815	1,619
Trunk (km)		0	39.8	79.6	79.6	79.6	79.6

Table 11: E+ scenario - PILLAR 4: CCUS - CO2 storage

	•						
Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	2.19	8.81	16.3	25.8	35.4
Injection wells (wells)		0	2	10	18	30	38
Resource characterization, appraisal, permitting costs (million \$2020)		14.2	255	404	404	404	404
Wells and facilities construction costs (million \$2020)		0	78.2	305	543	909	1,128

# Table 12: E+ scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-243
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-10,076
deployment - Cropland measures (1000							
tCO2e/y)							( / 0
Carbon sink potential - Aggressive							-64.8
deployment - Permanent conservation							
cover (1000 tC02e/y)							10.000
Carbon sink potential - Aggressive							-10,383
deployment - Total (1000 tCO2e/y)							0/0
Carbon sink potential - Moderate							-243
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							F 10.0
Carbon sink potential - Moderate							-5,130
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-32.4
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-5,405
deployment - Total (1000 tCO2e/y)							0//
Land impacted for carbon sink -							96.4
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							0.055
Land impacted for carbon sink -							2,955
Aggressive deployment - Cropland							
measures (1000 hectares)							440
Land impacted for carbon sink -							118
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							3,170
Aggressive deployment - Total (1000							
hectares)							07.7
Land impacted for carbon sink - Moderate							96.4
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							4.505
Land impacted for carbon sink - Moderate							1,507
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							58.9
deployment - Permanent conservation							
cover (1000 hectares)							1 / / 2
Land impacted for carbon sink - Moderate							1,662
deployment - Total (1000 hectares)							

Table 13: E+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-356
regeneration (1000 tC02e/y)							
Carbon sink potential - High - All (not							-46,154
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,334
deforestation (1000 tC02e/y)							
Carbon sink potential - High - Extend							-9,227
rotation length (1000 tCO2e/y)							0.077
Carbon sink potential - High - Improve							-3,044
plantations (1000 tC02e/y)							10.005
Carbon sink potential - High - Increase							-13,825
retention of HWP (1000 tC02e/y)							1100
Carbon sink potential - High - Increase							-1,120
trees outside forests (1000 tC02e/y)							1.077
Carbon sink potential - High - Reforest							-1,077
cropland (1000 tCO2e/y)  Carbon sink potential - High - Reforest							-11,526
,							-11,526
pasture (1000 tCO2e/y)  Carbon sink potential - High - Restore							-4,644
productivity (1000 tC02e/y)							-4,044
Carbon sink potential - Low - Accelerate							-178
regeneration (1000 tC02e/y)							-110
Carbon sink potential - Low - All (not							-13,471
counting overlap) (1000 tC02e/y)							-13,471
Carbon sink potential - Low - Avoid							-222
deforestation (1000 tC02e/y)							-222
Carbon sink potential - Low - Extend							-3,544
rotation length (1000 tCO2e/y)							-5,544
Carbon sink potential - Low - Improve							-1,549
plantations (1000 tCO2e/y)							-1,047
Carbon sink potential - Low - Increase							-4,608
retention of HWP (1000 tC02e/y)							-4,000
Carbon sink potential - Low - Increase							-392
trees outside forests (1000 tCO2e/y)							072
Carbon sink potential - Low - Reforest							-538
cropland (1000 tCO2e/y)							000
Carbon sink potential - Low - Reforest							-873
pasture (1000 tCO2e/y)							0.0
Carbon sink potential - Low - Restore							-1,565
productivity (1000 tCO2e/y)							,
Carbon sink potential - Mid - Accelerate							-267
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-29,786
counting overlap) (1000 tC02e/y)							•
Carbon sink potential - Mid - Avoid							-778
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-6,386
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-2,270
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-9,217
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-756
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-807
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-6,200
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-3,105
productivity (1000 tCO2e/y)							

Table 13: E+ scenario - PILLAR 6: Land sinks - Forests (continued)

Table 13: E+ scenario - PILLAR 6: Land sini		·					
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							58.3
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							181
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,705
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,121
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 -							106
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							71.2
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							327
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,539
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							8,110
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							29.1
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							170
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,803
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							561
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 -							56
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							35.6
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							56.8
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							931
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							3,642
Low - Total impacted (over 30 years)							•
(1000 hectares)							
Land impacted for carbon sink potential -							43.7
Mid - Accelerate regeneration (1000							
Mid - Accelerate regeneration riboo		,	1	,			

Table 13: E+	econario -	DTIIAP 6.	I and sinks -	Enrocte	(continued)
Table 15. E+	SCEHUITO -	PILLAR D.	LUHU SHIKS -	FULESTS	COMUNICEUR

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							175
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,254
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							844
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 -							81.2
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							53.4
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							410
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,876
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,737
Mid - Total impacted (over 30 years) (1000							
hectares)							

## Table 14: E+ scenario - IMPACTS - Fossil fuel industries

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		279	235	189	142	89.4	62
Natural gas consumption - Cumulative (tcf)							5,687
Natural gas production - Annual (tcf)		720	681	593	501	397	309
Oil consumption - Annual (million bbls)		54.3	46.3	34.6	23.5	14.8	7.61
Oil consumption - Cumulative (million bbls)							1,065
Oil production - Annual (million bbls)		6.5	6.52	6.52	5.16	4.2	2.79

## Table 15: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		319	0.217	0.206	0.16	0.104	0.004
Monetary damages from air pollution - Natural Gas (million 2019\$)		113	64.1	34	28.5	12.5	6.16
Monetary damages from air pollution - Transportation (million 2019\$)		404	374	283	163	74.8	30.8
Premature deaths from air pollution - Coal (deaths)		36	0.024	0.023	0.018	0.012	0
Premature deaths from air pollution - Natural Gas (deaths)		12.8	7.24	3.84	3.21	1.41	0.695
Premature deaths from air pollution - Transportation (deaths)		45.5	42.1	31.8	18.3	8.42	3.46

# Table 16: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		122	247	259	772	1,312	1,336
By economic sector - Construction (jobs)		4,896	6,363	11,223	15,191	14,823	20,176
By economic sector - Manufacturing		5,351	6,235	8,016	8,218	7,279	9,324
(jobs)							
By economic sector - Mining (jobs)		4,370	3,274	2,308	1,469	913	501

Table 16: E+ scenario - IMPACTS - Jobs (continued)

Table 16: E+ Scendro - IMPACTS - Jobs (co	-						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		378	481	1,264	1,956	1,707	2,330
By economic sector - Pipeline (jobs)		462	422	348	245	210	294
By economic sector - Professional (jobs)		3,306	4,324	7,167	10,566	12,169	16,526
By economic sector - Trade (jobs)		2,329	2,667	4,131	5,742	6,200	8,554
By economic sector - Utilities (jobs)		5,433	5,851	9,006	12,339	13,051	18,471
By education level - All sectors -		8,235	9,338	13,898	17,964	18,160	24,604
Associates degree or some college (jobs)							
By education level - All sectors -		5,967	6,481	9,160	11,755	12,197	16,367
Bachelors degree (jobs)							
By education level - All sectors - Doctoral		206	233	346	474	521	698
degree (jobs)			10.000	10.010			
By education level - All sectors - High		10,795	12,232	18,040	23,297	23,593	31,540
school diploma or less (jobs)		1110	1.500		2.222	2.121	
By education level - All sectors - Masters		1,442	1,582	2,278	3,008	3,194	4,302
or professional degree (jobs)					2 222	. = 2 .	
By resource sector - Biomass (jobs)		523	682	737	2,323	4,786	5,704
By resource sector - CO2 (jobs)		5.51	379	463	249	721	1,891
By resource sector - Coal (jobs)		901	80.8	0	0	0	0
By resource sector - Grid (jobs)		5,282	7,780	14,354	20,576	22,284	32,952
By resource sector - Natural Gas (jobs)		9,323	7,514	5,850	5,167	3,424	1,726
By resource sector - Nuclear (jobs)		549	0.005	0.01	0.011	0.023	0.035
By resource sector - Oil (jobs)		3,609	2,977	2,297	1,546	1,027	571
By resource sector - Solar (jobs)		2,982	2,521	6,677	8,730	4,946	5,816
By resource sector - Wind (jobs)		3,471	7,932	13,343	17,906	20,476	28,852
Median wages - Annual - All (\$2019 per		53,507	53,547	53,429	54,135	55,332	56,196
job)							
On-Site or In-Plant Training - Total jobs - 1		4,292	4,836	7,148	9,211	9,294	12,561
to 4 years (jobs)							
On-Site or In-Plant Training - Total jobs - 4		1,721	1,962	2,972	3,911	3,977	5,402
to 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		4,337	4,872	7,160	9,290	9,515	12,757
None (jobs)							
On-Site or In-Plant Training - Total jobs -		216	251	381	498	508	693
Over 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		16,078	17,944	26,061	33,587	34,369	46,099
Up to 1 year (jobs)							
On-the-Job Training - All sectors - 1 to 4		5,538	6,243	9,246	11,929	12,040	16,297
years (jobs)							
On-the-Job Training - All sectors - 4 to 10		1,631	1,885	2,911	3,863	3,924	5,347
years (jobs)							
On-the-Job Training - All sectors - None		1,449	1,598	2,345	3,041	3,108	4,169
(jobs)		,	,				•
On-the-Job Training - All sectors - Over 10		262	294	430	537	527	703
years (jobs)							
On-the-Job Training - All sectors - Up to 1		17,766	19,845	28,789	37,127	38,066	50,995
year (jobs)		,	,	-, -		,	
Related work experience - All sectors - 1		9,737	10,843	15,763	20,344	20,782	27,917
to 4 years (jobs)		,					•
Related work experience - All sectors - 4		6,307	7,048	10,298	13,269	13,528	18,258
to 10 years (jobs)		,,,,,,	.,	,	,	,	,
Related work experience - All sectors -		3,765	4,235	6,234	8,105	8,276	11,117
None (jobs)		3,.55	.,200	0,20 .	0,.00	3,2.3	,
Related work experience - All sectors -		1,750	1,931	2,762	3,489	3,529	4,753
Over 10 years (jobs)		.,. 55	.,,,,,,,	2,.02	5, 107	3,327	.,. 00
Related work experience - All sectors - Up		5,087	5,808	8,665	11,289	11,550	15,465
to 1 year (jobs)		5,55.	2,000	2,000	,20,	,000	.5, .55
Wage income - All (million \$2019)		1,426	1,599	2,336	3,059	3,191	4,356
**************************************		1,720	1,077	2,000	0,007	5,171	-,000

Table 17: E- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		10,527	12,223				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	30.1	34.2	39	52	70.1	81.2	85
Resistance (%)							
Sales of cooking units - Gas (%)	69.9	65.8	61	48	29.9	18.8	15
Sales of space heating units - Electric	2.92	17.8	23.5	40	65.6	83.3	89.8
Heat Pump (%)							
Sales of space heating units - Electric	2.74	4.44	4.48	4.65	5.07	5.74	6.19
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	94.3	77.8	72	55.4	29.3	11	3.97
(%)							
Sales of water heating units - Electric	0.08	1.96	7.15	22.1	45	59.9	65.1
Heat Pump (%)							
Sales of water heating units - Electric	2.31	4.44	6.56	12.7	22.2	28.4	30.5
Resistance (%)							
Sales of water heating units - Gas Furnace	96.5	91.8	84.5	63.4	31	9.91	2.58
(%)							
Sales of water heating units - Other (%)	1.07	1.78	1.78	1.78	1.79	1.79	1.8

Table 18: E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.1	2.13	2.57	2.64	3.75	3.95
Cumulative 5-yr (billion \$2018)							

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

Item	2020	2025	2030	2035	2040	2045	2050			
Final energy use - Commercial (PJ)	90	90.7	90.4	89.6	87.6	85.4	84.4			
Final energy use - Industry (PJ)	236	243	246	249	254	253	258			
Final energy use - Residential (PJ)	123	118	114	110	103	94.4	86.6			
Final energy use - Transportation (PJ)	324	305	276	255	238	219	197			

Table 20: E- scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		2.28	2.67				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	52.5	53.8	58.1	69.6	85.5	95.3	98.7
Resistance (%)							
Sales of cooking units - Gas (%)	47.5	46.2	41.9	30.4	14.5	4.68	1.26
Sales of space heating units - Electric	11.9	18.1	23.5	39	62.6	78	83.3
Heat Pump (%)							
Sales of space heating units - Electric	34.9	37.6	35.2	28.7	19	12.7	10.5
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	13.1	12.5	10.3	7.08	5.03	4.32
Sales of space heating units - Gas (%)	45.1	31.2	28.8	22	11.3	4.24	1.82
Sales of water heating units - Electric	0	1.94	7.45	23.3	47.7	63.6	69.1
Heat Pump (%)							
Sales of water heating units - Electric	44.5	55.7	53.5	47.1	37	30.5	28.2
Resistance (%)							
Sales of water heating units - Gas Furnace	53.7	40.9	37.5	28.1	13.8	4.37	1.13
(%)							
Sales of water heating units - Other (%)	1.86	1.52	1.52	1.51	1.52	1.5	1.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		0	86.7	184	621	1,961	2,854
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.043		0.334		1.85		5.2
units)							
Public EV charging plugs - L2 (1000 units)	0.243		8.03		44.4		125
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC	0.332	0.969	2.74	7.17	15.7	26.3	34
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.82	2.19	2.11	1.69	1.1	0.572	0.244
Vehicle sales - Light-duty - EV (%)	1.58	4.01	10.5	23.6	45.9	70.4	86.9
Vehicle sales - Light-duty - gasoline (%)	92.7	88.7	81.8	69.5	49	26.6	11.7
Vehicle sales - Light-duty - hybrid (%)	3.69	4.55	5.17	4.83	3.75	2.29	1.14
Vehicle sales - Light-duty - hydrogen FC	0.113	0.388	0.341	0.266	0.193	0.109	0.05
(%)							
Vehicle sales - Light-duty - other (%)	0.114	0.118	0.109	0.096	0.07	0.039	0.018
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 22: E- scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-243
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-10,076
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-64.8
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-10,383
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-243
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-5,130
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-32.4
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-5,405
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink -							96.4
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,955
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							118
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							

Table 22: E- scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							3,170
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							96.4
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,507
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							58.9
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,662
deployment - Total (1000 hectares)							

Table 23: E- scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-356
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-46,154
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,334
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-9,227
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-3,044
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-13,825
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,120
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,077
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-11,526
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-4,644
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-178
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-13,471
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-222
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,544
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-1,549
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-4,608
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-392
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-538
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-873
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-1,565
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-267
regeneration (1000 tC02e/y)							

Table 23: E- scenario - PILLAR 6: Land sinks - Forests (continued)

Item Carbon sink potential - Mid - All (not	2020	2025	2030	2035	2040	2045	2050 -29,786
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-778
deforestation (1000 tCO2e/y) Carbon sink potential - Mid - Extend							-6,386
rotation length (1000 tC02e/y)							
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-2,270
Carbon sink potential - Mid - Increase							-9,217
retention of HWP (1000 tCO2e/y)  Carbon sink potential - Mid - Increase							-756
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							-807
cropland (1000 tCO2e/y) Carbon sink potential - Mid - Reforest							-6,200
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore productivity (1000 tC02e/y)							-3,105
Land impacted for carbon sink potential -							58.3
High - Accelerate regeneration (1000							
hectares)							181
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years)							181
(1000 hectares)							
Land impacted for carbon sink potential -							4,705
High - Extend rotation length (1000 hectares)							
Land impacted for carbon sink potential -							1,121
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 -							106
High - Increase trees outside forests							100
(1000 hectares)							
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							71.2
Land impacted for carbon sink potential -							327
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential - High - Restore productivity (1000							1,539
hectares)							
Land impacted for carbon sink potential -							8,110
High - Total impacted (over 30 years) (1000 hectares)							
Land impacted for carbon sink potential -							29.1
Low - Accelerate regeneration (1000							
hectares) Land impacted for carbon sink potential -							170
Low - Avoid deforestation (over 30 years)							110
(1000 hectares)							
Land impacted for carbon sink potential - Low - Extend rotation length (1000							1,803
hectares)							
Land impacted for carbon sink potential -							561
Low - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							_
hectares)							

Table 23: E- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							56
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							35.6
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							56.8
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							931
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							3,642
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							43.7
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							175
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,254
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							844
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 -							81.2
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							53.4
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							410
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,876
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,737
Mid - Total impacted (over 30 years) (1000							
hectares)							

#### Table 24: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		319	0.217	0.206	0.16	0.104	0.004
Monetary damages from air pollution - Natural Gas (million 2019\$)		110	54	25	11.9	4.22	3.25
Monetary damages from air pollution - Transportation (million 2019\$)		410	410	397	357	283	194
Premature deaths from air pollution - Coal (deaths)		36	0.024	0.023	0.018	0.012	0
Premature deaths from air pollution - Natural Gas (deaths)		12.4	6.1	2.82	1.34	0.476	0.367
Premature deaths from air pollution - Transportation (deaths)		46.1	46.1	44.7	40.1	31.8	21.8

Table 25: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		10,539	12,307				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Resistance (%)							
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Sales of space heating units - Electric	2.92	27.3	77.1	91.1	92.3	92.3	92.3
Heat Pump (%)							
Sales of space heating units - Electric	2.74	4.44	4.73	6.05	6.35	6.37	6.39
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	94.3	68.3	18.2	2.83	1.38	1.34	1.33
(%)							
Sales of water heating units - Electric	0.08	10.7	56.3	66.5	66.9	66.9	66.9
Heat Pump (%)							
Sales of water heating units - Electric	2.31	8.07	26.9	31.1	31.3	31.3	31.3
Resistance (%)							
Sales of water heating units - Gas Furnace	96.5	79.4	15	0.632	0	0	0
(%)							
Sales of water heating units - Other (%)	1.07	1.78	1.78	1.78	1.79	1.79	1.8

Table 26: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.42	2.48	3.87	4.09	4.01	4.2
Cumulative 5-yr (billion \$2018)							

Table 27: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	90	90.4	87	81.6	77.4	76.4	78.1
Final energy use - Industry (PJ)	236	242	246	246	250	250	255
Final energy use - Residential (PJ)	123	117	108	95.6	85.1	78.9	76.1
Final energy use - Transportation (PJ)	324	303	265	220	179	155	146

Table 28: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		2.31	2.82				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	52.7	62.8	93.6	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	47.3	37.2	6.37	0.321	0	0	0
Sales of space heating units - Electric	11.9	27.2	74.3	84.8	85.3	85.2	85.2
Heat Pump (%)							
Sales of space heating units - Electric	34.9	33.8	14.2	9.82	9.65	9.82	9.86
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	11.9	5.59	4.18	4.11	4.04	4.03
Sales of space heating units - Gas (%)	45.1	27.1	5.9	1.18	0.978	0.957	0.954
Sales of water heating units - Electric	0	11.3	59.7	70.6	71.1	71.1	71.1
Heat Pump (%)							
Sales of water heating units - Electric	44.5	51.9	32.1	27.6	27.4	27.4	27.4
Resistance (%)							
Sales of water heating units - Gas Furnace	53.7	35.3	6.65	0.277	0	0	0
(%)							
Sales of water heating units - Other (%)	1.86	1.52	1.52	1.49	1.49	1.5	1.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		542	1,384	2,253	3,409	3,714	3,539
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.043		1.12		5.01		8.11
units)							
Public EV charging plugs - L2 (1000 units)	0.243		26.9		120		195
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC	0.392	2.54	12.7	30.4	38.2	39.7	40
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.81	2.04	1.36	0.439	0.079	0.013	0
Vehicle sales - Light-duty - EV (%)	3.04	12.5	42.3	80.1	96.1	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.3	81	53.1	18.2	3.51	0.597	0
Vehicle sales - Light-duty - hybrid (%)	3.57	3.93	2.92	1.11	0.266	0.056	0
Vehicle sales - Light-duty - hydrogen FC	0.112	0.354	0.224	0.071	0.014	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.113	0.11	0.074	0.026	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen	0.196	1.27	6.33	15.2	19.1	19.9	20
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 30: E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion		0.463	3.64	3.66	3.27	10.3	9.23
\$2018)							
Capital invested - Wind - Base (billion		3.54	8.66	17.5	15.8	25.6	45.4
\$2018)							
Installed renewables - OffshoreWind -	0	0	0	0	0	0	0
Base land use assumptions (MW)							
Installed renewables - OffshoreWind -	0	0	0	0	0	0	0
Constrained land use assumptions (MW)							
Installed renewables - Solar - Base land	210	615	4,170	8,051	11,730	23,975	35,637
use assumptions (MW)							
Installed renewables - Solar -	420	2,602	5,415	12,165	21,255	51,254	81,104
Constrained land use assumptions (MW)							
Installed renewables - Wind - Base land	84.5	2,493	8,997	23,141	36,480	59,292	102,194
use assumptions (MW)							
Installed renewables - Wind - Constrained	1,082	11,547	29,449	76,798	115,447	120,835	209,188
land use assumptions (MW)							

Table 31: E+RE+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	409	1,067	6,857	13,206	19,204	39,180	58,106
Solar - Constrained land use assumptions	818	4,380	8,972	20,009	34,879	83,626	131,845
(GWh)							
Wind - Base land use assumptions (GWh)	315	8,421	29,861	76,570	117,863	186,498	305,189
Wind - Constrained land use assumptions	3,977	40,471	100,043	243,924	347,631	365,116	642,486
(GWh)							

Table 32: E+RE+ scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-243
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Aggressive							-10,076
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-64.8
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-10,383
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-243
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							
Carbon sink potential - Moderate							-5,130
deployment - Cropland measures (1000							-,
tCO2e/y)							
Carbon sink potential - Moderate							-32.4
deployment - Permanent conservation							0
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate		+	+				-5,405
deployment - Total (1000 tC02e/y)							0,400
Land impacted for carbon sink -		+	+				96.4
Aggressive deployment - Corn-ethanol to							70.4
energy grasses (1000 hectares)							
Land impacted for carbon sink -		+	+				2,955
Aggressive deployment - Cropland							2,700
measures (1000 hectares)							
Land impacted for carbon sink -		+					118
Aggressive deployment - Permanent							110
conservation cover (1000 hectares)							
Land impacted for carbon sink -							3,170
Aggressive deployment - Total (1000							3,170
hectares) Land impacted for carbon sink - Moderate							96.4
							90.4
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							1,507
Land impacted for carbon sink - Moderate							1,507
deployment - Cropland measures (1000							
hectares)							500
Land impacted for carbon sink - Moderate							58.9
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,662
deployment - Total (1000 hectares)							

Table 33: E+RE+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-356
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-46,154
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,334
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-9,227
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-3,044
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-13,825
retention of HWP (1000 tCO2e/y)							

Table 33: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase							-1,120
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,077
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-11,526
Carbon sink potential - High - Restore productivity (1000 tC02e/y)							-4,644
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-178
Carbon sink potential - Low - All (not							-13,471
counting overlap) (1000 tCO2e/y) Carbon sink potential - Low - Avoid							-222
deforestation (1000 tCO2e/y) Carbon sink potential - Low - Extend							-3,544
rotation length (1000 tCO2e/y) Carbon sink potential - Low - Improve							-1,549
plantations (1000 tCO2e/y)  Carbon sink potential - Low - Increase							-4,608
retention of HWP (1000 tC02e/y) Carbon sink potential - Low - Increase							-392
trees outside forests (1000 tC02e/y) Carbon sink potential - Low - Reforest							-538
cropland (1000 tCO2e/y)  Carbon sink potential - Low - Reforest							-873
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,565
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-267
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-29,786
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-778
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,386
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-2,270
Carbon sink potential - Mid - Increase retention of HWP (1000 tC02e/y)							-9,217
Carbon sink potential - Mid - Increase trees outside forests (1000 tC02e/y)							-756
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-807
Carbon sink potential - Mid - Reforest							-6,200
pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore							-3,105
productivity (1000 tC02e/y) Land impacted for carbon sink potential -							58.3
High - Accelerate regeneration (1000 hectares)							
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years)							181
(1000 hectares)							4,705
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,705
Land impacted for carbon sink potential - High - Improve plantations (1000							1,121
hectares)							

Table 33: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase retention of HWP (1000							0
hectares)							
Land impacted for carbon sink potential -							106
High - Increase trees outside forests							
(1000 hectares)							71.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							71.2
Land impacted for carbon sink potential -							327
High - Reforest pasture (1000 hectares)							321
Land impacted for carbon sink potential -							1,539
High - Restore productivity (1000							.,007
hectares)							
Land impacted for carbon sink potential -							8,110
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							29.1
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							170
Low - Avoid deforestation (over 30 years)							
(1000 hectares)  Land impacted for carbon sink potential -							1.000
Low - Extend rotation length (1000							1,803
hectares)							
Land impacted for carbon sink potential -							561
Low - Improve plantations (1000							301
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							56
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							35.6
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							56.8
Low - Reforest pasture (1000 hectares)							001
Land impacted for carbon sink potential - Low - Restore productivity (1000							931
hectares)							
Land impacted for carbon sink potential -							3,642
Low - Total impacted (over 30 years)							3,042
(1000 hectares)							
Land impacted for carbon sink potential -							43.7
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							175
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,254
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							844
Mid - Improve plantations (1000 hectares)							
Land impacted for carbon sink potential -							0
Mid - Increase retention of HWP (1000							
hectares)							81.2
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000							01.2
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Table 33: <i>E+RE+</i>	scenario -	DTII AR 6.	I and sinks -	Forests	(continued)
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Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							53.4
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							410
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,876
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,737
Mid - Total impacted (over 30 years) (1000							
hectares)							

#### Table 34: E+RE+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		319	0.217	0.206	0.16	0.104	0.004
Coal (million 2019\$)							
Monetary damages from air pollution -		104	59.7	24.6	17.2	5.17	2.89
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		404	374	283	163	74.8	30.8
Transportation (million 2019\$)							
Premature deaths from air pollution -		36	0.024	0.023	0.018	0.012	0
Coal (deaths)							
Premature deaths from air pollution -		11.7	6.74	2.78	1.95	0.583	0.326
Natural Gas (deaths)							
Premature deaths from air pollution -		45.5	42.1	31.8	18.3	8.42	3.46
Transportation (deaths)							

## Table 35: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		10,539	12,307				
Sales of cooking units - Electric Resistance (%)	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Sales of space heating units - Electric Heat Pump (%)	2.92	27.3	77.1	91.1	92.3	92.3	92.3
Sales of space heating units - Electric Resistance (%)	2.74	4.44	4.73	6.05	6.35	6.37	6.39
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	94.3	68.3	18.2	2.83	1.38	1.34	1.33
Sales of water heating units - Electric Heat Pump (%)	0.08	10.7	56.3	66.5	66.9	66.9	66.9
Sales of water heating units - Electric Resistance (%)	2.31	8.07	26.9	31.1	31.3	31.3	31.3
Sales of water heating units - Gas Furnace (%)	96.5	79.4	15	0.632	0	0	0
Sales of water heating units - Other (%)	1.07	1.78	1.78	1.78	1.79	1.79	1.8

#### Table 36: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.42	2.48	3.87	4.09	4.01	4.2
Cumulative 5-yr (billion \$2018)							

## Table 37: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	90	90.4	87	81.6	77.4	76.4	78.1

Table 37: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	236	242	246	246	250	250	255
Final energy use - Residential (PJ)	123	117	108	95.6	85.1	78.9	76.1
Final energy use - Transportation (PJ)	324	303	265	220	179	155	146

Table 38: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		2.31	2.82				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	52.7	62.8	93.6	99.7	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	47.3	37.2	6.37	0.321	0	0	0
Sales of space heating units - Electric	11.9	27.2	74.3	84.8	85.3	85.2	85.2
Heat Pump (%)							
Sales of space heating units - Electric	34.9	33.8	14.2	9.82	9.65	9.82	9.86
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	11.9	5.59	4.18	4.11	4.04	4.03
Sales of space heating units - Gas (%)	45.1	27.1	5.9	1.18	0.978	0.957	0.954
Sales of water heating units - Electric	0	11.3	59.7	70.6	71.1	71.1	71.1
Heat Pump (%)							
Sales of water heating units - Electric	44.5	51.9	32.1	27.6	27.4	27.4	27.4
Resistance (%)							
Sales of water heating units - Gas Furnace	53.7	35.3	6.65	0.277	0	0	0
(%)							
Sales of water heating units - Other (%)	1.86	1.52	1.52	1.49	1.49	1.5	1.5

Table 39: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation

2020	2025	2030	2035	2040	2045	2050
	542	1,384	2,253	3,409	3,714	3,539
0.043		1.12		5.01		8.11
0.243		26.9		120		195
97.2	92.1	67	23.3	4.22	0.628	0
0.588	3.81	19	45.6	57.4	59.6	60
0.227	0.227	0.176	0.066	0.013	0.002	0
0.082	0.09	0.077	0.031	0.007	0.001	0
0.392	2.54	12.7	30.4	38.2	39.7	40
1.5	1.23	1.07	0.568	0.163	0.038	0
1.81	2.04	1.36	0.439	0.079	0.013	0
3.04	12.5	42.3	80.1	96.1	99.3	100
91.3	81	53.1	18.2	3.51	0.597	0
3.57	3.93	2.92	1.11	0.266	0.056	0
0.112	0.354	0.224	0.071	0.014	0.002	0
0.113	0.11	0.074	0.026	0.005	0.001	0
64.7	59.7	42.3	14.4	2.59	0.384	0
0.784	5.07	25.3	60.8	76.5	79.5	80
33.7	33.3	25.5	9.32	1.77	0.277	0
0.363	0.402	0.341	0.14	0.03	0.005	0
0.196	1.27	6.33	15.2	19.1	19.9	20
0.253	0.255	0.205	0.083	0.019	0.004	0
	0.243 97.2 0.588 0.227 0.082 0.392 1.5 1.81 3.04 91.3 3.57 0.112 0.113 64.7 0.784 33.7 0.363 0.196	0.043       0.243       97.2     92.1       0.588     3.81       0.227     0.227       0.082     0.09       0.392     2.54       1.5     1.23       1.81     2.04       3.04     12.5       91.3     81       3.57     3.93       0.112     0.354       0.113     0.11       64.7     59.7       0.784     5.07       33.7     33.3       0.363     0.402       0.196     1.27	542         1,384           0.043         1.12           0.243         26.9           97.2         92.1         67           0.588         3.81         19           0.227         0.227         0.176           0.082         0.09         0.077           0.392         2.54         12.7           1.5         1.23         1.07           1.81         2.04         1.36           3.04         12.5         42.3           91.3         81         53.1           3.57         3.93         2.92           0.112         0.354         0.224           0.113         0.11         0.074           64.7         59.7         42.3           0.784         5.07         25.3           33.7         33.3         25.5           0.363         0.402         0.341           0.196         1.27         6.33	542         1,384         2,253           0.043         1.12           0.243         26.9           97.2         92.1         67         23.3           0.588         3.81         19         45.6           0.227         0.227         0.176         0.066           0.082         0.09         0.077         0.031           0.392         2.54         12.7         30.4           1.5         1.23         1.07         0.568           1.81         2.04         1.36         0.439           3.04         12.5         42.3         80.1           91.3         81         53.1         18.2           3.57         3.93         2.92         1.11           0.112         0.354         0.224         0.071           0.113         0.11         0.074         0.026           64.7         59.7         42.3         14.4           0.784         5.07         25.3         60.8           33.7         33.3         25.5         9.32           0.363         0.402         0.341         0.14           0.196         1.27         6.33         15.2     <	542         1,384         2,253         3,409           0.043         1.12         5.01           0.243         26.9         120           97.2         92.1         67         23.3         4.22           0.588         3.81         19         45.6         57.4           0.227         0.227         0.176         0.066         0.013           0.082         0.09         0.077         0.031         0.007           0.392         2.54         12.7         30.4         38.2           1.5         1.23         1.07         0.568         0.163           1.81         2.04         1.36         0.439         0.079           3.04         12.5         42.3         80.1         96.1           91.3         81         53.1         18.2         3.51           3.57         3.93         2.92         1.11         0.266           0.112         0.354         0.224         0.071         0.014           0.113         0.11         0.074         0.026         0.005           64.7         59.7         42.3         14.4         2.59           0.784         5.07         25.	542         1,384         2,253         3,409         3,714           0.043         1.12         5.01         5.01           0.243         26.9         120           97.2         92.1         67         23.3         4.22         0.628           0.588         3.81         19         45.6         57.4         59.6           0.227         0.227         0.176         0.066         0.013         0.002           0.082         0.09         0.077         0.031         0.007         0.001           0.392         2.54         12.7         30.4         38.2         39.7           1.5         1.23         1.07         0.568         0.163         0.038           1.81         2.04         1.36         0.439         0.079         0.013           3.04         12.5         42.3         80.1         96.1         99.3           91.3         81         53.1         18.2         3.51         0.597           3.57         3.93         2.92         1.11         0.266         0.056           0.112         0.354         0.224         0.071         0.014         0.002           0.13

Table 40: E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)		0.463	1.85	2	1.93	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		1.81	2.13	1.76	3.38	2.64	0
Capital invested - Wind - Base (billion \$2018)		2.7	1.94	0.055	4.45	5.63	10.7
Capital invested - Wind - Constrained (billion \$2018)		4.74	4.41	0.402	6.29	6.57	19.3
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Solar - Base land use assumptions (MW)	210	615	2,426	4,552	6,724	6,724	6,724
Installed renewables - Solar - Constrained land use assumptions (MW)	210	1,796	3,878	5,745	9,548	12,703	12,703
Installed renewables - Wind - Base land use assumptions (MW)	0.1	1,833	3,290	3,335	7,100	12,120	22,237
Installed renewables - Wind - Constrained land use assumptions (MW)	454	3,673	6,982	7,306	12,631	18,491	36,708

Table 41: E+RE- scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	0	0	0	0	0	0
assumptions (GWh)							
OffshoreWind - Constrained land use	0	0	0	0	0	0	0
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	409	1,067	4,016	7,492	11,030	11,030	11,030
Solar - Constrained land use assumptions	409	2,985	6,383	9,427	15,643	20,795	20,795
(GWh)							
Wind - Base land use assumptions (GWh)	0.381	6,347	11,018	11,183	23,559	40,418	73,548
Wind - Constrained land use assumptions	1,673	13,018	24,317	25,503	43,224	61,883	116,904
(GWh)							

Table 42: E+RE- scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-243
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-10,076
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-64.8
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-10,383
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							-243
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-5,130
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-32.4
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-5,405
deployment - Total (1000 tCO2e/y)							

Table 42: E+RE- scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink -							96.4
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							2,955
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							118
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							3,170
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							96.4
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,507
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							58.9
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							1,662
deployment - Total (1000 hectares)							

Table 43: E+RE- scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-356
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-46,154
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,334
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-9,227
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-3,044
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-13,825
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,120
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,077
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-11,526
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-4,644
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-178
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-13,471
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-222
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,544
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-1,549
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-4,608
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-392
trees outside forests (1000 tC02e/y)							

Table 43: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	205
Carbon sink potential - Low - Reforest							-53
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-87
pasture (1000 tC02e/y)							4.5.4
Carbon sink potential - Low - Restore							-1,56
productivity (1000 tC02e/y)							0.4
Carbon sink potential - Mid - Accelerate							-26
regeneration (1000 tCO2e/y)							0070
Carbon sink potential - Mid - All (not							-29,78
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-77
deforestation (1000 tC02e/y)							
Carbon sink potential - Mid - Extend							-6,38
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-2,27
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-9,21
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-75
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-80
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-6,20
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-3,10
productivity (1000 tCO2e/y)							
and impacted for carbon sink potential -							58
High - Accelerate regeneration (1000							
nectares)							
Land impacted for carbon sink potential -							18
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,70
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,12
High - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
nectares)							
Land impacted for carbon sink potential -							10
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							71
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							32
High - Reforest pasture (1000 hectares)							0.
Land impacted for carbon sink potential -							1,53
High - Restore productivity (1000							.,00
nectares)							
and impacted for carbon sink potential -							8,11
High - Total impacted (over 30 years)							0,11
1000 hectares)							
and impacted for carbon sink potential -							29
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000							29
nectares)							
•							17
Land impacted for carbon sink potential -							17
Low - Avoid deforestation (over 30 years)			[				

Table 43: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							1,803
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							561
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 -							56
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							35.6
Low - Reforest cropland (1000 hectares)							00.0
Land impacted for carbon sink potential -							56.8
Low - Reforest pasture (1000 hectares)							50.0
Land impacted for carbon sink potential -							931
Low - Restore productivity (1000							731
, , , ,							
hectares)							0.//0
Land impacted for carbon sink potential -							3,642
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							43.7
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							175
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,254
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							844
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 -							81.2
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							53.4
Mid - Reforest cropland (1000 hectares)							00. 1
Land impacted for carbon sink potential -							410
Mid - Reforest pasture (1000 hectares)							710
Land impacted for carbon sink potential -							1,876
Mid - Restore productivity (1000							1,010
hectares)							/ 707
Land impacted for carbon sink potential -							6,737
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 44: E+RE- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		319	0.217	0.206	0.16	0.104	0.004
Coal (million 2019\$)							
Monetary damages from air pollution -		117	64.9	68	54.8	18.6	5.95
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		404	374	283	163	74.8	30.8
Transportation (million 2019\$)							
Premature deaths from air pollution -		36	0.024	0.023	0.018	0.012	0
Coal (deaths)							

#### Table 44: E+RE- scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		13.2	7.33	7.68	6.19	2.1	0.672
Natural Gas (deaths)							
Premature deaths from air pollution -		45.5	42.1	31.8	18.3	8.42	3.46
Transportation (deaths)							

## Table 45: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

- / 1						
2020	2025	2030	2035	2040	2045	2050
	10,527	12,223				
30.1	34.2	39	52	70.1	81.2	85
69.9	65.8	61	48	29.9	18.8	15
2.92	17.8	23.5	40	65.6	83.3	89.8
2.74	4.44	4.48	4.65	5.07	5.74	6.19
0	0	0	0	0	0	0
94.3	77.8	72	55.4	29.3	11	3.97
0.08	1.96	7.15	22.1	45	59.9	65.1
2.31	4.44	6.56	12.7	22.2	28.4	30.5
96.5	91.8	84.5	63.4	31	9.91	2.58
1.07	1.78	1.78	1.78	1.79	1.79	1.8
	2020 30.1 69.9 2.92 2.74 0 94.3 0.08 2.31 96.5	10,527 30.1 34.2 69.9 65.8 2.92 17.8 2.74 4.44 0 0 0 94.3 77.8 0.08 1.96 2.31 4.44 96.5 91.8	2020         2025         2030           10,527         12,223           30.1         34.2         39           69.9         65.8         61           2.92         17.8         23.5           2.74         4.44         4.48           0         0         0           94.3         77.8         72           0.08         1.96         7.15           2.31         4.44         6.56           96.5         91.8         84.5	2020         2025         2030         2035           10,527         12,223         2035           30.1         34.2         39         52           69.9         65.8         61         48           2.92         17.8         23.5         40           2.74         4.44         4.48         4.65           0         0         0         0           94.3         77.8         72         55.4           0.08         1.96         7.15         22.1           2.31         4.44         6.56         12.7           96.5         91.8         84.5         63.4	2020         2025         2030         2035         2040           10,527         12,223         2030         2035         2040           30.1         34.2         39         52         70.1           69.9         65.8         61         48         29.9           2.92         17.8         23.5         40         65.6           2.74         4.44         4.48         4.65         5.07           0         0         0         0         0           94.3         77.8         72         55.4         29.3           0.08         1.96         7.15         22.1         45           2.31         4.44         6.56         12.7         22.2           96.5         91.8         84.5         63.4         31	2020         2025         2030         2035         2040         2045           10,527         12,223         2035         2040         2045           30.1         34.2         39         52         70.1         81.2           69.9         65.8         61         48         29.9         18.8           2.92         17.8         23.5         40         65.6         83.3           2.74         4.44         4.48         4.65         5.07         5.74           0         0         0         0         0         0           94.3         77.8         72         55.4         29.3         11           0.08         1.96         7.15         22.1         45         59.9           2.31         4.44         6.56         12.7         22.2         28.4           96.5         91.8         84.5         63.4         31         9.91

## Table 46: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.1	2.13	2.57	2.64	3.75	3.95
Cumulative 5-yr (billion \$2018)							

#### Table 47: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	90	90.7	90.4	89.6	87.6	85.4	84.4
Final energy use - Industry (PJ)	236	243	246	249	254	253	258
Final energy use - Residential (PJ)	123	118	114	110	103	94.4	86.6
Final energy use - Transportation (PJ)	324	305	276	255	238	219	197

#### Table 48: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		2.28	2.67				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	52.5	53.8	58.1	69.6	85.5	95.3	98.7
Resistance (%)							
Sales of cooking units - Gas (%)	47.5	46.2	41.9	30.4	14.5	4.68	1.26
Sales of space heating units - Electric	11.9	18.1	23.5	39	62.6	78	83.3
Heat Pump (%)							
Sales of space heating units - Electric	34.9	37.6	35.2	28.7	19	12.7	10.5
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	13.1	12.5	10.3	7.08	5.03	4.32
Sales of space heating units - Gas (%)	45.1	31.2	28.8	22	11.3	4.24	1.82
Sales of water heating units - Electric	0	1.94	7.45	23.3	47.7	63.6	69.1
Heat Pump (%)							
Sales of water heating units - Electric	44.5	55.7	53.5	47.1	37	30.5	28.2
Resistance (%)							

## Table 48: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)

	-	-		-			
Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	53.7	40.9	37.5	28.1	13.8	4.37	1.13
Sales of water heating units - Other (%)	1.86	1.52	1.52	1.51	1.52	1.5	1.5

#### Table 49: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		0	86.7	184	621	1,961	2,854
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.043		0.334		1.85		5.2
units)							
Public EV charging plugs - L2 (1000 units)	0.243		8.03		44.4		125
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC	0.332	0.969	2.74	7.17	15.7	26.3	34
(%)							
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.82	2.19	2.11	1.69	1.1	0.572	0.244
Vehicle sales - Light-duty - EV (%)	1.58	4.01	10.5	23.6	45.9	70.4	86.9
Vehicle sales - Light-duty - gasoline (%)	92.7	88.7	81.8	69.5	49	26.6	11.7
Vehicle sales - Light-duty - hybrid (%)	3.69	4.55	5.17	4.83	3.75	2.29	1.14
Vehicle sales - Light-duty - hydrogen FC	0.113	0.388	0.341	0.266	0.193	0.109	0.05
(%)							
Vehicle sales - Light-duty - other (%)	0.114	0.118	0.109	0.096	0.07	0.039	0.018
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen	0.166	0.485	1.37	3.58	7.86	13.2	17
FC (%)							
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

#### Table 50: E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant	0	0	0	0	0	0	0
(billion \$2018)							
Capital invested - Biomass w/ccu allam	0	0	0	0	0	0	0.063
power plant (billion \$2018)							
Capital invested - Biomass w/ccu power	0	0	0	13.1	6.33	8.69	5.05
plant (billion \$2018)							

#### Table 51: E-B+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	62.9
Biomass w/ccu power plant (GWh)	0	0	0	14,741	21,844	31,603	37,270

#### Table 52: E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)		0	0	886	1,910	2,497	2,840
Conversion capital investment -		0	0	12,047	12,821	7,975	4,709
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	1

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Table 52: E-B+ scenario -	PILLAR 3: Clean fuels -	Bioeneray Icontinued I

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Beccs hydrogen	0	0	0	0	8	8	8
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu	0	0	0	12	18	26	30
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

#### Table 53: E-B+ scenario - PILLAR 4: CCUS - CO2 capture

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	14.6	30.6	40.3	45.8
Annual - BECCS (MMT)		0	0	14.6	30.6	40.3	45.8
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	14.6	45.2	85.5	131
Cumulative - BECCS (MMT)		0	0	14.6	45.2	85.5	131
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0

## Table 54: E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	39.8	150	721	1,074	1,074
Cumulative investment - All (million \$2018)		0	284	887	1,728	2,267	2,443
Cumulative investment - Spur (million \$2018)		0	0	318	874	1,414	1,589
Cumulative investment - Trunk (million \$2018)		0	284	569	853	853	853
Spur (km)		0	0	69.9	602	955	955
Trunk (km)		0	39.8	79.6	119	119	119

## Table 55: E-B+ scenario - PILLAR 4: CCUS - CO2 storage

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	3.69	15	30.9	41.4	45.1
Injection wells (wells)		0	4	14	26	42	54
Resource characterization, appraisal, permitting costs (million \$2020)		14.2	350	562	562	562	562
Wells and facilities construction costs (million \$2020)		0	111	432	770	1,288	1,600

#### Table 56: E-B+ scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-923
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-9,220
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							

Table 56: E-B+ scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Aggressive							-49.6
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-10,192
deployment - Total (1000 tC02e/y)							
Carbon sink potential - Moderate							-923
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-4,678
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy							
crops (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Pasture to energy crops							
(1000 tC02e/y)							
Carbon sink potential - Moderate							-24.8
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-5,626
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							367
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							6,684
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							143
Aggressive deployment - Cropland to							
woody energy crops (1000 hectares)							
Land impacted for carbon sink -							440
Aggressive deployment - Pasture to							
energy crops (1000 hectares)							
Land impacted for carbon sink -							90.3
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							7,724
Aggressive deployment - Total (1000							•
hectares)							
Land impacted for carbon sink - Moderate							367
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							1,376
deployment - Cropland measures (1000							1,010
hectares)							
Land impacted for carbon sink - Moderate							143
deployment - Cropland to woody energy							1-10
crops (1000 hectares)							
Land impacted for carbon sink - Moderate							440
deployment - Pasture to energy crops							440
(1000 hectares)							
7							45.1
Land impacted for carbon sink - Moderate							45.1
deployment - Permanent conservation							
cover (1000 hectares)							0.074
Land impacted for carbon sink - Moderate							2,371
deployment - Total (1000 hectares)							

Table 57: E-B+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-356
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-46,154
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,334
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-9,227
rotation length (1000 tC02e/y)							
Carbon sink potential - High - Improve							-3,044
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-13,825
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-1,120
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-1,077
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-11,526
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-4,644
productivity (1000 tC02e/y)							
Carbon sink potential - Low - Accelerate							-178
regeneration (1000 tC02e/y)							
Carbon sink potential - Low - All (not							-13,471
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-222
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-3,544
rotation length (1000 tC02e/y)							15/0
Carbon sink potential - Low - Improve							-1,549
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-4,608
retention of HWP (1000 tC02e/y)							
Carbon sink potential - Low - Increase							-392
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							-538
cropland (1000 tC02e/y)							070
Carbon sink potential - Low - Reforest							-873
pasture (1000 tC02e/y)							15/5
Carbon sink potential - Low - Restore							-1,565
productivity (1000 tC02e/y)							0/7
Carbon sink potential - Mid - Accelerate							-267
regeneration (1000 tC02e/y)							00707
Carbon sink potential - Mid - All (not							-29,786
counting overlap) (1000 tC02e/y)  Carbon sink potential - Mid - Avoid							-778
							-110
deforestation (1000 tC02e/y) Carbon sink potential - Mid - Extend							( 20 (
							-6,386
rotation length (1000 tC02e/y)  Carbon sink potential - Mid - Improve							-2,270
plantations (1000 tCO2e/y)							-2,210
Carbon sink potential - Mid - Increase							-9,217
retention of HWP (1000 tCO2e/y)							-9,217
Carbon sink potential - Mid - Increase							-756
trees outside forests (1000 tCO2e/y)							-120
Carbon sink potential - Mid - Reforest							-807
·							-807
cropland (1000 tCO2e/y)  Carbon sink potential - Mid - Reforest						+	-6,200
pasture (1000 tCO2e/y)							-0,200
Carbon sink potential - Mid - Restore							-3,105
productivity (1000 tC02e/y)							-3,103
pi oddotivity (1000 to028/9)							

Table 57: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

Table 57: E-B+ scenario - PILLAR 6: Land s		•					
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							58.3
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							181
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							4,705
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1,121
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 -							106
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							71.2
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							327
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,539
High - Restore productivity (1000							.,
hectares)							
Land impacted for carbon sink potential -							8,110
High - Total impacted (over 30 years)							-,
(1000 hectares)							
Land impacted for carbon sink potential -						+	29.1
Low - Accelerate regeneration (1000							27.1
hectares)							
Land impacted for carbon sink potential -							170
Low - Avoid deforestation (over 30 years)							110
(1000 hectares)							
Land impacted for carbon sink potential -							1,803
Low - Extend rotation length (1000							1,003
hectares)							
Land impacted for carbon sink potential -							561
							301
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 -							56
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							35.6
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							56.8
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							931
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							3,642
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							43.7
Mid - Accelerate regeneration (1000							
hectares)							

<u>Table 57: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)</u>

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							175
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							3,254
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							844
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 -							81.2
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							53.4
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							410
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,876
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							6,737
Mid - Total impacted (over 30 years) (1000							
hectares)							

#### Table 58: E-B+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		319	0.217	0.206	0.16	0.104	0.004
Coal (million 2019\$)							
Monetary damages from air pollution -		110	52.6	30.1	21.1	8.66	4.65
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		410	410	397	357	283	194
Transportation (million 2019\$)							
Premature deaths from air pollution -		36	0.024	0.023	0.018	0.012	0
Coal (deaths)							
Premature deaths from air pollution -		12.4	5.93	3.4	2.39	0.977	0.525
Natural Gas (deaths)							
Premature deaths from air pollution -		46.1	46.1	44.7	40.1	31.8	21.8
Transportation (deaths)							

# Table 59: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		10,305	10,816				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	30.1	32.3	32.3	32.3	32.3	32.3	32.3
Resistance (%)							
Sales of cooking units - Gas (%)	69.9	67.7	67.7	67.7	67.7	67.7	67.7
Sales of space heating units - Electric	2.92	28.4	67	78.3	79.4	79.5	79.5
Heat Pump (%)							
Sales of space heating units - Electric	2.74	6.12	11.6	15.8	18.7	19.1	19.2
Resistance (%)							
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace	94.3	65.5	21.4	5.92	1.92	1.38	1.33
(%)							
Sales of water heating units - Electric	0.08	0.13	0.128	0.13	0.13	0.128	0.128
Heat Pump (%)							
Sales of water heating units - Electric	2.31	3.68	3.66	3.67	3.69	3.68	3.7
Resistance (%)							

## Table 59: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	96.5	94.4	94.4	94.4	94.4	94.4	94.4
Sales of water heating units - Other (%)	1.07	1.78	1.78	1.78	1.79	1.79	1.8

#### Table 60: REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.28	2.33	3.46	3.64	3.57	3.72
Cumulative 5-yr (billion \$2018)							

### Table 61: REF scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	90	91.9	92.9	93.6	95.4	100	108
Final energy use - Industry (PJ)	236	248	257	261	270	278	287
Final energy use - Residential (PJ)	123	117	115	115	116	119	121
Final energy use - Transportation (PJ)	324	305	279	263	263	271	282

#### Table 62: REF scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		2.25	2.32				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	52.1	52.1	52.1	52.1	52.1	52.1	52.1
Resistance (%)							
Sales of cooking units - Gas (%)	47.9	47.9	47.9	47.9	47.9	47.9	47.9
Sales of space heating units - Electric	8.95	36.6	37.8	39.7	41.3	43.3	46.3
Heat Pump (%)							
Sales of space heating units - Electric	36.2	30.2	29.6	28.9	27.9	26.1	23
Resistance (%)							
Sales of space heating units - Fossil (%)	8.35	8.61	8.72	8.67	8.53	8.52	8.55
Sales of space heating units - Gas (%)	46.5	24.5	23.8	22.8	22.3	22.1	22.2
Sales of water heating units - Electric	0	0	0	0	0	0	0
Heat Pump (%)							
Sales of water heating units - Electric	44.5	56.5	56.6	56.6	56.5	56.5	56.5
Resistance (%)							
Sales of water heating units - Gas Furnace	53.7	42	41.9	41.8	42	42	42
(%)							
Sales of water heating units - Other (%)	1.86	1.52	1.52	1.52	1.53	1.53	1.53

#### Table 63: REF scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC	0.119	0.138	0.16	0.186	0.216	0.25	0.29
(%)							
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.82	2.19	2.23	2.07	1.88	1.75	1.67
Vehicle sales - Light-duty - EV (%)	2.7	4.49	5.15	6.27	7.7	9.08	10.2
Vehicle sales - Light-duty - gasoline (%)	91.7	88.3	86.6	85.1	83.3	81.3	79.6
Vehicle sales - Light-duty - hybrid (%)	3.59	4.48	5.51	6.09	6.72	7.41	8.05
Vehicle sales - Light-duty - hydrogen FC	0.112	0.386	0.361	0.325	0.325	0.327	0.339
(%)							
Vehicle sales - Light-duty - other (%)	0.114	0.118	0.115	0.116	0.116	0.115	0.118
Vehicle sales - Medium-duty - diesel (%)	65.2	63.5	61.6	59.6	58	56.5	55.2
Vehicle sales - Medium-duty - EV (%)	0.027	0.105	0.329	0.671	0.895	0.973	0.993
Vehicle sales - Medium-duty - gasoline (%)	34	35.5	37	38.5	39.7	40.8	41.7

Table 63: REF scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen FC (%)	0.175	0.208	0.242	0.285	0.339	0.409	0.487
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

Table 64: REF scenario - PILLAR 6: Land sinks - Forests

Item Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate	2020	2025	2030	2035	2040	2045	-356
regeneration (1000 tCO2e/y)							-330
Carbon sink potential - High - All (not							-46,154
counting overlap) (1000 tC02e/y)							-40,134
Carbon sink potential - High - Avoid							-1,334
deforestation (1000 tCO2e/y)							-1,334
Carbon sink potential - High - Extend							-9,227
rotation length (1000 tCO2e/y)							-9,221
Carbon sink potential - High - Improve							-3,044
plantations (1000 tCO2e/y)							-3,044
Carbon sink potential - High - Increase							-13,825
retention of HWP (1000 tCO2e/y)							-13,623
Carbon sink potential - High - Increase							-1,120
trees outside forests (1000 tC02e/y)							-1,120
						<del></del>	-1,077
Carbon sink potential - High - Reforest							-1,077
cropland (1000 tC02e/y)							11 50/
Carbon sink potential - High - Reforest							-11,526
pasture (1000 tC02e/y)						$\longrightarrow$	1 / 1 1
Carbon sink potential - High - Restore							-4,644
productivity (1000 tC02e/y)							170
Carbon sink potential - Low - Accelerate							-178
regeneration (1000 tC02e/y)							10 / 71
Carbon sink potential - Low - All (not							-13,471
counting overlap) (1000 tC02e/y)							000
Carbon sink potential - Low - Avoid							-222
deforestation (1000 tC02e/y)							0.577
Carbon sink potential - Low - Extend							-3,544
rotation length (1000 tC02e/y)							1510
Carbon sink potential - Low - Improve							-1,549
plantations (1000 tC02e/y)							/ / 0.0
Carbon sink potential - Low - Increase							-4,608
retention of HWP (1000 tC02e/y)						$\longrightarrow$	000
Carbon sink potential - Low - Increase							-392
trees outside forests (1000 tC02e/y)						$\longrightarrow$	-538
Carbon sink potential - Low - Reforest							-538
cropland (1000 tC02e/y)						$\longrightarrow$	070
Carbon sink potential - Low - Reforest							-873
pasture (1000 tC02e/y)						$\longrightarrow$	1 5 / 5
Carbon sink potential - Low - Restore							-1,565
productivity (1000 tC02e/y)							-267
Carbon sink potential - Mid - Accelerate regeneration (1000 tC02e/y)							-267
Carbon sink potential - Mid - All (not							-29,786
counting overlap) (1000 tC02e/y)							-29,100
							770
Carbon sink potential - Mid - Avoid							-778
deforestation (1000 tC02e/y)  Carbon sink potential - Mid - Extend							/ 20/
· ·							-6,386
rotation length (1000 tC02e/y)							0.070
Carbon sink potential - Mid - Improve							-2,270
plantations (1000 tC02e/y)							0.017
Carbon sink potential - Mid - Increase							-9,217
retention of HWP (1000 tCO2e/y)							

Table 64: REF scenario - PILLAR 6: Land sinks - Forests (continued)

Item  Copper sink notantial, Mid. Increase	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase							-756
trees outside forests (1000 tC02e/y)							007
Carbon sink potential - Mid - Reforest							-807
cropland (1000 tCO2e/y)							/ 000
Carbon sink potential - Mid - Reforest							-6,200
pasture (1000 tCO2e/y)							0.105
Carbon sink potential - Mid - Restore							-3,105
productivity (1000 tCO2e/y)  Land impacted for carbon sink potential -							58.3
High - Accelerate regeneration (1000							58.3
,							
hectares)							101
Land impacted for carbon sink potential -							181
High - Avoid deforestation (over 30 years)							
(1000 hectares)							/ 705
Land impacted for carbon sink potential -							4,705
High - Extend rotation length (1000							
hectares)							1.101
Land impacted for carbon sink potential -							1,121
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 -							106
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							71.2
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							327
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							1,539
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							8,110
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							29.1
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							170
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							1,803
Low - Extend rotation length (1000							•
hectares)							
Land impacted for carbon sink potential -							561
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 -							56
Low - Increase trees outside forests							00
(1000 hectares)							
Land impacted for carbon sink potential -							35.6
Low - Reforest cropland (1000 hectares)							33.0
Land impacted for carbon sink potential -							56.8
Low - Reforest pasture (1000 hectares)							JU.0
Land impacted for carbon sink potential -							931
Low - Restore productivity (1000							731
LOVY - NOSCOLO DI DUUGLIVILY (1000	1	I	[			1	

Table 64: REF scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,642
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							43.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							175
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,254
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							844
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							81.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							53.4
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							410
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,876
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,737

#### Table 65: REF scenario - PILLAR 6: Land sinks - Forests - REF only

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-22.2		-14.6				-11.9
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-3.76		-6.27				-6.6
Business-as-usual carbon sink - Total (Mt CO2e/y)	-26		-20.9				-18.5

#### Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		1,291	810	532	419	377	374
Coal (million 2019\$)							
Monetary damages from air pollution -		122	119	126	95.4	75.3	67.7
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		410	416	424	433	443	453
Transportation (million 2019\$)							
Premature deaths from air pollution -		146	91.5	60.1	47.3	42.6	42.2
Coal (deaths)							
Premature deaths from air pollution -		13.8	13.5	14.2	10.8	8.5	7.64
Natural Gas (deaths)							
Premature deaths from air pollution -		46.2	46.8	47.7	48.7	49.8	51
Transportation (deaths)							