

Net-Zero America - new jersey state report

2021-03-18

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 https://netzeroamerica.prince-ton.edu.
- 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 -		41,628	45,491				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	18.5	33.7	75.3	83.5	83.9	84	84
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Sales of space heating units - Electric	0.831	16.8	53.8	78.3	81.8	82	81.9
Heat Pump (%)							
Sales of space heating units - Electric	2.64	4.45	11.2	16.1	17	17	17.2
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	11.7	2.29	0.1	0	0	0
Sales of space heating units - Gas Furnace	88.4	67.1	32.7	5.5	1.14	0.906	0.899
(%)							
Sales of water heating units - Electric	0.247	7.96	43.7	60.3	62.3	62.4	62.4
Heat Pump (%)							
Sales of water heating units - Electric	1.46	5.37	23	35.5	37.3	37.4	37.4
Resistance (%)							
Sales of water heating units - Gas Furnace	97.6	85.5	33	4.08	0.216	0	0
(%)							
Sales of water heating units - Other (%)	0.649	1.16	0.372	0.184	0.175	0.176	0.176

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.49	3.59	11.3	12.3	10	10.7
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)	306	301	289	269	251	242	241
Final energy use - Industry (PJ)	130	131	133	133	134	135	137
Final energy use - Residential (PJ)	376	351	316	265	217	183	164
Final energy use - Transportation (PJ)	683	640	573	490	414	364	340

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		7.13	8.05				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	33.6	47.7	91.1	99.5	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	66.4	52.3	8.94	0.45	0	0	0
Sales of space heating units - Electric	4.07	17.8	67.1	90.9	93.9	94.1	94
Heat Pump (%)							
Sales of space heating units - Electric	6.87	9.53	5.27	2.94	2.62	2.66	2.75
Resistance (%)							
Sales of space heating units - Fossil (%)	9.77	15	4.87	2.25	2.08	2.05	1.99
Sales of space heating units - Gas (%)	79.3	57.7	22.7	3.87	1.37	1.23	1.23
Sales of water heating units - Electric	0	7.03	39.6	53.9	55.6	55.7	55.7
Heat Pump (%)							
Sales of water heating units - Electric	17.8	33.3	37.6	43.3	44.2	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	57.8	22.4	2.77	0.146	0	0
(%)							
Sales of water heating units - Other (%)	3.14	1.9	0.397	0.064	0.049	0.049	0.05

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		1,151	2,985	4,782	7,266	7,885	7,530
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.341		1.73		7.27		11.7
units)							
Public EV charging plugs - L2 (1000 units)	0.794		41.6		175		281
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 (%)	1.28	1.58	1.15	0.366	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.81	17.9	50.5	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.4	74.9	44.6	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.29	5.17	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC	0.109	0.324	0.182	0.055	0.011	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.018	0.004	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	0.008	0.35	0	0	0.019	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Offshore Wind - Base (billion \$2018)		0.236	0.183	0.208	0.284	41.2	14.5
Capital invested - Offshore Wind - Constrained (billion \$2018)		0.236	0.231	0.226	0.132	34.2	20.6
Capital invested - Solar PV - Base (billion \$2018)		1.39	1.17	0.71	0	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		3.68	0.736	0.911	0	0	0
Capital invested - Wind - Constrained (billion \$2018)		0	0	0.075	0.536	0	0
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	83.2	159	261	425	28,362	39,330
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	83.2	159	261	425	28,362	39,330
Installed renewables - Rooftop PV (MW)	1,929	2,892	3,843	5,079	6,573	8,274	10,225
Installed renewables - Solar - Base land use assumptions (MW)	786	2,001	3,149	3,903	3,903	3,903	3,903
Installed renewables - Solar - Constrained land use assumptions (MW)	42	976	1,583	1,966	1,966	1,966	1,966
Installed renewables - Wind - Base land use assumptions (MW)	9	9	9	9	9	9	9
Installed renewables - Wind - Constrained land use assumptions (MW)	9	9	9	42.8	295	295	295

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	14.6	701	701	701	741	741
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use	0	355	677	1,118	1,823	125,140	175,860
assumptions (GWh)							
OffshoreWind - Constrained land use	0	355	677	1,118	1,823	125,140	175,860
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	1,439	3,311	5,037	6,164	6,164	6,164	6,164
Solar - Constrained land use assumptions	77.8	1,539	2,459	3,029	3,029	3,029	3,029
(GWh)							
Wind - Base land use assumptions (GWh)	30.5	30.5	30.5	30.5	30.5	30.5	30.5
Wind - Constrained land use assumptions	30.5	30.5	30.5	155	939	939	939
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)		1.81	65.2	66.1	66.2	67.3	67.3
Conversion capital investment -		8.36	390	27.3	2.77	22.9	0
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	0
Annual - BECCS (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	0	0
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - 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	107	142	142	142	142
Cumulative investment - All (million \$2018)		0	230	438	438	438	438
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	0
Cumulative investment - Trunk (million \$2018)		0	230	438	438	438	438
Spur (km)		0	0	0	0	0	0
Trunk (km)		0	107	142	142	142	142

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million \$2020)		0	0	0	0	0	0
Wells and facilities construction costs (million \$2020)		0	0	0	0	0	0

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

Table 12: E+ Scenario - PILLAR 6: Land Sink			0000	0005	0040	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tC02e/y)							0/1
Carbon sink potential - Aggressive							-341
deployment - Cropland measures (1000							
tCO2e/y)							0.00
Carbon sink potential - Aggressive							-8.38
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-349
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-178
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-4.19
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-182
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							172
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							15.2
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							188
Aggressive deployment - Total (1000							100
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							U
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							89.9
deployment - Cropland measures (1000							07.7
hectares)							
,							7.62
Land impacted for carbon sink - Moderate							7.62
deployment - Permanent conservation							
cover (1000 hectares)							07/
Land impacted for carbon sink - Moderate							97.6
deployment - Total (1000 hectares)							

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

Carbon sink potential High - Accelerate regeneration (1000 t002e/v) Carbon sink potential - High - All (not counting owerlap) (1000 t002e/v) -3,576 Carbon sink potential - High - Avoid deforestation (1000 t002e/v) Carbon sink potential - High - Avoid deforestation (1000 t002e/v) Carbon sink potential - High - Extend rotation length (1000 t002e/v) Carbon sink potential - High - Improve plantations (1000 t002e/v) Carbon sink potential - High - Improve plantations (1000 t002e/v) Carbon sink potential - High - Improve plantations (1000 t002e/v) Carbon sink potential - High - Improve plantations (1000 t002e/v) Carbon sink potential - High - Improve plantations (1000 t002e/v) Carbon sink potential - High - Improve plantations (1000 t002e/v) Carbon sink potential - High - Reforest crepland (1000 t002e/v) Carbon sink potential - High - Reforest crepland (1000 t002e/v) Carbon sink potential - High - Reforest productivity (1000 t002e/v) Carbon sink potential - High - Restore productivity (1000 t002e/v) Carbon sink potential - Low - Accelerate regeneration (1000 t002e/v) Carbon sink potential - Low - Accelerate regeneration (1000 t002e/v) Carbon sink potential - Low - Accelerate regeneration (1000 t002e/v) Carbon sink potential - Low - Avoid deforestation (1000 t002e/v) Carbon sink potential - Low - Avoid deforestation (1000 t002e/v) Carbon sink potential - Low - Fixth (1000 topic - 1000 topi	Table 13: E+ scenario - PILLAR 6: Land sin	ks - Forests						
regeneration (1000 t002e/n) Carbon sink potential - High - All (not counting overlap) (1000 t002e/n) Carbon sink potential - High - All (not counting overlap) (1000 t002e/n) Carbon sink potential - High - All (not counting overlap) (1000 t002e/n) Carbon sink potential - High - Extend rotation length (1000 t002e/n) Carbon sink potential - High - Improve plantations (1000 t002e/n) Carbon sink potential - High - Improve plantations (1000 t002e/n) Carbon sink potential - High - Increase retention of HWP (1000 t002e/n) Carbon sink potential - High - Increase retention of HWP (1000 t002e/n) Carbon sink potential - High - Reforest coulside forests (1000 t002e/n) Carbon sink potential - High - Reforest coulside forests (1000 t002e/n) Carbon sink potential - High - Reforest pasture (1000 t002e/n) Carbon sink potential - High - Reforest productivity (1000 t002e/n) Carbon sink potential - High - Reforest productivity (1000 t002e/n) Carbon sink potential - Low - Accelerate regeneration (1000 t002e/n) Carbon sink potential - Low - Accelerate regeneration (1000 t002e/n) Carbon sink potential - Low - All finot counting overlap) (1000 t002e/n) Carbon sink potential - Low - All finot counting overlap) (1000 t002e/n) Carbon sink potential - Low - Fatend rotation length (1000 t002e/n) Carbon sink potential - Low - Fatend rotation length (1000 t002e/n) Carbon sink potential - Low - Improve plantations (1000 t002e/n) Carbon sink potential - Low - Increase retention of HWP (1000 t002e/n) Carbon sink potential - Low - Increase retention of HWP (1000 t002e/n) Carbon sink potential - Low - Reforest pasture (1000 t002e/n) Carbon sink potential - Low - Reforest pasture (1000 t002e/n) Carbon sink potential - Low - Reforest productivity (1000 t002e/n) Carbon sink potential - High - All finot productivity (1000 t002e/n) Carbon sink potential - High - Reforest pasture (1000 t0002e/n) Carbon sink potential - High - Febreat potential - High - Febreat productivity (1000 t002e/n) Carbon sink potential - High - Febreat potential - High - Febreat	Item	2020	2025	2030	2035	2040	2045	2050
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Carbon sink potential - Mid - Reforest cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -319								-101
cropland (1000 tC02e/y) Carbon sink potential - Mid - Reforest pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -319								
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pasture (1000 tC02e/y) Carbon sink potential - Mid - Restore -319								
Carbon sink potential - Mid - Restore	Carbon sink potential - Mid - Reforest							-165
Carbon sink potential - Mid - Restore								
								-319
	productivity (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							11.2
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							177
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							494
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.48
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 -							25.5
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares)							 .
Land impacted for carbon sink potential -		+					158
High - Restore productivity (1000							100
hectares)							
Land impacted for carbon sink potential -		+					877
High - Total impacted (over 30 years)							011
(1000 hectares)							
Land impacted for carbon sink potential -		+					5.6
Low - Accelerate regeneration (1000							5.0
hectares)							
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							100
(1000 hectares)							
Land impacted for carbon sink potential -							189
Low - Extend rotation length (1000							107
hectares)							
Land impacted for carbon sink potential -							1.24
							1.24
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							10 /
Land impacted for carbon sink potential -							13.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							4 =4
Land impacted for carbon sink potential -							1.51
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -		T					8.4
Mid - Accelerate regeneration (1000							
hectares)							

Tahla 12. Fx	econario -	DILLAD 6.	Land sinks -	Enrecte	(continued)
Table 15. Et	SCEIIUI 10 -	PILLAK O.	LUIIU SIIIKS -	. คบา ยอเอา	COHUHUEUT

171
342
1.87
0
19.5
0
11
193
747
1.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		596	503	403	303	191	132
Natural gas consumption - Cumulative							12,141
(tcf)							
Natural gas production - Annual (tcf)		0	0	0	0	0	0
Oil consumption - Annual (million bbls)		160	138	108	79.4	57.2	35.6
Oil consumption - Cumulative (million							3,314
bbls)							
Oil production - Annual (million bbls)		0	0	0	0	0	0

Table 15: E+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		975	0.677	0.673	0.627	0.41	0.028
Monetary damages from air pollution - Natural Gas (million 2019\$)		721	538	367	359	245	100
Monetary damages from air pollution - Transportation (million 2019\$)		3,928	3,747	2,908	1,717	789	300
Premature deaths from air pollution - Coal (deaths)		110	0.076	0.076	0.071	0.046	0.003
Premature deaths from air pollution - Natural Gas (deaths)		81.4	60.8	41.4	40.6	27.6	11.3
Premature deaths from air pollution - Transportation (deaths)		442	421	327	193	88.7	33.7

Table 16: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		81.7	243	271	229	187	151
By economic sector - Construction (jobs)		11,359	11,076	13,094	13,576	32,022	34,571
By economic sector - Manufacturing		13,162	24,229	24,490	19,330	24,937	19,631
(jobs)							
By economic sector - Mining (jobs)		3,110	2,210	1,447	893	518	276

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

Table 16: E+ Scending - IMPACTS - Jubs (CC	-						
Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		1,388	1,462	1,835	2,076	3,898	5,731
By economic sector - Pipeline (jobs)		749	664	527	373	246	163
By economic sector - Professional (jobs)		4,624	4,637	5,486	5,831	16,754	20,653
By economic sector - Trade (jobs)		3,826	3,528	3,815	3,934	9,786	12,578
By economic sector - Utilities (jobs)		9,854	9,936	12,948	13,999	35,997	31,142
By education level - All sectors -		15,146	18,317	20,396	19,406	40,441	40,573
Associates degree or some college (jobs) By education level - All sectors -		9,888	11,721	12,678	11,817	24,557	25,102
Bachelors degree (jobs)		9,000	11,721	12,010	11,017	24,551	25,102
By education level - All sectors - Doctoral		296	308	337	331	799	931
degree (jobs)		270	300	331	331	177	731
By education level - All sectors - High		20,577	25,102	27,709	26,009	52,564	51,966
school diploma or less (jobs)		20,011	20,102	21,107	20,007	02,00	0.,700
By education level - All sectors - Masters		2,249	2,536	2,793	2,679	5,983	6,324
or professional degree (jobs)		_,,	_,,,,,	_,. , ,	2,0.7	3,755	0,02 .
By resource sector - Biomass (jobs)		350	670	771	691	681	647
By resource sector - CO2 (jobs)		0	234	209	0	0	0
By resource sector - Coal (jobs)		209	70	0	0	0	0
By resource sector - Grid (jobs)		10,677	12,029	19,548	21,831	69,149	58,759
By resource sector - Natural Gas (jobs)		7,886	6,335	5,401	6,079	4,247	3,788
By resource sector - Nuclear (jobs)		1,833	1,803	1,540	953	360	0.169
By resource sector - Oil (jobs)		7,097	5,643	4,064	2,777	1,868	1,091
By resource sector - Solar (jobs)		20,012	30,166	31,521	25,480	25,447	30,596
By resource sector - Wind (jobs)		90.1	1,033	859	2,432	22,592	30,016
Median wages - Annual - All (\$2019 per		68,976	67,710	69,100	70,944	74,431	75,716
job)							
On-Site or In-Plant Training - Total jobs - 1		7,815	9,291	10,346	9,862	20,695	20,676
to 4 years (jobs)							
On-Site or In-Plant Training - Total jobs - 4		3,020	3,238	3,715	3,720	8,466	8,688
to 10 years (jobs)							
On-Site or In-Plant Training - Total jobs -		7,869	9,562	10,457	9,788	19,941	20,322
None (jobs)					=10	1.100	
On-Site or In-Plant Training - Total jobs -		397	467	532	518	1,128	1,128
Over 10 years (jobs)		00.057	05 / 0/	00.070	07.057	7/ 11/	7/ 000
On-Site or In-Plant Training - Total jobs -		29,054	35,426	38,863	36,354	74,114	74,082
Up to 1 year (jobs) On-the-Job Training - All sectors - 1 to 4		10,014	11,830	13,206	12,638	26,734	26,766
years (jobs)		10,014	11,030	13,200	12,036	20,134	20,100
On-the-Job Training - All sectors - 4 to 10		2,920	3,101	3,600	3,646	8,415	8,669
years (jobs)		2,720	0,101	0,000	0,040	0,410	0,007
On-the-Job Training - All sectors - None		2,620	3,093	3,371	3,165	6,459	6,678
(jobs)		_,	-,	5,511	57.55	5, 121	2,2.2
On-the-Job Training - All sectors - Over 10		512	653	698	632	1,186	1,188
years (jobs)							
On-the-Job Training - All sectors - Up to 1		32,088	39,308	43,038	40,160	81,549	81,595
year (jobs)							
Related work experience - All sectors - 1		17,245	20,578	22,680	21,423	44,534	44,801
to 4 years (jobs)							
Related work experience - All sectors - 4		11,147	13,241	14,621	13,857	29,072	29,285
to 10 years (jobs)			0.000	6.107	0.400	10.000	10.050
Related work experience - All sectors -		6,888	8,228	9,137	8,692	18,002	18,050
None (jobs)		0.007	0.071	/ 105	0.070	7.010	7710
Related work experience - All sectors -		3,094	3,841	4,185	3,872	7,812	7,719
Over 10 years (jobs) Related work experience - All sectors - Up		9,782	12,096	13,290	12,397	24,923	25,041
to 1 year (jobs)		7,102	12,070	13,270	12,371	24,723	20,041
Wage income - All (million \$2019)		3,322	3,926	4,417	4,274	9,256	9,458
vvago moomo - An (million 42017)		0,022	3,720	7,411	7,414	7,230	7,430

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		41,604	45,411				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	18.5	21.6	27.5	43	64.5	77.7	82.3
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	78.4	72.5	57	35.5	22.3	17.7
Sales of space heating units - Electric	0.831	10.8	15	27.7	49.8	69	77.8
Heat Pump (%)							
Sales of space heating units - Electric	2.64	3.4	4.18	6.57	10.9	14.6	16.6
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	13.5	12.9	9.99	5	1.6	0.431
Sales of space heating units - Gas Furnace	88.4	72.3	67.9	55.8	34.4	14.9	5.15
(%)							
Sales of water heating units - Electric	0.247	1.77	5.84	17.8	37.6	53.1	59.7
Heat Pump (%)							
Sales of water heating units - Electric	1.46	2.65	4.65	10.7	21.4	30.9	35.4
Resistance (%)							
Sales of water heating units - Gas Furnace	97.6	94.3	88.2	70.5	40.4	15.7	4.7
(%)							
Sales of water heating units - Other (%)	0.649	1.31	1.29	1.01	0.586	0.311	0.212

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.76	2.76	4.34	4.53	9.51	10.3
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)	306	301	299	297	292	284	276
Final energy use - Industry (PJ)	130	131	133	135	136	137	139
Final energy use - Residential (PJ)	376	353	337	317	287	250	214
Final energy use - Transportation (PJ)	684	645	598	556	522	481	433

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		7.14	8.46				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	33.3	35.1	41.2	57.3	79.6	93.4	98.2
Resistance (%)							
Sales of cooking units - Gas (%)	66.7	64.9	58.8	42.7	20.4	6.57	1.77
Sales of space heating units - Electric	4.07	9.27	14.9	31.5	59.1	80.8	90.2
Heat Pump (%)							
Sales of space heating units - Electric	6.87	10.2	9.71	8.26	5.82	3.82	3.01
Resistance (%)							
Sales of space heating units - Fossil (%)	9.77	16.9	15.8	12.4	7.29	3.83	2.52
Sales of space heating units - Gas (%)	79.3	63.6	59.6	47.8	27.8	11.6	4.3
Sales of water heating units - Electric	0	1.31	5.02	15.9	33.8	47.5	53.3
Heat Pump (%)							
Sales of water heating units - Electric	17.8	32.8	33.2	34.8	38	41.5	43.4
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	63.7	59.7	47.8	27.4	10.7	3.19
(%)							
Sales of water heating units - Other (%)	3.14	2.18	2.01	1.52	0.769	0.279	0.109

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		0	192	391	1,332	4,152	6,062
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.341		0.582		2.73		7.49
units)							
Public EV charging plugs - L2 (1000 units)	0.794		14		65.6		180
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 (%)	1.3	1.75	2.01	1.58	0.994	0.506	0.218
Vehicle sales - Light-duty - EV (%)	2.2	5.38	13.2	28.1	50.8	73.6	88.2
Vehicle sales - Light-duty - gasoline (%)	90.8	86.1	77.4	63.9	43.5	23.2	10.3
Vehicle sales - Light-duty - hybrid (%)	5.5	6.26	6.92	6.17	4.49	2.58	1.22
Vehicle sales - Light-duty - hydrogen FC	0.112	0.372	0.311	0.232	0.161	0.088	0.041
(%)							
Vehicle sales - Light-duty - other (%)	0.091	0.095	0.085	0.073	0.052	0.028	0.013
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							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-341
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-8.38
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-349
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-178
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-4.19
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Moderate							-182
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							172
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -		\neg					15.2
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 -							188
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							89.9
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							7.62
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							97.6
deployment - Total (1000 hectares)							

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

Table 23: E- scenario - PILLAR 6: Land sink							
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-68.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-3,576
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,305
deforestation (1000 tC02e/y)							
Carbon sink potential - High - Extend							-969
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6.74
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-172
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-308
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-478
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tCO2e/y)							
Carbon sink potential - Low - Extend							-372
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-57.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-161
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tC02e/y)							
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tC02e/y)							
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							445
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-181
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							0
cropland (1000 tC02e/y)							4/5
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tCO2e/y)							010
Carbon sink potential - Mid - Restore							-319
productivity (1000 tCO2e/y)							44.0
Land impacted for carbon sink potential -							11.2
High - Accelerate regeneration (1000							
hectares)							477
Land impacted for carbon sink potential -							177
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							494
High - Extend rotation length (1000							
hectares)							0.70
Land impacted for carbon sink potential - High - Improve plantations (1000							2.48
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							U
hectares)							
Land impacted for carbon sink potential -							25.5
High - Increase trees outside forests							20.0
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							U
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares)							0.14
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							100
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							011
(1000 hectares)							
Land impacted for carbon sink potential -							5.6
Low - Accelerate regeneration (1000							0.0
hectares)							
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							100
(1000 hectares)							
Land impacted for carbon sink potential -		+				+	189
Low - Extend rotation length (1000							107
hectares)		[
Land impacted for carbon sink potential -							1.24
Low - Improve plantations (1000							1.24
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							J
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 -							13.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.51
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							8.4
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							171
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							342
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.87
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 -							19.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							193
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							747
Mid - Total impacted (over 30 years) (1000							
hectares)							

Table 24: E- scenario - IMPACTS - Health

2020	2025	2030	2035	2040	2045	2050
	975	0.677	0.673	0.627	0.41	0.028
	678	395	187	88.8	27.1	20.6
	4,005	4,154	4,132	3,799	3,086	2,158
	110	0.076	0.076	0.071	0.046	0.003
	76.6	44.6	21.1	10	3.05	2.33
	450	467	465	427	347	243
	2020	975 678 4,005 110 76.6	975 0.677 678 395 4,005 4,154 110 0.076 76.6 44.6	975 0.677 0.673 678 395 187 4,005 4,154 4,132 110 0.076 0.076 76.6 44.6 21.1	975 0.677 0.673 0.627 678 395 187 88.8 4,005 4,154 4,132 3,799 110 0.076 0.076 0.071 76.6 44.6 21.1 10	975 0.677 0.673 0.627 0.41 678 395 187 88.8 27.1 4,005 4,154 4,132 3,799 3,086 110 0.076 0.076 0.071 0.046 76.6 44.6 21.1 10 3.05

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

Item	2020	2025	2030	2035	2040	2045	2050
	2020			2033	2040	2045	2030
Commercial HVAC investment in 2020s -		41,628	45,491				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	18.5	33.7	75.3	83.5	83.9	84	84
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Sales of space heating units - Electric	0.831	16.8	53.8	78.3	81.8	82	81.9
Heat Pump (%)							
Sales of space heating units - Electric	2.64	4.45	11.2	16.1	17	17	17.2
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	11.7	2.29	0.1	0	0	0
Sales of space heating units - Gas Furnace	88.4	67.1	32.7	5.5	1.14	0.906	0.899
(%)							
Sales of water heating units - Electric	0.247	7.96	43.7	60.3	62.3	62.4	62.4
Heat Pump (%)							
Sales of water heating units - Electric	1.46	5.37	23	35.5	37.3	37.4	37.4
Resistance (%)							
Sales of water heating units - Gas Furnace	97.6	85.5	33	4.08	0.216	0	0
(%)							
Sales of water heating units - Other (%)	0.649	1.16	0.372	0.184	0.175	0.176	0.176

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.49	3.59	11.3	12.3	10	10.7
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)	306	301	289	269	251	242	241
Final energy use - Industry (PJ)	130	131	133	133	134	135	137
Final energy use - Residential (PJ)	376	351	316	265	217	183	164
Final energy use - Transportation (PJ)	683	640	573	490	414	364	340

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		7.13	8.05				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	33.6	47.7	91.1	99.5	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	66.4	52.3	8.94	0.45	0	0	0
Sales of space heating units - Electric	4.07	17.8	67.1	90.9	93.9	94.1	94
Heat Pump (%)							
Sales of space heating units - Electric	6.87	9.53	5.27	2.94	2.62	2.66	2.75
Resistance (%)							
Sales of space heating units - Fossil (%)	9.77	15	4.87	2.25	2.08	2.05	1.99
Sales of space heating units - Gas (%)	79.3	57.7	22.7	3.87	1.37	1.23	1.23
Sales of water heating units - Electric	0	7.03	39.6	53.9	55.6	55.7	55.7
Heat Pump (%)							
Sales of water heating units - Electric	17.8	33.3	37.6	43.3	44.2	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	57.8	22.4	2.77	0.146	0	0
(%)							
Sales of water heating units - Other (%)	3.14	1.9	0.397	0.064	0.049	0.049	0.05

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		1,151	2,985	4,782	7,266	7,885	7,530
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.341		1.73		7.27		11.7
units)							
Public EV charging plugs - L2 (1000 units)	0.794		41.6		175		281
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 (%)	1.28	1.58	1.15	0.366	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.81	17.9	50.5	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.4	74.9	44.6	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.29	5.17	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC	0.109	0.324	0.182	0.055	0.011	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.018	0.004	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 - Offshore Wind - Base		0.236	0.183	0.38	22.9	33.3	4.26
(billion \$2018)							
Capital invested - Solar PV - Base (billion		4.45	0.529	0	0	0	5.3
\$2018)							
Capital invested - Wind - Base (billion		0	0	0	0	0.524	0.315
\$2018)							
Installed renewables - OffshoreWind -	0	83.2	159	345	13,537	36,114	39,330
Base land use assumptions (MW)							
Installed renewables - OffshoreWind -	0	166	358	732	26,820	47,143	78,287
Constrained land use assumptions (MW)							
Installed renewables - Solar - Base land	786	4,679	5,196	5,196	5,196	5,196	11,900
use assumptions (MW)							
Installed renewables - Solar -	1,573	6,343	8,930	8,930	8,930	8,930	31,181
Constrained land use assumptions (MW)							
Installed renewables - Wind - Base land	9	9	9	9	9	269	434
use assumptions (MW)							
Installed renewables - Wind - Constrained	18	18	18	422	589	589	589
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	355	677	1,479	59,134	160,800	175,860
assumptions (GWh)							
OffshoreWind - Constrained land use	0	710	1,529	3,123	117,853	207,591	350,018
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	1,439	7,460	8,237	8,237	8,237	8,237	18,554
Solar - Constrained land use assumptions	2,878	10,226	14,138	14,138	14,138	14,138	48,346
(GWh)							
Wind - Base land use assumptions (GWh)	30.5	30.5	30.5	30.5	30.5	899	1,382

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

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Constrained land use assumptions	61	61	61	1,411	1,878	1,878	1,878
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-341
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-8.38
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Aggressive							-349
deployment - Total (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-178
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-4.19
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-182
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							172
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							15.2
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							188
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							C
deployment - Corn-ethanol to energy							
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate							89.9
deployment - Cropland measures (1000							
hectares)							
Land impacted for carbon sink - Moderate							7.62
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							97.6
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 regeneration (1000 tCO2e/y)							-68.4
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-3,576
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,305

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend							-969
rotation length (1000 tC02e/y)							. 71
Carbon sink potential - High - Improve							-6.74
plantations (1000 tC02e/y)							170
Carbon sink potential - High - Increase							-172
retention of HWP (1000 tC02e/y)							0/0
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tC02e/y) Carbon sink potential - High - Reforest							0
cropland (1000 tC02e/y)							U
Carbon sink potential - High - Reforest							-308
pasture (1000 tC02e/y)							-300
Carbon sink potential - High - Restore							-478
productivity (1000 tC02e/y)							-410
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tC02e/y)							-34.3
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tC02e/y)							-700
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tC02e/y)							-210
Carbon sink potential - Low - Extend							-372
rotation length (1000 tCO2e/y)							-512
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tCO2e/y)							-0.40
Carbon sink potential - Low - Increase							-57.4
retention of HWP (1000 tC02e/y)							-51.4
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tCO2e/y)							-74.1
Carbon sink potential - Low - Reforest							0
cropland (1000 tC02e/y)							·
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tC02e/y)							-20.0
Carbon sink potential - Low - Restore							-161
productivity (1000 tC02e/y)							101
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							01
Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tCO2e/y)							2,207
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-181
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							_
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tC02e/y)							
Carbon sink potential - Mid - Restore							-319
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							11.2
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							177
High - Avoid deforestation (over 30 years)							
(1000 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 - Extend rotation length (1000							494
hectares)							
Land impacted for carbon sink potential -							2.48
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 -							25.5
High - Increase trees outside forests							25.5
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							ŭ
Land impacted for carbon sink potential -			+				8.74
High - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							5.6
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							100
Land impacted for carbon sink potential -							189
Low - Extend rotation length (1000 hectares)							
Land impacted for carbon sink potential -							1.24
Low - Improve plantations (1000							1.24
hectares)							
Land impacted for carbon sink potential -			+				0
Low - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							13.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.51
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							
hectares) Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							413
(1000 hectares)							
Land impacted for carbon sink potential -			+	+			8.4
Mid - Accelerate regeneration (1000							0.4
hectares)							
Land impacted for carbon sink potential -							171
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							342
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.87
	i .						

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 -							0
Mid - Increase retention of HWP (1000							
hectares)							
Land impacted for carbon sink potential -							19.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							193
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							747
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 -		975	0.677	0.673	0.627	0.41	0.028
Coal (million 2019\$)							
Monetary damages from air pollution -		628	462	296	227	84.3	15.7
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		3,928	3,747	2,908	1,717	789	300
Transportation (million 2019\$)							
Premature deaths from air pollution -		110	0.076	0.076	0.071	0.046	0.003
Coal (deaths)							
Premature deaths from air pollution -		70.8	52.2	33.4	25.6	9.52	1.77
Natural Gas (deaths)							
Premature deaths from air pollution -		442	421	327	193	88.7	33.7
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 -		41,628	45,491				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	18.5	33.7	75.3	83.5	83.9	84	84
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Sales of space heating units - Electric	0.831	16.8	53.8	78.3	81.8	82	81.9
Heat Pump (%)							
Sales of space heating units - Electric	2.64	4.45	11.2	16.1	17	17	17.2
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	11.7	2.29	0.1	0	0	0
Sales of space heating units - Gas Furnace	88.4	67.1	32.7	5.5	1.14	0.906	0.899
(%)							
Sales of water heating units - Electric	0.247	7.96	43.7	60.3	62.3	62.4	62.4
Heat Pump (%)							
Sales of water heating units - Electric	1.46	5.37	23	35.5	37.3	37.4	37.4
Resistance (%)							
Sales of water heating units - Gas Furnace	97.6	85.5	33	4.08	0.216	0	0
(%)							
Sales of water heating units - Other (%)	0.649	1.16	0.372	0.184	0.175	0.176	0.176

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		3.49	3.59	11.3	12.3	10	10.7
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)	306	301	289	269	251	242	241
Final energy use - Industry (PJ)	130	131	133	133	134	135	137
Final energy use - Residential (PJ)	376	351	316	265	217	183	164
Final energy use - Transportation (PJ)	683	640	573	490	414	364	340

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		7.13	8.05				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	33.6	47.7	91.1	99.5	100	100	100
Resistance (%)							
Sales of cooking units - Gas (%)	66.4	52.3	8.94	0.45	0	0	0
Sales of space heating units - Electric	4.07	17.8	67.1	90.9	93.9	94.1	94
Heat Pump (%)							
Sales of space heating units - Electric	6.87	9.53	5.27	2.94	2.62	2.66	2.75
Resistance (%)							
Sales of space heating units - Fossil (%)	9.77	15	4.87	2.25	2.08	2.05	1.99
Sales of space heating units - Gas (%)	79.3	57.7	22.7	3.87	1.37	1.23	1.23
Sales of water heating units - Electric	0	7.03	39.6	53.9	55.6	55.7	55.7
Heat Pump (%)							
Sales of water heating units - Electric	17.8	33.3	37.6	43.3	44.2	44.3	44.3
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	57.8	22.4	2.77	0.146	0	0
(%)							
Sales of water heating units - Other (%)	3.14	1.9	0.397	0.064	0.049	0.049	0.05

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		1,151	2,985	4,782	7,266	7,885	7,530
Cumulative 5-yr (million \$2018)							
Public EV charging plugs - DC Fast (1000	0.341		1.73		7.27		11.7
units)							
Public EV charging plugs - L2 (1000 units)	0.794		41.6		175		281
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 (%)	1.28	1.58	1.15	0.366	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.81	17.9	50.5	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.4	74.9	44.6	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.29	5.17	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC	0.109	0.324	0.182	0.055	0.011	0.002	0
(%)							
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.018	0.004	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

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

	•	-	•	•	-		
Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion \$2018)		0.451	0.447	0.359	0.621	4.07	1.56
Capital invested - Offshore Wind - Constrained (billion \$2018)		0.507	0.267	0.527	0.533	3.39	1.03
Capital invested - Solar PV - Base (billion \$2018)		0.566	0.667	0.657	0.669	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		0.309	1.06	0.212	0.31	0	0
Capital invested - Wind - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Wind - Constrained (billion \$2018)		0	0	0	0	0	0
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	159	345	521	879	3,638	4,819
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	179	290	548	855	3,156	3,936
Installed renewables - Solar - Base land use assumptions (MW)	786	1,281	1,934	2,631	3,385	3,385	3,385
Installed renewables - Solar - Constrained land use assumptions (MW)	786	1,056	2,097	2,322	2,671	2,671	2,671
Installed renewables - Wind - Base land use assumptions (MW)	9	9	9	9	9	9	9
Installed renewables - Wind - Constrained land use assumptions (MW)	9	9	9	9	9	9	9

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use	0	677	1,479	2,233	3,750	15,641	20,804
assumptions (GWh)							
OffshoreWind - Constrained land use	0	765	1,239	2,347	3,655	13,568	16,966
assumptions (GWh)							
Solar - Base land use assumptions (GWh)	1,439	2,213	3,227	4,281	5,425	5,425	5,425
Solar - Constrained land use assumptions	1,439	1,862	3,445	3,784	4,310	4,310	4,310
(GWh)							
Wind - Base land use assumptions (GWh)	30.5	30.5	30.5	30.5	30.5	30.5	30.5
Wind - Constrained land use assumptions	30.5	30.5	30.5	30.5	30.5	30.5	30.5
(GWh)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-341
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Aggressive							-8.38
deployment - Permanent conservation							
cover (1000 tCO2e/y)							
Carbon sink potential - Aggressive							-349
deployment - Total (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate							0
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							
Carbon sink potential - Moderate							-178
deployment - Cropland measures (1000							
tCO2e/y)							
Carbon sink potential - Moderate							-4.19
deployment - Permanent conservation							
cover (1000 tC02e/y)							
Carbon sink potential - Moderate							-182
deployment - Total (1000 tC02e/y)							
Land impacted for carbon sink -							0
Aggressive deployment - Corn-ethanol to							
energy grasses (1000 hectares)							
Land impacted for carbon sink -							172
Aggressive deployment - Cropland							
measures (1000 hectares)							
Land impacted for carbon sink -							15.2
Aggressive deployment - Permanent							
conservation cover (1000 hectares)							
Land impacted for carbon sink -							188
Aggressive deployment - Total (1000							
hectares)							
Land impacted for carbon sink - Moderate							0
deployment - Corn-ethanol to energy							Ū
grasses (1000 hectares)							
Land impacted for carbon sink - Moderate			+				89.9
deployment - Cropland measures (1000							07.7
hectares)							
Land impacted for carbon sink - Moderate							7.62
deployment - Permanent conservation							1.02
cover (1000 hectares)							
Land impacted for carbon sink - Moderate			-				97.6
deployment - Total (1000 hectares)							71.0
achioline - intai (1000 liectai es)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-68.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-3,576
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,305
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-969
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6.74
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-172
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-308
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-478
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							

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

Item	2020	2025	2030	2035	2040	2045	205
Carbon sink potential - Low - All (not							-96
counting overlap) (1000 tC02e/y)							04
Carbon sink potential - Low - Avoid							-21
deforestation (1000 tC02e/y)							
Carbon sink potential - Low - Extend							-37
rotation length (1000 tC02e/y)							
Carbon sink potential - Low - Improve							-3.4
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-57.
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-94
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23.
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-16
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-51.
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-2,26
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-76
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-6
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-5.0
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-11
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-18
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Mid - Reforest							
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-16
pasture (1000 tC02e/y)							-10
Carbon sink potential - Mid - Restore		+					-31
productivity (1000 tCO2e/y)							-51
							11.
Land impacted for carbon sink potential -							11.
High - Accelerate regeneration (1000							
hectares)							4-
Land impacted for carbon sink potential -							17
High - Avoid deforestation (over 30 years)							
(1000 hectares)							, ,
Land impacted for carbon sink potential -							49
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.4
High - Improve plantations (1000							
nectares)							
and impacted for carbon sink potential -							
High - Increase retention of HWP (1000							
nectares)							
Land impacted for carbon sink potential -							25
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							8.7
High - Reforest pasture (1000 hectares)							

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

Table 43: E+RE- scenario - PILLAR 6: Land Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							5.6
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							189
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.24
Low - Improve plantations (1000							
hectares)							
Land impacted for carbon sink potential -							0
Low - Increase retention of HWP (1000							
hectares)							10.7
Land impacted for carbon sink potential -							13.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							1 [1
Land impacted for carbon sink potential -							1.51
Low - Reforest pasture (1000 hectares) Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							93.0
hectares)							
Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							410
(1000 hectares)							
Land impacted for carbon sink potential -							8.4
Mid - Accelerate regeneration (1000							0.4
hectares)							
Land impacted for carbon sink potential -							171
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							342
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.87
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 -							19.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							193
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							747
Mid - Total impacted (over 30 years) (1000							
hectares)							

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Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution -		975	0.677	0.673	0.627	0.41	0.028
Coal (million 2019\$)							
Monetary damages from air pollution -		679	537	605	482	214	59.1
Natural Gas (million 2019\$)							
Monetary damages from air pollution -		3,928	3,747	2,908	1,717	789	300
Transportation (million 2019\$)							
Premature deaths from air pollution -		110	0.076	0.076	0.071	0.046	0.003
Coal (deaths)							
Premature deaths from air pollution -		76.6	60.7	68.3	54.4	24.2	6.67
Natural Gas (deaths)							
Premature deaths from air pollution -		442	421	327	193	88.7	33.7
Transportation (deaths)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		41,604	45,411				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	18.5	21.6	27.5	43	64.5	77.7	82.3
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	78.4	72.5	57	35.5	22.3	17.7
Sales of space heating units - Electric	0.831	10.8	15	27.7	49.8	69	77.8
Heat Pump (%)							
Sales of space heating units - Electric	2.64	3.4	4.18	6.57	10.9	14.6	16.6
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	13.5	12.9	9.99	5	1.6	0.431
Sales of space heating units - Gas Furnace	88.4	72.3	67.9	55.8	34.4	14.9	5.15
(%)							
Sales of water heating units - Electric	0.247	1.77	5.84	17.8	37.6	53.1	59.7
Heat Pump (%)							
Sales of water heating units - Electric	1.46	2.65	4.65	10.7	21.4	30.9	35.4
Resistance (%)							
Sales of water heating units - Gas Furnace	97.6	94.3	88.2	70.5	40.4	15.7	4.7
(%)							
Sales of water heating units - Other (%)	0.649	1.31	1.29	1.01	0.586	0.311	0.212

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.76	2.76	4.34	4.53	9.51	10.3
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)	306	301	299	297	292	284	276
Final energy use - Industry (PJ)	130	131	133	135	136	137	139
Final energy use - Residential (PJ)	376	353	337	317	287	250	214
Final energy use - Transportation (PJ)	684	645	598	556	522	481	433

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs.		7.14	8.46				
REF - Cumulative 5-yr (billion \$2018)							
Sales of cooking units - Electric	33.3	35.1	41.2	57.3	79.6	93.4	98.2
Resistance (%)							
Sales of cooking units - Gas (%)	66.7	64.9	58.8	42.7	20.4	6.57	1.77
Sales of space heating units - Electric	4.07	9.27	14.9	31.5	59.1	80.8	90.2
Heat Pump (%)							

Table 48: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)
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Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric	6.87	10.2	9.71	8.26	5.82	3.82	3.01
Resistance (%)							
Sales of space heating units - Fossil (%)	9.77	16.9	15.8	12.4	7.29	3.83	2.52
Sales of space heating units - Gas (%)	79.3	63.6	59.6	47.8	27.8	11.6	4.3
Sales of water heating units - Electric	0	1.31	5.02	15.9	33.8	47.5	53.3
Heat Pump (%)							
Sales of water heating units - Electric	17.8	32.8	33.2	34.8	38	41.5	43.4
Resistance (%)							
Sales of water heating units - Gas Furnace	79.1	63.7	59.7	47.8	27.4	10.7	3.19
(%)							
Sales of water heating units - Other (%)	3.14	2.18	2.01	1.52	0.769	0.279	0.109

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs -		0	192	391	1,332	4,152	6,062
Cumulative 5-yr (million \$2018)						,	•
Public EV charging plugs - DC Fast (1000	0.341		0.582		2.73		7.49
units)							
Public EV charging plugs - L2 (1000 units)	0.794		14		65.6		180
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 (%)	1.3	1.75	2.01	1.58	0.994	0.506	0.218
Vehicle sales - Light-duty - EV (%)	2.2	5.38	13.2	28.1	50.8	73.6	88.2
Vehicle sales - Light-duty - gasoline (%)	90.8	86.1	77.4	63.9	43.5	23.2	10.3
Vehicle sales - Light-duty - hybrid (%)	5.5	6.26	6.92	6.17	4.49	2.58	1.22
Vehicle sales - Light-duty - hydrogen FC	0.112	0.372	0.311	0.232	0.161	0.088	0.041
(%)							
Vehicle sales - Light-duty - other (%)	0.091	0.095	0.085	0.073	0.052	0.028	0.013
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 (billion \$2018)	0	0.008	0.352	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	16.3	707	707	707	707	707
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0

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

	<u> </u>						
Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million \$2018/year)		14.3	180	183	183	184	593
Conversion capital investment -		9.36	392	34.4	5.46	9	4,899
Cumulative 5-yr (million \$2018)							
Number of facilities - Allam power w ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Beccs hydrogen	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	7
Number of facilities - Pyrolysis ccu	0	0	0	0	0	0	0
(quantity)							
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	0
Annual - BECCS (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	0	0
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - 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

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Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	107	142	142	142	142
Cumulative investment - All (million \$2018)		0	230	438	438	460	460
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	0
Cumulative investment - Trunk (million \$2018)		0	230	438	438	460	460
Spur (km)		0	0	0	0	0	0
Trunk (km)		0	107	142	142	142	142

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

		-					
Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal,		0	0	0	0	0	0
permitting costs (million \$2020)							
Wells and facilities construction costs		0	0	0	0	0	0
(million \$2020)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive							-18.8
deployment - Corn-ethanol to energy							
grasses (1000 tCO2e/y)							

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

Item Carbon sink potential - Aggressive	2020	2025	2030	2035	2040	2045	2050 -324
deployment - Cropland measures (1000 tCO2e/y)							-324
Carbon sink potential - Aggressive							0
deployment - Cropland to woody energy crops (1000 tC02e/y)							O
Carbon sink potential - Aggressive deployment - Pasture to energy crops							0
(1000 tC02e/y)							
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-7.83
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-351
Carbon sink potential - Moderate		+		+	+	+	-18.8
deployment - Corn-ethanol to energy grasses (1000 tC02e/y)							-10.0
Carbon sink potential - Moderate							-169
deployment - Cropland measures (1000 tCO2e/y)							
Carbon sink potential - Moderate							0
deployment - Cropland to woody energy crops (1000 tCO2e/y)							
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Permanent conservation							-3.91
cover (1000 tC02e/y) Carbon sink potential - Moderate							-191
deployment - Total (1000 tCO2e/y)							
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							9.08
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							403
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							4.53
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							2.71
Land impacted for carbon sink - Aggressive deployment - Permanent							14.2
conservation cover (1000 hectares) Land impacted for carbon sink -							434
Aggressive deployment - Total (1000 hectares)							
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							9.08
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							85.2
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy							4.53
crops (1000 hectares) Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							2.71

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

T1	0000	0005	0000	0005	0010	00/5	0050
Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate							7.12
deployment - Permanent conservation							
cover (1000 hectares)							
Land impacted for carbon sink - Moderate							109
deployment - Total (1000 hectares)							

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

Table 57: E-B+ scenario - PILLAR 6: Land	sinks - Fores	sts					
Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate							-68.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - High - All (not							-3,576
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,305
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-969
rotation length (1000 tCO2e/y)							
Carbon sink potential - High - Improve							-6.74
plantations (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-172
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - High - Reforest							-308
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-478
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tC02e/y)							
Carbon sink potential - Low - Extend							-372
rotation length (1000 tCO2e/y)							
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-57.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tC02e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tCO2e/y)							
Carbon sink potential - Low - Restore							-161
productivity (1000 tCO2e/y)							
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tCO2e/y)							
Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tCO2e/y)							
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tCO2e/y)							
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tCO2e/y)							
		I.			I		

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

Item Carbon sink potential - Mid - Increase	2020	2025	2030	2035	2040	2045	2050 -181
trees outside forests (1000 tC02e/y)							-101
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tC02e/y)							010
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-319
Land impacted for carbon sink potential -							11.2
High - Accelerate regeneration (1000							11.2
hectares)							
Land impacted for carbon sink potential -							177
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							494
High - Extend rotation length (1000							
hectares)							0.70
Land impacted for carbon sink potential - High - Improve plantations (1000							2.48
hectares)							
Land impacted for carbon sink potential -							0
High - Increase retention of HWP (1000							Ū
hectares)							
Land impacted for carbon sink potential -							25.5
High - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares) Land impacted for carbon sink potential -							158
High - Restore productivity (1000							158
hectares)							
Land impacted for carbon sink potential -							877
High - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							5.6
Low - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							100
Land impacted for carbon sink potential - Low - Extend rotation length (1000							189
hectares)							
Land impacted for carbon sink potential -							1.24
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 -							13.4
Low - Increase trees outside forests							
(1000 hectares)							
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential -							1.51
Low - Reforest pasture (1000 hectares)							1.51
Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							70.0
hectares)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							8.4
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							171
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							342
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.87
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 -							19.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							193
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							747
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 - Coal (million 2019\$)		975	0.677	0.673	0.627	0.41	0.028
Monetary damages from air pollution - Natural Gas (million 2019\$)		666	369	221	185	109	29.7
Monetary damages from air pollution - Transportation (million 2019\$)		4,005	4,154	4,132	3,799	3,086	2,158
Premature deaths from air pollution - Coal (deaths)		110	0.076	0.076	0.071	0.046	0.003
Premature deaths from air pollution - Natural Gas (deaths)		75.2	41.6	24.9	20.8	12.3	3.35
Premature deaths from air pollution - Transportation (deaths)		450	467	465	427	347	243

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s -		41,117	42,334				
Cumulative 5-yr (million \$2018)							
Sales of cooking units - Electric	18.5	19.4	19.4	19.6	19.7	19.8	19.9
Resistance (%)							
Sales of cooking units - Gas (%)	81.5	80.6	80.6	80.4	80.3	80.2	80.1
Sales of space heating units - Electric	0.831	15.4	41.5	62.9	66.3	66.6	66.5
Heat Pump (%)							
Sales of space heating units - Electric	2.64	4.05	8.88	20.9	30.7	32.3	32.6
Resistance (%)							
Sales of space heating units - Fossil (%)	8.14	13.2	10.3	4.62	0.695	0.058	0

Table CO. DCC assessia	DILLAD 1. Efficiency /Floorwiff continue	0
Table 59: REE Scenorio	- PTLLAR 1 [,] Efficiency/Flectrification -	Commerciai I continuea i

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace	88.4	67.4	39.3	11.6	2.31	0.996	0.899
(%)							
Sales of water heating units - Electric	0.247	0.326	0.328	0.328	0.329	0.331	0.332
Heat Pump (%)							
Sales of water heating units - Electric	1.46	1.94	1.92	1.93	1.93	1.93	1.93
Resistance (%)							
Sales of water heating units - Gas Furnace	97.6	96.4	96.3	96.3	96.3	96.3	96.3
_(%)							
Sales of water heating units - Other (%)	0.649	1.34	1.42	1.41	1.43	1.46	1.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested -		2.77	2.78	8.27	8.93	8.04	8.51
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)	306	305	307	309	314	329	352
Final energy use - Industry (PJ)	130	134	140	145	151	158	164
Final energy use - Residential (PJ)	376	350	336	325	318	315	313
Final energy use - Transportation (PJ)	684	651	614	593	597	615	636

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		6.64	7				
Sales of cooking units - Electric Resistance (%)	32.8	32.8	32.8	32.8	32.8	32.8	32.8
Sales of cooking units - Gas (%)	67.2	67.2	67.2	67.2	67.2	67.2	67.2
Sales of space heating units - Electric Heat Pump (%)	2.27	23.8	24.8	26.1	26.8	27.3	28.1
Sales of space heating units - Electric Resistance (%)	7.12	8.97	8.81	8.6	8.48	7.9	7.12
Sales of space heating units - Fossil (%)	9.93	13.6	7.36	3.84	3.54	3.54	3.56
Sales of space heating units - Gas (%)	80.7	53.6	59.1	61.5	61.2	61.2	61.3
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	17.8	32.6	32.5	32.5	32.5	32.5	32.4
Sales of water heating units - Gas Furnace (%)	79.1	65.2	65.2	65.3	65.3	65.3	65.3
Sales of water heating units - Other (%)	3.14	2.24	2.24	2.24	2.24	2.24	2.24

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 (%)	1.29	1.74	2.14	2	1.79	1.66	1.58
Vehicle sales - Light-duty - EV (%)	4.44	6.75	7.58	9.37	11.3	12.9	14.1
Vehicle sales - Light-duty - gasoline (%)	88.8	84.9	82.5	80.3	78.1	76.2	74.7
Vehicle sales - Light-duty - hybrid (%)	5.31	6.12	7.41	7.95	8.45	8.89	9.18

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC	0.109	0.367	0.331	0.29	0.285	0.284	0.294
(%)							
Vehicle sales - Light-duty - other (%)	0.09	0.094	0.09	0.09	0.09	0.088	0.09
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
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen	0.175	0.208	0.242	0.285	0.339	0.409	0.487
FC (%)							
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

Table 64: REF scenario - PILLAR 6: Land s Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate	2020	2020	2030	2030	2040	2040	-68.4
regeneration (1000 tC02e/y)							00.⊣
Carbon sink potential - High - All (not							-3,576
counting overlap) (1000 tCO2e/y)							
Carbon sink potential - High - Avoid							-1,305
deforestation (1000 tCO2e/y)							
Carbon sink potential - High - Extend							-969
rotation length (1000 tC02e/y)							
Carbon sink potential - High - Improve							-6.74
plantations (1000 tC02e/y)			-				170
Carbon sink potential - High - Increase retention of HWP (1000 tC02e/y)							-172
Carbon sink potential - High - Increase							-269
trees outside forests (1000 tCO2e/y)							-209
Carbon sink potential - High - Reforest			+				0
cropland (1000 tCO2e/y)							J
Carbon sink potential - High - Reforest							-308
pasture (1000 tCO2e/y)							
Carbon sink potential - High - Restore							-478
productivity (1000 tCO2e/y)							
Carbon sink potential - Low - Accelerate							-34.3
regeneration (1000 tCO2e/y)							
Carbon sink potential - Low - All (not							-963
counting overlap) (1000 tCO2e/y)							010
Carbon sink potential - Low - Avoid							-218
deforestation (1000 tC02e/y) Carbon sink potential - Low - Extend							-372
rotation length (1000 tC02e/y)							-312
Carbon sink potential - Low - Improve							-3.43
plantations (1000 tC02e/y)							0.40
Carbon sink potential - Low - Increase			+				-57.4
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Low - Increase							-94.1
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Low - Reforest							-23.3
pasture (1000 tC02e/y)							
Carbon sink potential - Low - Restore							-161
productivity (1000 tC02e/y)							F1 /
Carbon sink potential - Mid - Accelerate							-51.4
regeneration (1000 tC02e/y) Carbon sink potential - Mid - All (not							-2,269
counting overlap) (1000 tC02e/y)							-2,209
Carbon sink potential - Mid - Avoid							-761
deforestation (1000 tC02e/y)							101
40101 00141011 (1000 10020/)							

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Extend							-671
rotation length (1000 tC02e/y)							
Carbon sink potential - Mid - Improve							-5.02
plantations (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-115
retention of HWP (1000 tCO2e/y)							
Carbon sink potential - Mid - Increase							-181
trees outside forests (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							0
cropland (1000 tCO2e/y)							
Carbon sink potential - Mid - Reforest							-165
pasture (1000 tCO2e/y)							
Carbon sink potential - Mid - Restore							-319
productivity (1000 tCO2e/y)							
Land impacted for carbon sink potential -							11.2
High - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							177
High - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							494
High - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							2.48
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 -							25.5
High - Increase trees outside forests							20.0
(1000 hectares)							
Land impacted for carbon sink potential -							0
High - Reforest cropland (1000 hectares)							U
Land impacted for carbon sink potential -							8.74
High - Reforest pasture (1000 hectares)							0.14
Land impacted for carbon sink potential -							158
High - Restore productivity (1000							130
hectares)							
Land impacted for carbon sink potential -							877
·							011
High - Total impacted (over 30 years) (1000 hectares)							
`							Г/
Land impacted for carbon sink potential -							5.6
Low - Accelerate regeneration (1000							
hectares)							1//
Land impacted for carbon sink potential -							166
Low - Avoid deforestation (over 30 years)							
(1000 hectares)							100
Land impacted for carbon sink potential -							189
Low - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.24
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 -							13.4
Low - Increase trees outside forests							
(1000 hectares)					1		

Table 6/1	DEE conar	O - DILLARA	: Land sinks -	Enrocte	Continued
Table 04.	KEF SURIIUI	U - PILLAK O.	. Luliu Siliks -	FULESIS I	CUITLITUEUT

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential -							0
Low - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							1.51
Low - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							95.8
Low - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							473
Low - Total impacted (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							8.4
Mid - Accelerate regeneration (1000							
hectares)							
Land impacted for carbon sink potential -							171
Mid - Avoid deforestation (over 30 years)							
(1000 hectares)							
Land impacted for carbon sink potential -							342
Mid - Extend rotation length (1000							
hectares)							
Land impacted for carbon sink potential -							1.87
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 -							19.5
Mid - Increase trees outside forests (1000							
hectares)							
Land impacted for carbon sink potential -							0
Mid - Reforest cropland (1000 hectares)							
Land impacted for carbon sink potential -							11
Mid - Reforest pasture (1000 hectares)							
Land impacted for carbon sink potential -							193
Mid - Restore productivity (1000							
hectares)							
Land impacted for carbon sink potential -							747
Mid - Total impacted (over 30 years) (1000							
hectares)							

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	0.55		-1.73				-1.55
uptake (Mt CO2e/y)							
Business-as-usual carbon sink - Retained	-0.047		-0.084				-0.088
in Hardwood Products (Mt CO2e/y)							
Business-as-usual carbon sink - Total (Mt	0.503		-1.82				-1.64
CO2e/y)							

Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		2,530	1,621	1,520	1,481	1,455	1,336
Monetary damages from air pollution - Natural Gas (million 2019\$)		490	504	775	798	818	790
Monetary damages from air pollution - Transportation (million 2019\$)		3,992	4,196	4,392	4,611	4,833	5,068
Premature deaths from air pollution - Coal (deaths)		286	183	172	167	164	151
Premature deaths from air pollution - Natural Gas (deaths)		55.3	56.9	87.5	90.1	92.3	89.1

Table 66: REF scenario - IMPACTS - Health (continued)

	•	,					
Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution -		449	472	494	519	544	570
Transportation (deaths)							