



Net-Zero America - district of columbia state report

2021-03-15

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.princeton.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 state-level 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 - Cumulative 5-yr (million \$2018)		5,166	5,788				
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	2.05	28.4	70.8	84.1	85.4	85.4	85.4
Sales of space heating units - Electric Resistance (%)	2.42	8.17	10.2	12.3	12.6	12.7	12.7
Sales of space heating units - Fossil (%)	1.05	3.87	0.737	0.031	0	0	0
Sales of space heating units - Gas Furnace (%)	94.5	59.5	18.2	3.63	1.98	1.93	1.91
Sales of water heating units - Electric Heat Pump (%)	0.085	10.5	54.6	64.5	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	2.17	10.8	28.3	32.3	32.4	32.4	32.4
Sales of water heating units - Gas Furnace (%)	96.6	74.7	14.1	0.595	0	0	0
Sales of water heating units - Other (%)	1.11	3.93	2.93	2.68	2.68	2.68	2.68

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.425	0.429	0.84	0.893	0.835	0.874

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	46	46	43.8	40.6	38.1	37.2	37.7
Final energy use - Industry (PJ)	5.02	4.93	5.03	5.16	5.31	5.5	5.74
Final energy use - Residential (PJ)	19.8	18.7	17.2	15.1	13.5	12.5	12.1
Final energy use - Transportation (PJ)	31	28.7	26.1	22.8	19.8	18	17.2

Table 4: *E+ 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)		0.402	0.417				
Sales of cooking units - Electric Resistance (%)	55.7	65.1	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.3	34.9	5.97	0.3	0	0	0
Sales of space heating units - Electric Heat Pump (%)	16.5	34.9	77.8	87.4	87.8	87.8	87.7
Sales of space heating units - Electric Resistance (%)	22.8	22.2	9.26	6.35	6.2	6.29	6.29
Sales of space heating units - Fossil (%)	1.63	2.49	1.11	0.815	0.808	0.783	0.781
Sales of space heating units - Gas (%)	59	40.4	11.8	5.45	5.16	5.18	5.18
Sales of water heating units - Electric Heat Pump (%)	0	9.33	49.4	58.4	58.8	58.8	58.8
Sales of water heating units - Electric Resistance (%)	37.1	50.9	42.3	40.4	40.3	40.2	40.2
Sales of water heating units - Gas Furnace (%)	61.4	38.7	7.32	0.309	0	0	0
Sales of water heating units - Other (%)	1.49	1.09	0.957	0.942	0.957	0.984	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018)		66.3	174	275	420	454	434
Public EV charging plugs - DC Fast (1000 units)	0.087		0.099		0.395		0.632
Public EV charging plugs - L2 (1000 units)	0.517		2.37		9.48		15.2
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 (%)	0.809	1.15	0.981	0.307	0.063	0.013	0
Vehicle sales - Light-duty - EV (%)	6.39	22.9	57.2	86	96.8	99.3	100
Vehicle sales - Light-duty - gasoline (%)	85.8	69.2	37.6	12.2	2.74	0.574	0
Vehicle sales - Light-duty - hybrid (%)	6.82	6.32	3.99	1.4	0.353	0.08	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.106	0.296	0.147	0.043	0.01	0.002	0
Vehicle sales - Light-duty - other (%)	0.069	0.062	0.036	0.012	0.003	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 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 6: E+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		0.01	0	0	0	0	0
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	71.1	107	142	187	242	305	377
Installed renewables - Solar - Base land use assumptions (MW)	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	16	16	16	16	16	16	16
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

Table 8: *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 9: *E+ scenario - PILLAR 4: CCUS - CO2 pipelines*

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

Table 10: *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 11: *E+ scenario - IMPACTS - Fossil fuel industries*

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		24.4	20.5	16.5	12.4	7.8	5.41
Natural gas consumption - Cumulative (tcf)							496
Natural gas production - Annual (tcf)		0	0	0	0	0	0
Oil consumption - Annual (million bbls)		1.9	1.54	1.05	0.601	0.251	0
Oil consumption - Cumulative (million bbls)							33.1
Oil production - Annual (million bbls)		0	0	0	0	0	0

Table 12: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		73	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Natural Gas (million 2019\$)		32.3	24.2	15.2	14	8.49	3.59
Monetary damages from air pollution - Transportation (million 2019\$)		411	374	279	160	70.5	25.3
Premature deaths from air pollution - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		3.65	2.73	1.72	1.58	0.958	0.406
Premature deaths from air pollution - Transportation (deaths)		46.2	42.1	31.4	17.9	7.93	2.84

Table 13: E+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		7.81	15.9	6.06	4.7	3.46	2.57
By economic sector - Construction (jobs)		99.3	91.7	176	170	138	139
By economic sector - Manufacturing (jobs)		35.7	33.4	48.8	44.3	34.6	32.9
By economic sector - Mining (jobs)		60	41.4	25.8	14.6	6.81	2.93
By economic sector - Other (jobs)		1.84	2.08	8.47	8.7	7.36	7.68
By economic sector - Pipeline (jobs)		23	19.1	14.8	10.7	6.48	4.14
By economic sector - Professional (jobs)		42.9	42	63.7	59.8	48.3	46.9
By economic sector - Trade (jobs)		33.3	27.2	39.1	35	27.4	26.3
By economic sector - Utilities (jobs)		117	111	264	260	213	215
By education level - All sectors - Associates degree or some college (jobs)		131	119	211	200	160	158
By education level - All sectors - Bachelors degree (jobs)		89	78.3	124	115	90.5	88.2
By education level - All sectors - Doctoral degree (jobs)		2.84	2.54	3.54	3.21	2.52	2.41
By education level - All sectors - High school diploma or less (jobs)		176	165	278	262	210	208
By education level - All sectors - Masters or professional degree (jobs)		21.4	19	30.3	28.1	22.3	21.8
By resource sector - Biomass (jobs)		33.5	43.7	17.3	14.2	12.6	11
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		82.9	97.3	450	469	398	424
By resource sector - Natural Gas (jobs)		220	180	140	103	66.1	42.7
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		84.6	63	39.5	21	8.21	0
Median wages - Annual - All (\$2019 per job)		74,628	74,875	75,338	76,225	77,229	78,280
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		69.7	63.1	111	105	83.7	82.7
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		30.7	27.7	49.2	46.4	37.1	36.6
On-Site or In-Plant Training - Total jobs - None (jobs)		66.7	60.8	99.3	92.7	73.8	72.4
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		3.69	3.38	6.22	5.91	4.74	4.7
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		250	229	382	358	286	281
On-the-Job Training - All sectors - 1 to 4 years (jobs)		90.4	81.6	144	136	109	107
On-the-Job Training - All sectors - 4 to 10 years (jobs)		29.7	26.9	49	46.4	37.2	36.8
On-the-Job Training - All sectors - None (jobs)		22.1	19.8	32.1	29.8	23.7	23.3
On-the-Job Training - All sectors - Over 10 years (jobs)		3.86	3.41	5.5	5.1	4.03	3.93
On-the-Job Training - All sectors - Up to 1 year (jobs)		275	252	417	390	311	306
Related work experience - All sectors - 1 to 4 years (jobs)		154	140	234	219	175	172
Related work experience - All sectors - 4 to 10 years (jobs)		100	89.6	153	143	114	112
Related work experience - All sectors - None (jobs)		61.9	57.1	96.5	90.7	72.5	71.4
Related work experience - All sectors - Over 10 years (jobs)		26.1	23.2	39.6	37.1	29.6	29.1
Related work experience - All sectors - Up to 1 year (jobs)		79.2	74.3	124	117	93.8	92.9
Wage income - All (million \$2019)		31.4	28.7	48.8	46.3	37.4	37.4

Table 14: E- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,159	5,728				
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	2.05	20.4	25.2	39.3	61.5	77.1	83.1
Sales of space heating units - Electric Resistance (%)	2.42	7.86	8.12	8.85	10.2	11.6	12.4
Sales of space heating units - Fossil (%)	1.05	4.47	4.15	3.13	1.52	0.487	0.128
Sales of space heating units - Gas Furnace (%)	94.5	67.3	62.5	48.8	26.8	10.8	4.39
Sales of water heating units - Electric Heat Pump (%)	0.085	2.04	7.05	21.5	43.6	58.1	63.1
Sales of water heating units - Electric Resistance (%)	2.17	7.4	9.35	15.1	24	29.7	31.7
Sales of water heating units - Gas Furnace (%)	96.6	86.4	79.5	59.7	29.2	9.32	2.43
Sales of water heating units - Other (%)	1.11	4.12	4.12	3.71	3.21	2.85	2.73

Table 15: E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.36	0.356	0.467	0.477	0.862	0.916

Table 16: E- scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	46	46.1	45.5	44.7	43.2	41.6	40.7
Final energy use - Industry (PJ)	5.02	4.93	5.04	5.23	5.42	5.65	5.91
Final energy use - Residential (PJ)	19.8	18.8	18.3	17.7	16.6	15.3	14
Final energy use - Transportation (PJ)	31.1	29	27.3	25.8	24.6	23.1	21.2

Table 17: E- 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)		0.401	0.411				
Sales of cooking units - Electric Resistance (%)	55.5	56.7	60.7	71.5	86.4	95.6	98.8
Sales of cooking units - Gas (%)	44.5	43.3	39.3	28.5	13.6	4.39	1.18
Sales of space heating units - Electric Heat Pump (%)	16.5	26.6	31.6	45.8	67.3	81.3	86.2
Sales of space heating units - Electric Resistance (%)	22.8	24.7	23	18.6	12.2	8.08	6.66
Sales of space heating units - Fossil (%)	1.63	2.76	2.65	2.23	1.53	1.04	0.878
Sales of space heating units - Gas (%)	59	45.9	42.7	33.4	19	9.58	6.31
Sales of water heating units - Electric Heat Pump (%)	0	1.61	6.17	19.3	39.5	52.6	57.2
Sales of water heating units - Electric Resistance (%)	37.1	52.6	51.5	48.6	44.3	41.5	40.6
Sales of water heating units - Gas Furnace (%)	61.4	44.7	41.2	31	15.2	4.85	1.26
Sales of water heating units - Other (%)	1.49	1.12	1.13	1.1	1.04	1.01	1.01

Table 18: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018)		0	11.4	22.4	77.3	238	349
Public EV charging plugs - DC Fast (1000 units)	0.087		0.036		0.151		0.405
Public EV charging plugs - L2 (1000 units)	0.517		0.857		3.61		9.71
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 (%)	0.829	1.35	1.93	1.5	0.908	0.457	0.198
Vehicle sales - Light-duty - EV (%)	2.75	6.64	15.5	31.7	54.6	75.9	89.2
Vehicle sales - Light-duty - gasoline (%)	89.1	83.7	73.8	59.3	39.2	20.8	9.31
Vehicle sales - Light-duty - hybrid (%)	7.13	7.85	8.37	7.26	5.08	2.79	1.29
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.358	0.285	0.204	0.136	0.073	0.034
Vehicle sales - Light-duty - other (%)	0.071	0.073	0.065	0.055	0.038	0.02	0.009
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 FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 19: *E- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		73	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Natural Gas (million 2019\$)		33.7	21.9	10.1	4.93	1.66	1.07
Monetary damages from air pollution - Transportation (million 2019\$)		420	418	402	358	281	189
Premature deaths from air pollution - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		3.8	2.47	1.14	0.556	0.187	0.121
Premature deaths from air pollution - Transportation (deaths)		47.2	47.1	45.2	40.2	31.6	21.2

Table 20: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,166	5,788				
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	2.05	28.4	70.8	84.1	85.4	85.4	85.4
Sales of space heating units - Electric Resistance (%)	2.42	8.17	10.2	12.3	12.6	12.7	12.7
Sales of space heating units - Fossil (%)	1.05	3.87	0.737	0.031	0	0	0
Sales of space heating units - Gas Furnace (%)	94.5	59.5	18.2	3.63	1.98	1.93	1.91
Sales of water heating units - Electric Heat Pump (%)	0.085	10.5	54.6	64.5	64.9	64.9	64.9

Table 20: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	2.17	10.8	28.3	32.3	32.4	32.4	32.4
Sales of water heating units - Gas Furnace (%)	96.6	74.7	14.1	0.595	0	0	0
Sales of water heating units - Other (%)	1.11	3.93	2.93	2.68	2.68	2.68	2.68

Table 21: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.425	0.429	0.84	0.893	0.835	0.874

Table 22: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	46	46	43.8	40.6	38.1	37.2	37.7
Final energy use - Industry (PJ)	5.02	4.93	5.03	5.16	5.31	5.5	5.74
Final energy use - Residential (PJ)	19.8	18.7	17.2	15.1	13.5	12.5	12.1
Final energy use - Transportation (PJ)	31	28.7	26.1	22.8	19.8	18	17.2

Table 23: *E+RE+ 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)		0.402	0.417				
Sales of cooking units - Electric Resistance (%)	55.7	65.1	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.3	34.9	5.97	0.3	0	0	0
Sales of space heating units - Electric Heat Pump (%)	16.5	34.9	77.8	87.4	87.8	87.8	87.7
Sales of space heating units - Electric Resistance (%)	22.8	22.2	9.26	6.35	6.2	6.29	6.29
Sales of space heating units - Fossil (%)	1.63	2.49	1.11	0.815	0.808	0.783	0.781
Sales of space heating units - Gas (%)	59	40.4	11.8	5.45	5.16	5.18	5.18
Sales of water heating units - Electric Heat Pump (%)	0	9.33	49.4	58.4	58.8	58.8	58.8
Sales of water heating units - Electric Resistance (%)	37.1	50.9	42.3	40.4	40.3	40.2	40.2
Sales of water heating units - Gas Furnace (%)	61.4	38.7	7.32	0.309	0	0	0
Sales of water heating units - Other (%)	1.49	1.09	0.957	0.942	0.957	0.984	1

Table 24: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018)		66.3	174	275	420	454	434
Public EV charging plugs - DC Fast (1000 units)	0.087		0.099		0.395		0.632
Public EV charging plugs - L2 (1000 units)	0.517		2.37		9.48		15.2
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 (%)	0.809	1.15	0.981	0.307	0.063	0.013	0
Vehicle sales - Light-duty - EV (%)	6.39	22.9	57.2	86	96.8	99.3	100
Vehicle sales - Light-duty - gasoline (%)	85.8	69.2	37.6	12.2	2.74	0.574	0

Table 24: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hybrid (%)	6.82	6.32	3.99	1.4	0.353	0.08	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.106	0.296	0.147	0.043	0.01	0.002	0
Vehicle sales - Light-duty - other (%)	0.069	0.062	0.036	0.012	0.003	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 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 25: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Solar - Base land use assumptions (MW)	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Installed renewables - Solar - Constrained land use assumptions (MW)	16.8	16.8	16.8	16.8	16.8	16.8	16.8
Installed renewables - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0

Table 26: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	16	16	16	16	16	16	16
Solar - Constrained land use assumptions (GWh)	32.1	32.1	32.1	32.1	32.1	32.1	32.1
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		73	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Natural Gas (million 2019\$)		30.8	20.5	13.2	9.44	3.32	0.589
Monetary damages from air pollution - Transportation (million 2019\$)		411	374	279	160	70.5	25.3
Premature deaths from air pollution - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		3.48	2.32	1.49	1.07	0.374	0.066
Premature deaths from air pollution - Transportation (deaths)		46.2	42.1	31.4	17.9	7.93	2.84

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,166	5,788				
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	2.05	28.4	70.8	84.1	85.4	85.4	85.4
Sales of space heating units - Electric Resistance (%)	2.42	8.17	10.2	12.3	12.6	12.7	12.7
Sales of space heating units - Fossil (%)	1.05	3.87	0.737	0.031	0	0	0
Sales of space heating units - Gas Furnace (%)	94.5	59.5	18.2	3.63	1.98	1.93	1.91
Sales of water heating units - Electric Heat Pump (%)	0.085	10.5	54.6	64.5	64.9	64.9	64.9
Sales of water heating units - Electric Resistance (%)	2.17	10.8	28.3	32.3	32.4	32.4	32.4
Sales of water heating units - Gas Furnace (%)	96.6	74.7	14.1	0.595	0	0	0
Sales of water heating units - Other (%)	1.11	3.93	2.93	2.68	2.68	2.68	2.68

Table 29: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.425	0.429	0.84	0.893	0.835	0.874

Table 30: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	46	46	43.8	40.6	38.1	37.2	37.7
Final energy use - Industry (PJ)	5.02	4.93	5.03	5.16	5.31	5.5	5.74
Final energy use - Residential (PJ)	19.8	18.7	17.2	15.1	13.5	12.5	12.1
Final energy use - Transportation (PJ)	31	28.7	26.1	22.8	19.8	18	17.2

Table 31: *E+RE- 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)		0.402	0.417				
Sales of cooking units - Electric Resistance (%)	55.7	65.1	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.3	34.9	5.97	0.3	0	0	0
Sales of space heating units - Electric Heat Pump (%)	16.5	34.9	77.8	87.4	87.8	87.8	87.7
Sales of space heating units - Electric Resistance (%)	22.8	22.2	9.26	6.35	6.2	6.29	6.29
Sales of space heating units - Fossil (%)	1.63	2.49	1.11	0.815	0.808	0.783	0.781
Sales of space heating units - Gas (%)	59	40.4	11.8	5.45	5.16	5.18	5.18
Sales of water heating units - Electric Heat Pump (%)	0	9.33	49.4	58.4	58.8	58.8	58.8
Sales of water heating units - Electric Resistance (%)	37.1	50.9	42.3	40.4	40.3	40.2	40.2
Sales of water heating units - Gas Furnace (%)	61.4	38.7	7.32	0.309	0	0	0
Sales of water heating units - Other (%)	1.49	1.09	0.957	0.942	0.957	0.984	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018)		66.3	174	275	420	454	434
Public EV charging plugs - DC Fast (1000 units)	0.087		0.099		0.395		0.632
Public EV charging plugs - L2 (1000 units)	0.517		2.37		9.48		15.2
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 (%)	0.809	1.15	0.981	0.307	0.063	0.013	0
Vehicle sales - Light-duty - EV (%)	6.39	22.9	57.2	86	96.8	99.3	100
Vehicle sales - Light-duty - gasoline (%)	85.8	69.2	37.6	12.2	2.74	0.574	0
Vehicle sales - Light-duty - hybrid (%)	6.82	6.32	3.99	1.4	0.353	0.08	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.106	0.296	0.147	0.043	0.01	0.002	0
Vehicle sales - Light-duty - other (%)	0.069	0.062	0.036	0.012	0.003	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 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 33: *E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	0	0	0	0
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Solar - Base land use assumptions (MW)	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Installed renewables - Solar - Constrained land use assumptions (MW)	8.4	8.4	8.4	8.4	8.4	8.4	8.4
Installed renewables - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0

Table 34: *E+RE- scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	16	16	16	16	16	16	16
Solar - Constrained land use assumptions (GWh)	16	16	16	16	16	16	16
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

Table 35: *E+RE- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		73	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Natural Gas (million 2019\$)		21.1	16.5	18.7	14.2	4.88	1.57
Monetary damages from air pollution - Transportation (million 2019\$)		411	374	279	160	70.5	25.3
Premature deaths from air pollution - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		2.38	1.87	2.11	1.6	0.551	0.178
Premature deaths from air pollution - Transportation (deaths)		46.2	42.1	31.4	17.9	7.93	2.84

Table 36: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,159	5,728				
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	2.05	20.4	25.2	39.3	61.5	77.1	83.1
Sales of space heating units - Electric Resistance (%)	2.42	7.86	8.12	8.85	10.2	11.6	12.4
Sales of space heating units - Fossil (%)	1.05	4.47	4.15	3.13	1.52	0.487	0.128
Sales of space heating units - Gas Furnace (%)	94.5	67.3	62.5	48.8	26.8	10.8	4.39
Sales of water heating units - Electric Heat Pump (%)	0.085	2.04	7.05	21.5	43.6	58.1	63.1
Sales of water heating units - Electric Resistance (%)	2.17	7.4	9.35	15.1	24	29.7	31.7
Sales of water heating units - Gas Furnace (%)	96.6	86.4	79.5	59.7	29.2	9.32	2.43
Sales of water heating units - Other (%)	1.11	4.12	4.12	3.71	3.21	2.85	2.73

Table 37: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.36	0.356	0.467	0.477	0.862	0.916

Table 38: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	46	46.1	45.5	44.7	43.2	41.6	40.7
Final energy use - Industry (PJ)	5.02	4.93	5.04	5.23	5.42	5.65	5.91
Final energy use - Residential (PJ)	19.8	18.8	18.3	17.7	16.6	15.3	14
Final energy use - Transportation (PJ)	31.1	29	27.3	25.8	24.6	23.1	21.2

Table 39: *E-B+ 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)		0.401	0.411				
Sales of cooking units - Electric Resistance (%)	55.5	56.7	60.7	71.5	86.4	95.6	98.8
Sales of cooking units - Gas (%)	44.5	43.3	39.3	28.5	13.6	4.39	1.18
Sales of space heating units - Electric Heat Pump (%)	16.5	26.6	31.6	45.8	67.3	81.3	86.2

Table 39: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Resistance (%)	22.8	24.7	23	18.6	12.2	8.08	6.66
Sales of space heating units - Fossil (%)	1.63	2.76	2.65	2.23	1.53	1.04	0.878
Sales of space heating units - Gas (%)	59	45.9	42.7	33.4	19	9.58	6.31
Sales of water heating units - Electric Heat Pump (%)	0	1.61	6.17	19.3	39.5	52.6	57.2
Sales of water heating units - Electric Resistance (%)	37.1	52.6	51.5	48.6	44.3	41.5	40.6
Sales of water heating units - Gas Furnace (%)	61.4	44.7	41.2	31	15.2	4.85	1.26
Sales of water heating units - Other (%)	1.49	1.12	1.13	1.1	1.04	1.01	1.01

Table 40: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million \$2018)		0	11.4	22.4	77.3	238	349
Public EV charging plugs - DC Fast (1000 units)	0.087		0.036		0.151		0.405
Public EV charging plugs - L2 (1000 units)	0.517		0.857		3.61		9.71
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 (%)	0.829	1.35	1.93	1.5	0.908	0.457	0.198
Vehicle sales - Light-duty - EV (%)	2.75	6.64	15.5	31.7	54.6	75.9	89.2
Vehicle sales - Light-duty - gasoline (%)	89.1	83.7	73.8	59.3	39.2	20.8	9.31
Vehicle sales - Light-duty - hybrid (%)	7.13	7.85	8.37	7.26	5.08	2.79	1.29
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.358	0.285	0.204	0.136	0.073	0.034
Vehicle sales - Light-duty - other (%)	0.071	0.073	0.065	0.055	0.038	0.02	0.009
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 FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 41: 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 42: E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	0	0	0	0	0
Cumulative investment - All (million \$2018)		0	0	0	0	0	0

Table 42: E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	0
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	0
Trunk (km)		0	0	0	0	0	0

Table 43: 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, permitting costs (million \$2020)		0	0	0	0	0	0
Wells and facilities construction costs (million \$2020)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		73	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Natural Gas (million 2019\$)		32.3	20	11.7	9.48	5.64	1.63
Monetary damages from air pollution - Transportation (million 2019\$)		420	418	402	358	281	189
Premature deaths from air pollution - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		3.64	2.25	1.32	1.07	0.636	0.184
Premature deaths from air pollution - Transportation (deaths)		47.2	47.1	45.2	40.2	31.6	21.2

Table 45: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		5,089	5,292				
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Sales of space heating units - Electric Heat Pump (%)	2.05	24.3	48.7	68.8	72.1	72.4	72.4
Sales of space heating units - Electric Resistance (%)	2.42	8.6	12.6	19.8	24.7	25.6	25.7
Sales of space heating units - Fossil (%)	1.05	4.35	3.2	1.36	0.197	0.016	0
Sales of space heating units - Gas Furnace (%)	94.5	62.7	35.5	10	2.95	1.99	1.92
Sales of water heating units - Electric Heat Pump (%)	0.085	0.274	0.27	0.271	0.273	0.271	0.272
Sales of water heating units - Electric Resistance (%)	2.17	6.7	6.64	6.64	6.67	6.65	6.67
Sales of water heating units - Gas Furnace (%)	96.6	88.9	88.8	88.9	88.8	88.8	88.8
Sales of water heating units - Other (%)	1.11	4.16	4.29	4.22	4.28	4.31	4.29

Table 46: REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.398	0.398	0.818	0.868	0.949	1

Table 47: REF scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	46	46.7	47.1	47.1	47.3	48.7	51.4
Final energy use - Industry (PJ)	5.02	5.07	5.32	5.71	6.12	6.59	7.12
Final energy use - Residential (PJ)	19.8	18.9	18.7	18.7	18.9	19.4	20
Final energy use - Transportation (PJ)	31	28.9	27.4	26.4	26.6	27.2	27.9

Table 48: 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)		0.375	0.389				
Sales of cooking units - Electric Resistance (%)	55.1	55.1	55.1	55.1	55.1	55.1	55.1
Sales of cooking units - Gas (%)	44.9	44.9	44.9	44.9	44.9	44.9	44.9
Sales of space heating units - Electric Heat Pump (%)	14.5	42.1	43.3	45	46.3	47.7	49.7
Sales of space heating units - Electric Resistance (%)	23.5	20.4	19.9	19.2	18.5	17.2	14.9
Sales of space heating units - Fossil (%)	1.66	2.13	1.42	1.13	1.1	1.11	1.16
Sales of space heating units - Gas (%)	60.3	35.3	35.4	34.6	34.1	34	34.2
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	37.1	52.9	52.8	52.7	52.7	52.6	52.5
Sales of water heating units - Gas Furnace (%)	61.4	46	46	46.1	46.1	46.2	46.2
Sales of water heating units - Other (%)	1.49	1.13	1.16	1.18	1.2	1.22	1.24

Table 49: 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 (%)	0.812	1.33	2.07	1.93	1.72	1.6	1.52
Vehicle sales - Light-duty - EV (%)	6	8.83	9.58	11.9	14.2	15.7	17.1
Vehicle sales - Light-duty - gasoline (%)	86.2	81.8	79	76.4	74	72.4	71.1
Vehicle sales - Light-duty - hybrid (%)	6.85	7.63	8.97	9.46	9.8	9.98	10
Vehicle sales - Light-duty - hydrogen FC (%)	0.107	0.35	0.305	0.262	0.254	0.252	0.26
Vehicle sales - Light-duty - other (%)	0.069	0.072	0.07	0.07	0.069	0.068	0.069
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 FC (%)	0.175	0.208	0.242	0.285	0.339	0.409	0.487
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

Table 50: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		193	119	111	108	106	97.8
Monetary damages from air pollution - Natural Gas (million 2019\$)		27.4	29.7	34.2	34.7	32.1	31.5
Monetary damages from air pollution - Transportation (million 2019\$)		418	422	427	435	442	447
Premature deaths from air pollution - Coal (deaths)		21.8	13.5	12.6	12.2	12	11
Premature deaths from air pollution - Natural Gas (deaths)		3.09	3.36	3.87	3.92	3.63	3.56
Premature deaths from air pollution - Transportation (deaths)		47	47.5	48	48.9	49.7	50.2