Net-Zero America - District Of Columbia data

October 29, 2021 (updated January 9, 2022)

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

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Table 1: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		3.65	2.73	1.72	1.58	0.958	0.406
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.2	42.1	31.4	17.9	7.93	2.84
Premature deaths from air pollution - Gas Stations (deaths)		2.74	2.47	1.82	1.05	0.481	0.196
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.89	3.86	2.49	1.33	0.627	0.284
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.49	1.2	0.799	0.453	0.196	0.063
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.448	0.395	0.302	0.205	0.121	0.069
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.198	0.187	0.176	0.167	0.156	0.145
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.63	3.88	2.69	1.59	0.926	0.578
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.14	0.899	0.645	0.426	0.279	0.177
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.464	0.389	0.319	0.25	0.184	0.121
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.118	0.067	0.066	0.065	0.065	0.064
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		5.38	4.84	4.16	3.21	2.25	1.32
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		73.1	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		32.3	24.2	15.2	14	8.49	3.59
Monetary damages from air pollution - Mobile - On-Road (million $2019)		411	374	279	160	70.5	25.3
Monetary damages from air pollution - Gas Stations (million $2019)		24.3	21.9	16.2	9.32	4.26	1.74
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		43.3	34.2	22.1	11.8	5.56	2.52
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.2	10.6	7.08	4.02	1.73	0.554
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.97	3.5	2.68	1.82	1.07	0.614
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.75	1.65	1.56	1.47	1.38	1.28
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		41	34.4	23.8	14.1	8.19	5.12

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		10.1	7.96	5.71	3.77	2.47	1.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		4.1	3.45	2.82	2.22	1.63	1.07
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.04	0.587	0.581	0.572	0.578	0.567
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		47.8	43	36.9	28.5	20	11.7

Table 2: *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)		99.2	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)		1.83	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 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)		82.6	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
By education level - All sectors - High school diploma or less (jobs)		176	165	278	262	210	208
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 - Masters or professional degree (jobs)		21.3	19	30.3	28.1	22.3	21.8
By education level - All sectors - Doctoral degree (jobs)		2.84	2.54	3.54	3.21	2.52	2.41
Related work experience - All sectors - None (jobs)		61.8	57.1	96.5	90.7	72.5	71.4
Related work experience - All sectors - Up to 1 year (jobs)		79.1	74.3	124	117	93.8	92.9
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)		99.9	89.6	153	143	114	112
Related work experience - All sectors - Over 10 years (jobs)		26.1	23.2	39.6	37.1	29.6	29.1
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 - Up to 1 year (jobs)		275	252	417	390	311	306
On-the-Job Training - All sectors - 1 to 4 years (jobs)		90.3	81.6	144	136	109	107
On-the-Job Training - All sectors - 4 to 10 years (jobs)		29.6	26.9	49	46.4	37.2	36.8

Table 2: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		3.85	3.41	5.5	5.1	4.03	3.93
On-Site or In-Plant Training - All sectors - None (jobs)		66.6	60.8	99.3	92.7	73.8	72.4
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		250	229	382	358	286	281
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		69.7	63.1	111	105	83.7	82.7
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		30.7	27.7	49.2	46.4	37.1	36.6
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		3.69	3.38	6.22	5.91	4.74	4.7
Wage income - All (million $2019)		28.4	26	43.9	41.5	33.5	33.3

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

Item	2020	2025	2030	2035	2040	2045	2050
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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	31	28.7	26.1	22.8	19.8	18	17.2
Final energy use - Residential (PJ)	19.8	18.7	17.2	15.1	13.5	12.5	12.1
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

Table 5: *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 6: *E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	9.41	37.6	65.9	165	263	342	421
Vehicle stocks - LDV – All others (1000 units)	351	335	318	232	145	82.2	19.1
Light-duty vehicle capital costs vs. REF - 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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas (%)	59	40.4	11.8	5.45	5.16	5.18	5.18

Table 7: *E+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Fossil (%)	1.63	2.49	1.11	0.815	0.808	0.783	0.781
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
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
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.402	0.417				

Table 8: *E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas Furnace (%)	94.5	59.5	18.2	3.63	1.98	1.93	1.91
Sales of space heating units - Fossil (%)	1.05	3.87	0.737	0.031	0	0	0
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
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		5,166	5,788				

Table 9: *E+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	10.8	10.8	10.8	10.8	10.8	0	0
Installed thermal - Nuclear (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)	7.17	7.17	7.17	7.17	7.17	7.17	7.17
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

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

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

Table 10: *E+ scenario - PILLAR 2: Clean Electricity - Generation (continued)*

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

Table 11: *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 - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	0	0
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

Table 12: *E+ scenario - PILLAR 4: CCUS - CO2 pipelines*

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

Table 13: *E+ scenario - PILLAR 4: CCUS - CO2 storage*

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

Table 14: *E- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		3.8	2.47	1.14	0.556	0.187	0.121
Premature deaths from air pollution - Mobile - On-Road (deaths)		47.2	47.1	45.2	40.2	31.6	21.2
Premature deaths from air pollution - Gas Stations (deaths)		2.81	2.79	2.66	2.36	1.85	1.24
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.94	4.45	3.89	3.12	2.23	1.41
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.52	1.45	1.38	1.2	0.882	0.541
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.455	0.451	0.444	0.404	0.323	0.234

Table 14: *E- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.198	0.187	0.176	0.167	0.156	0.145
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.68	4.5	4.21	3.63	2.81	1.99
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.15	0.98	0.822	0.665	0.532	0.418
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.464	0.417	0.374	0.331	0.288	0.246
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.114	0.067	0.066	0.066	0.066	0.063
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		5.36	4.57	3.62	2.93	2.43	1.74
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		73.1	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		33.7	21.9	10.1	4.93	1.66	1.07
Monetary damages from air pollution - Mobile - On-Road (million $2019)		420	418	402	358	281	189
Monetary damages from air pollution - Gas Stations (million $2019)		24.8	24.7	23.6	20.9	16.3	11
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		43.8	39.4	34.4	27.6	19.8	12.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.5	12.8	12.2	10.6	7.81	4.79
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		4.03	4	3.93	3.58	2.86	2.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.75	1.65	1.56	1.47	1.38	1.28
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		41.4	39.9	37.3	32.1	24.8	17.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		10.2	8.67	7.27	5.88	4.71	3.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		4.1	3.69	3.31	2.93	2.55	2.17
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.01	0.588	0.585	0.579	0.578	0.554
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		47.6	40.6	32.2	26	21.6	15.5

Table 15: *E- scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		9.52	12.2	4.66	3	2.71	2.6
By economic sector - Construction (jobs)		92.5	82.2	93.2	91.6	177	177

Table 15: *E- scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		34.5	31.1	31	28.7	47.2	43.6
By economic sector - Mining (jobs)		60.4	41.6	28.4	19.3	12.5	6.28
By economic sector - Other (jobs)		1.36	1.62	3.13	3.47	9.24	9.51
By economic sector - Pipeline (jobs)		23	18.1	14	11.5	9.18	6.55
By economic sector - Professional (jobs)		40.7	33.5	32.3	31.1	60.7	58.4
By economic sector - Trade (jobs)		32	26.1	25.8	23.1	37.6	34.6
By economic sector - Utilities (jobs)		105	94.5	120	122	267	270
By resource sector - Biomass (jobs)		36.1	32.8	15.5	12.6	11.6	10.7
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		57	72	157	179	500	525
By resource sector - Natural Gas (jobs)		220	167	124	100	83.2	61
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		85.9	69.4	56.1	42	28.4	11.2
By education level - All sectors - High school diploma or less (jobs)		168	147	151	144	270	264
By education level - All sectors - Associates degree or some college (jobs)		124	105	112	108	205	200
By education level - All sectors - Bachelors degree (jobs)		84.8	69.8	69.8	64.8	117	113
By education level - All sectors - Masters or professional degree (jobs)		20.3	16.7	16.6	15.5	28.7	27.7
By education level - All sectors - Doctoral degree (jobs)		2.73	2.19	2.03	1.86	3.24	3.05
Related work experience - All sectors - None (jobs)		58.7	50.7	52.4	49.7	93	90.8
Related work experience - All sectors - Up to 1 year (jobs)		75.3	65.7	67.3	63.9	120	118
Related work experience - All sectors - 1 to 4 years (jobs)		146	124	128	121	225	219
Related work experience - All sectors - 4 to 10 years (jobs)		94.5	79.8	83.2	78.8	147	143
Related work experience - All sectors - Over 10 years (jobs)		24.6	20.7	21.6	20.4	38.1	37.1
On-the-Job Training - All sectors - None (jobs)		21	17.7	17.9	16.8	30.7	29.7
On-the-Job Training - All sectors - Up to 1 year (jobs)		261	224	228	215	400	390
On-the-Job Training - All sectors - 1 to 4 years (jobs)		85.1	72.5	77.1	73.6	139	137
On-the-Job Training - All sectors - 4 to 10 years (jobs)		27.8	23.8	25.8	24.9	47.5	46.7
On-the-Job Training - All sectors - Over 10 years (jobs)		3.67	3.08	3.13	2.93	5.22	5.04
On-Site or In-Plant Training - All sectors - None (jobs)		63.4	53.9	54.6	51.3	94.8	92.1
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		237	203	209	197	368	358
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		65.7	56.1	59.5	56.8	107	105
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		28.9	24.6	26.3	25.2	47.5	46.5
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		3.45	2.98	3.26	3.15	6.06	5.96
Wage income - All (million $2019)		27	23.1	24.1	23	43.1	42.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	31.1	29	27.3	25.8	24.6	23.1	21.2

Table 16: *E- scenario - PILLAR 1: Efficiency/Electrification - Overview (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	19.8	18.8	18.3	17.7	16.6	15.3	14
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

Table 17: *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 18: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.29	15.6	23.8	62.1	100	185	270
Vehicle stocks - LDV – All others (1000 units)	353	353	353	335	316	244	171
Light-duty vehicle capital costs vs. REF - 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

Table 19: *E- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas (%)	59	45.9	42.7	33.4	19	9.58	6.31
Sales of space heating units - Fossil (%)	1.63	2.76	2.65	2.23	1.53	1.04	0.878
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
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
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.401	0.411				

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

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas Furnace (%)	94.5	67.3	62.5	48.8	26.8	10.8	4.39
Sales of space heating units - Fossil (%)	1.05	4.47	4.15	3.13	1.52	0.487	0.128
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	1.11	4.12	4.12	3.71	3.21	2.85	2.73
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		5,159	5,728				

Table 21: *E- scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	10.8	10.8	10.8	10.8	10.8	0	0
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

Table 22: *E+RE+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		3.48	2.32	1.49	1.07	0.374	0.066
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.2	42.1	31.4	17.9	7.93	2.84
Premature deaths from air pollution - Gas Stations (deaths)		2.74	2.47	1.82	1.05	0.481	0.196
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.89	3.86	2.49	1.33	0.627	0.284
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.49	1.2	0.799	0.453	0.196	0.063
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.448	0.395	0.302	0.205	0.121	0.069
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.198	0.187	0.176	0.167	0.156	0.145
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.63	3.88	2.69	1.59	0.926	0.578
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.14	0.899	0.645	0.426	0.279	0.177
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.464	0.389	0.319	0.25	0.184	0.121
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.126	0.067	0.066	0.065	0.065	0.061
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		5.25	4.73	3.79	2.66	1.48	0.131
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		73.1	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		30.8	20.5	13.2	9.44	3.32	0.589
Monetary damages from air pollution - Mobile - On-Road (million $2019)		411	374	279	160	70.5	25.3
Monetary damages from air pollution - Gas Stations (million $2019)		24.3	21.9	16.2	9.32	4.26	1.74

Table 22: *E+RE+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		43.3	34.2	22.1	11.8	5.56	2.52
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.2	10.6	7.08	4.02	1.73	0.554
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.97	3.5	2.68	1.82	1.07	0.614
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.75	1.65	1.56	1.47	1.38	1.28
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		41	34.4	23.8	14.1	8.19	5.12
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		10.1	7.96	5.71	3.77	2.47	1.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		4.1	3.45	2.82	2.22	1.63	1.07
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.11	0.587	0.58	0.571	0.577	0.538
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		46.6	42	33.6	23.7	13.1	1.16

Table 23: *E+RE+ scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		7.86	16.3	6.03	3.84	3.1	2.27
By economic sector - Construction (jobs)		96.7	88.1	167	158	128	133
By economic sector - Manufacturing (jobs)		34.8	32.8	46.7	41	31.2	31.9
By economic sector - Mining (jobs)		58.7	39.8	22	10.1	3.19	1.73
By economic sector - Other (jobs)		1.82	2.04	8.46	8.68	7.33	7.68
By economic sector - Pipeline (jobs)		22.2	18.1	12.1	7.36	3.8	2.44
By economic sector - Professional (jobs)		41	43.2	61.9	57.5	46.3	45.9
By economic sector - Trade (jobs)		32.1	26.7	37.3	32.6	24.9	25.6
By economic sector - Utilities (jobs)		114	107	254	248	204	209
By resource sector - Biomass (jobs)		30.6	46	16.2	12.5	11.5	10
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		82.6	96.4	450	469	398	424
By resource sector - Natural Gas (jobs)		211	170	113	71	42.7	25.2
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		84.6	61.7	36.8	14.9	0	0
By education level - All sectors - High school diploma or less (jobs)		172	161	265	245	196	200
By education level - All sectors - Associates degree or some college (jobs)		128	115	201	187	149	151
By education level - All sectors - Bachelors degree (jobs)		86.4	76.7	118	107	84.1	84.8
By education level - All sectors - Masters or professional degree (jobs)		20.7	18.7	28.9	26.4	20.9	21
By education level - All sectors - Doctoral degree (jobs)		2.74	2.54	3.37	3	2.34	2.32
Related work experience - All sectors - None (jobs)		60.1	55.5	91.8	84.6	67.5	68.5
Related work experience - All sectors - Up to 1 year (jobs)		77	72.5	118	109	87.7	89.5

Table 23: *E+RE+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - 1 to 4 years (jobs)		150	136	223	205	163	165
Related work experience - All sectors - 4 to 10 years (jobs)		97.2	87.2	145	134	106	108
Related work experience - All sectors - Over 10 years (jobs)		25.3	22.6	37.6	34.6	27.6	28
On-the-Job Training - All sectors - None (jobs)		21.5	19.3	30.5	27.9	22.1	22.4
On-the-Job Training - All sectors - Up to 1 year (jobs)		267	246	397	365	290	295
On-the-Job Training - All sectors - 1 to 4 years (jobs)		88	79.1	137	127	102	103
On-the-Job Training - All sectors - 4 to 10 years (jobs)		28.8	26	46.4	43.3	34.7	35.2
On-the-Job Training - All sectors - Over 10 years (jobs)		3.75	3.3	5.19	4.71	3.71	3.75
On-Site or In-Plant Training - All sectors - None (jobs)		64.8	59.4	94.4	86.5	68.7	69.5
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		243	223	363	334	266	271
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		67.8	61.3	106	97.8	78.1	79.4
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		29.8	26.8	46.6	43.2	34.5	35
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		3.58	3.27	5.9	5.52	4.44	4.51
Wage income - All (million $2019)		27.7	25.4	41.7	38.7	31.1	32

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	31	28.7	26.1	22.8	19.8	18	17.2
Final energy use - Residential (PJ)	19.8	18.7	17.2	15.1	13.5	12.5	12.1
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

Table 25: *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 26: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	9.41	37.6	65.9	165	263	342	421
Vehicle stocks - LDV – All others (1000 units)	351	335	318	232	145	82.2	19.1
Light-duty vehicle capital costs vs. REF - 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

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	16.5	34.9	77.8	87.4	87.8	87.8	87.7

Table 27: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas (%)	59	40.4	11.8	5.45	5.16	5.18	5.18
Sales of space heating units - Fossil (%)	1.63	2.49	1.11	0.815	0.808	0.783	0.781
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
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
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.402	0.417				

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

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas Furnace (%)	94.5	59.5	18.2	3.63	1.98	1.93	1.91
Sales of space heating units - Fossil (%)	1.05	3.87	0.737	0.031	0	0	0
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
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		5,166	5,788				

Table 29: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	10.8	10.8	10.8	10.8	10.8	0	0
Installed thermal - Nuclear (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)	7.17	7.17	7.17	7.17	7.17	7.17	7.17
Installed renewables - Solar - Constrained land use assumptions (MW)	7.18	7.18	7.18	7.18	7.18	7.18	7.18
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0

Table 30: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generation*

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

Table 30: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generation (continued)*

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

Table 31: *E+RE- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		2.38	1.87	2.11	1.6	0.551	0.178
Premature deaths from air pollution - Mobile - On-Road (deaths)		46.2	42.1	31.4	17.9	7.93	2.84
Premature deaths from air pollution - Gas Stations (deaths)		2.74	2.47	1.82	1.05	0.481	0.196
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.89	3.86	2.49	1.33	0.627	0.284
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.49	1.2	0.799	0.453	0.196	0.063
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.448	0.395	0.302	0.205	0.121	0.069
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.198	0.187	0.176	0.167	0.156	0.145
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.63	3.88	2.69	1.59	0.926	0.578
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.14	0.899	0.645	0.426	0.279	0.177
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.464	0.389	0.319	0.25	0.184	0.121
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.11	0.066	0.066	0.065	0.065	0.061
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		5.48	5.15	4.97	4.34	3.63	2.71
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		73.1	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		21.1	16.5	18.7	14.2	4.88	1.57
Monetary damages from air pollution - Mobile - On-Road (million $2019)		411	374	279	160	70.5	25.3
Monetary damages from air pollution - Gas Stations (million $2019)		24.3	21.9	16.2	9.32	4.26	1.74
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		43.3	34.2	22.1	11.8	5.56	2.52

Table 31: *E+RE- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.2	10.6	7.08	4.02	1.73	0.554
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.97	3.5	2.68	1.82	1.07	0.614
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.75	1.65	1.56	1.47	1.38	1.28
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		41	34.4	23.8	14.1	8.19	5.12
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		10.1	7.96	5.71	3.77	2.47	1.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		4.1	3.45	2.82	2.22	1.63	1.07
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		0.967	0.587	0.581	0.572	0.578	0.538
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		48.7	45.7	44.1	38.6	32.2	24

Table 32: *E+RE- scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		8.94	12.8	4.28	3.53	3.25	2.82
By economic sector - Construction (jobs)		102	96.6	189	188	159	161
By economic sector - Manufacturing (jobs)		35.8	33	50.8	47.3	38.4	37.4
By economic sector - Mining (jobs)		61.3	43.5	30.4	20.1	12.4	7.66
By economic sector - Other (jobs)		1.82	2.08	8.49	8.71	7.37	7.82
By economic sector - Pipeline (jobs)		23.7	20.5	18.8	16.3	12.8	10.2
By economic sector - Professional (jobs)		41.5	36.6	64.3	61.8	50.9	50.4
By economic sector - Trade (jobs)		32.3	26.8	40.8	37.3	30.1	29.4
By economic sector - Utilities (jobs)		120	117	280	281	237	242
By resource sector - Biomass (jobs)		31.3	32.8	14.7	13.2	12.7	11.7
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		82.6	97.3	450	469	398	428
By resource sector - Natural Gas (jobs)		229	196	182	162	131	106
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		84.6	63	39.5	21	9.55	2.83
By education level - All sectors - High school diploma or less (jobs)		180	167	294	286	238	238
By education level - All sectors - Associates degree or some college (jobs)		134	122	225	219	183	182
By education level - All sectors - Bachelors degree (jobs)		89.6	78.2	131	125	103	101
By education level - All sectors - Masters or professional degree (jobs)		21.4	18.7	32	30.5	25.1	24.7
By education level - All sectors - Doctoral degree (jobs)		2.82	2.4	3.7	3.46	2.82	2.73
Related work experience - All sectors - None (jobs)		62.9	58	102	99.4	82.6	82.2
Related work experience - All sectors - Up to 1 year (jobs)		80.3	74.5	131	127	106	106
Related work experience - All sectors - 1 to 4 years (jobs)		156	141	248	240	199	197

Table 32: *E+RE- scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - 4 to 10 years (jobs)		101	91.3	163	158	131	130
Related work experience - All sectors - Over 10 years (jobs)		26.4	23.6	42.1	40.7	33.7	33.5
On-the-Job Training - All sectors - None (jobs)		22.3	19.9	34	32.6	26.9	26.7
On-the-Job Training - All sectors - Up to 1 year (jobs)		278	253	440	425	352	350
On-the-Job Training - All sectors - 1 to 4 years (jobs)		92.1	83.9	154	150	125	124
On-the-Job Training - All sectors - 4 to 10 years (jobs)		30.3	27.9	52.5	51.5	43	42.9
On-the-Job Training - All sectors - Over 10 years (jobs)		3.92	3.5	5.9	5.67	4.69	4.63
On-Site or In-Plant Training - All sectors - None (jobs)		67.6	61.1	105	101	84	83.3
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		253	231	404	390	324	322
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		71	64.8	118	115	95.8	95.4
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		31.3	28.7	52.7	51.5	42.9	42.7
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		3.76	3.48	6.64	6.51	5.44	5.43
Wage income - All (million $2019)		28.9	26.3	46.6	45.5	38.2	38.3

Table 33: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	31	28.7	26.1	22.8	19.8	18	17.2
Final energy use - Residential (PJ)	19.8	18.7	17.2	15.1	13.5	12.5	12.1
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

Table 34: *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 35: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	9.41	37.6	65.9	165	263	342	421
Vehicle stocks - LDV – All others (1000 units)	351	335	318	232	145	82.2	19.1
Light-duty vehicle capital costs vs. REF - 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

Table 36: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas (%)	59	40.4	11.8	5.45	5.16	5.18	5.18

Table 36: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Fossil (%)	1.63	2.49	1.11	0.815	0.808	0.783	0.781
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
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
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.402	0.417				

Table 37: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas Furnace (%)	94.5	59.5	18.2	3.63	1.98	1.93	1.91
Sales of space heating units - Fossil (%)	1.05	3.87	0.737	0.031	0	0	0
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
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		5,166	5,788				

Table 38: *E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	10.8	10.8	10.8	10.8	10.8	0	10.8
Installed thermal - Nuclear (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)	7.17	7.17	7.17	7.17	7.17	7.17	7.17
Installed renewables - Solar - Constrained land use assumptions (MW)	7.18	7.18	7.18	7.18	7.18	7.18	7.18
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0	0	0	0

Table 39: *E+RE- scenario - PILLAR 2: Clean Electricity - Generation*

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

Table 39: *E+RE- scenario - PILLAR 2: Clean Electricity - Generation (continued)*

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

Table 40: *E-B+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		8.25	0.006	0.006	0.005	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		3.64	2.25	1.32	1.07	0.636	0.184
Premature deaths from air pollution - Mobile - On-Road (deaths)		47.2	47.1	45.2	40.2	31.6	21.2
Premature deaths from air pollution - Gas Stations (deaths)		2.81	2.79	2.66	2.36	1.85	1.24
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.94	4.45	3.89	3.12	2.23	1.41
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.52	1.45	1.38	1.2	0.882	0.541
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.455	0.451	0.444	0.404	0.323	0.234
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.198	0.187	0.176	0.167	0.156	0.145
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.68	4.5	4.21	3.63	2.81	1.99
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.15	0.98	0.822	0.665	0.532	0.418
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.464	0.417	0.374	0.331	0.288	0.246
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.117	0.067	0.066	0.066	0.066	0.065
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		5.36	4.57	3.62	2.93	2.43	1.74
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		73.1	0.05	0.049	0.045	0.032	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		32.3	20	11.7	9.48	5.64	1.63
Monetary damages from air pollution - Mobile - On-Road (million $2019)		420	418	402	358	281	189
Monetary damages from air pollution - Gas Stations (million $2019)		24.8	24.7	23.6	20.9	16.3	11
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		43.8	39.4	34.4	27.6	19.8	12.5

Table 40: *E-B+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.5	12.8	12.2	10.6	7.81	4.79
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		4.03	4	3.93	3.58	2.86	2.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.75	1.65	1.56	1.47	1.38	1.28
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		41.4	39.9	37.3	32.1	24.8	17.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		10.2	8.67	7.27	5.88	4.71	3.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		4.1	3.69	3.31	2.93	2.55	2.17
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.03	0.588	0.585	0.579	0.585	0.571
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		47.6	40.6	32.2	26	21.6	15.5

Table 41: *E-B+ scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		8.71	12.2	4.56	3.37	2.8	2.47
By economic sector - Construction (jobs)		91.6	82	94.1	92.9	176	175
By economic sector - Manufacturing (jobs)		34.1	31	31.2	29.8	47.3	43.1
By economic sector - Mining (jobs)		59.9	41.5	28.7	20.3	12.2	5.67
By economic sector - Other (jobs)		1.36	1.62	3.13	3.48	9.25	9.52
By economic sector - Pipeline (jobs)		22.7	18.1	14.3	11.8	8.85	6.09
By economic sector - Professional (jobs)		40.1	33.5	32.4	32.2	61.4	58.6
By economic sector - Trade (jobs)		31.9	26.1	26	24	37.8	34.3
By economic sector - Utilities (jobs)		104	94.3	121	123	266	268
By resource sector - Biomass (jobs)		34.6	32.8	15.4	14.2	13	11.7
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		57	72	157	179	500	525
By resource sector - Natural Gas (jobs)		217	166	127	102	79.5	57.5
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		85.9	69.4	56.1	45.3	28.8	9.19
By education level - All sectors - High school diploma or less (jobs)		165	147	153	147	269	262
By education level - All sectors - Associates degree or some college (jobs)		122	105	114	109	204	199
By education level - All sectors - Bachelors degree (jobs)		83.9	69.7	70.3	66.4	117	112
By education level - All sectors - Masters or professional degree (jobs)		20.1	16.6	16.8	15.9	28.7	27.5
By education level - All sectors - Doctoral degree (jobs)		2.7	2.19	2.05	1.92	3.26	3.04
Related work experience - All sectors - None (jobs)		57.9	50.6	52.9	50.7	92.7	90.1
Related work experience - All sectors - Up to 1 year (jobs)		74.3	65.6	67.9	65.3	120	117
Related work experience - All sectors - 1 to 4 years (jobs)		144	124	129	123	224	217

Table 41: *E-B+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - 4 to 10 years (jobs)		93.5	79.6	83.9	80.3	146	142
Related work experience - All sectors - Over 10 years (jobs)		24.4	20.7	21.8	20.8	38	36.8
On-the-Job Training - All sectors - None (jobs)		20.8	17.6	18.1	17.2	30.6	29.5
On-the-Job Training - All sectors - Up to 1 year (jobs)		258	223	230	220	400	387
On-the-Job Training - All sectors - 1 to 4 years (jobs)		84.2	72.4	77.8	74.8	139	135
On-the-Job Training - All sectors - 4 to 10 years (jobs)		27.5	23.8	26.1	25.2	47.2	46.3
On-the-Job Training - All sectors - Over 10 years (jobs)		3.63	3.07	3.16	2.99	5.2	4.99
On-Site or In-Plant Training - All sectors - None (jobs)		62.7	53.8	55	52.4	94.5	91.4
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		235	203	210	201	367	355
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		65	56	60	57.7	107	104
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		28.6	24.6	26.6	25.6	47.2	46.1
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		3.42	2.98	3.29	3.2	6.03	5.92
Wage income - All (million $2019)		26.7	23.1	24.3	23.4	42.9	42.1

Table 42: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	31.1	29	27.3	25.8	24.6	23.1	21.2
Final energy use - Residential (PJ)	19.8	18.8	18.3	17.7	16.6	15.3	14
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

Table 43: *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 44: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	7.29	15.6	23.8	62.1	100	185	270
Vehicle stocks - LDV – All others (1000 units)	353	353	353	335	316	244	171
Light-duty vehicle capital costs vs. REF - 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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas (%)	59	45.9	42.7	33.4	19	9.58	6.31

Table 45: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Fossil (%)	1.63	2.76	2.65	2.23	1.53	1.04	0.878
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
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
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.401	0.411				

Table 46: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas Furnace (%)	94.5	67.3	62.5	48.8	26.8	10.8	4.39
Sales of space heating units - Fossil (%)	1.05	4.47	4.15	3.13	1.52	0.487	0.128
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
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		5,159	5,728				

Table 47: *E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	10.8	10.8	10.8	10.8	10.8	0	0
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

Table 48: *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 - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	0	0
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

Table 49: *E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines*

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	0

Table 49: *E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines (continued)*

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

Table 50: *E-B+ scenario - PILLAR 4: CCUS - CO2 storage*

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

Table 51: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		21.8	13.5	12.6	12.2	12	11
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		3.09	3.36	3.87	3.92	3.63	3.56
Premature deaths from air pollution - Mobile - On-Road (deaths)		47	47.5	48	48.9	49.7	50.2
Premature deaths from air pollution - Gas Stations (deaths)		2.79	2.81	2.83	2.88	2.91	2.92
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		4.85	4.45	4.19	4.1	4.12	4.11
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.45	1.19	0.827	0.525	0.312	0.196
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		0.434	0.423	0.42	0.426	0.434	0.439
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.206	0.204	0.203	0.201	0.199	0.195
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		4.71	4.57	4.23	3.86	3.7	3.78
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.17	1.07	0.955	0.846	0.784	0.749
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.484	0.495	0.508	0.521	0.532	0.542
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.211	0.155	0.132	0.126	0.123	0.116
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		5.41	5.76	5.94	5.65	5.65	5.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		193	119	111	108	106	97.9

Table 51: *REF scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		27.4	29.7	34.2	34.7	32.1	31.5
Monetary damages from air pollution - Mobile - On-Road (million $2019)		418	422	427	435	442	447
Monetary damages from air pollution - Gas Stations (million $2019)		24.7	24.9	25	25.5	25.8	25.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		43	39.4	37.2	36.3	36.5	36.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		12.8	10.5	7.33	4.65	2.76	1.73
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		3.84	3.75	3.72	3.78	3.84	3.89
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.83	1.81	1.79	1.78	1.76	1.73
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		41.7	40.5	37.5	34.2	32.8	33.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		10.4	9.44	8.45	7.49	6.94	6.63
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		4.29	4.38	4.5	4.61	4.71	4.8
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.86	1.37	1.16	1.11	1.09	1.03
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		48	51.2	52.7	50.2	50.2	48

Table 52: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		8.26	7.41	7.32	5.96	5.95	6.45
By economic sector - Construction (jobs)		94.9	105	208	210	226	234
By economic sector - Manufacturing (jobs)		34.4	34.2	58.2	57.7	60.7	62.1
By economic sector - Mining (jobs)		61.3	51.5	42.9	34	28.8	24.1
By economic sector - Other (jobs)		1.4	1.63	8.23	8.48	9.18	9.49
By economic sector - Pipeline (jobs)		23.5	25	25.6	23.7	23.9	23.4
By economic sector - Professional (jobs)		39.6	39.7	76.5	74.6	77.4	77.1
By economic sector - Trade (jobs)		31.7	29.1	46.6	45.3	46.8	46.8
By economic sector - Utilities (jobs)		108	122	295	296	317	324
By resource sector - Biomass (jobs)		31.9	29.8	27.7	24.8	25.3	25.8
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		59.6	73.6	436	454	495	519
By resource sector - Natural Gas (jobs)		226	241	245	222	223	212
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		86.2	70.7	60.3	55.2	52.6	50.7
By education level - All sectors - High school diploma or less (jobs)		169	175	328	324	342	349
By education level - All sectors - Associates degree or some college (jobs)		126	131	250	247	260	264
By education level - All sectors - Bachelors degree (jobs)		85.5	85.5	150	146	152	153

Table 52: *REF scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Masters or professional degree (jobs)		20.4	20.4	36.5	35.5	36.9	37
By education level - All sectors - Doctoral degree (jobs)		2.71	2.66	4.4	4.22	4.34	4.3
Related work experience - All sectors - None (jobs)		59.3	61.4	114	113	119	121
Related work experience - All sectors - Up to 1 year (jobs)		75.7	77.7	146	144	152	155
Related work experience - All sectors - 1 to 4 years (jobs)		147	151	279	274	288	292
Related work experience - All sectors - 4 to 10 years (jobs)		95.8	99	183	180	189	191
Related work experience - All sectors - Over 10 years (jobs)		25	25.6	47.2	46.4	48.7	49.3
On-the-Job Training - All sectors - None (jobs)		21.2	21.4	38.3	37.5	39.3	39.7
On-the-Job Training - All sectors - Up to 1 year (jobs)		263	269	494	486	510	518
On-the-Job Training - All sectors - 1 to 4 years (jobs)		86.6	90.7	171	169	178	181
On-the-Job Training - All sectors - 4 to 10 years (jobs)		28.4	30.3	58.2	57.6	61	62.1
On-the-Job Training - All sectors - Over 10 years (jobs)		3.73	3.84	6.69	6.56	6.89	6.98
On-Site or In-Plant Training - All sectors - None (jobs)		64	65.4	119	116	122	123
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		240	245	452	445	468	475
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		66.8	69.7	132	130	137	139
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		29.4	31.2	58.7	58	61.2	62.3
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		3.52	3.76	7.33	7.27	7.69	7.84
Wage income - All (million $2019)		27.3	28.3	52.4	52	55.3	56.7

Table 53: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	31	28.9	27.4	26.4	26.6	27.2	27.9
Final energy use - Residential (PJ)	19.8	18.9	18.7	18.7	18.9	19.4	20
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

Table 54: *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 55: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas (%)	60.3	35.3	35.4	34.6	34.1	34	34.2
Sales of space heating units - Fossil (%)	1.66	2.13	1.42	1.13	1.1	1.11	1.16

Table 55: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
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
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
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.375	0.389				

Table 56: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Gas Furnace (%)	94.5	62.7	35.5	10	2.95	1.99	1.92
Sales of space heating units - Fossil (%)	1.05	4.35	3.2	1.36	0.197	0.016	0
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
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		5,089	5,292				

Table 57: *REF scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	10.8	10.8	10.8	10.8	10.8	0	0
Installed thermal - Nuclear (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)	7.17	7.17	7.17	7.17	7.17	7.17	7.17

Table 58: *REF scenario - PILLAR 2: Clean Electricity - Generation*

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