Net-Zero America - district of columbia state report v2

Larson et al. 2020

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Reading guide

IN DRAFT

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

variable_name	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr	0	0.402	0.417	0	0	0	0
Sale of space heating units by type - Electric Heat Pump	0.165	0.349	0.778	0.874	0.878	0.878	0.877
Sale of space heating units by type - Electric Resistance	0.228	0.222	0.093	0.063	0.062	0.063	0.063
Sale of space heating units by type - Fossil	0.016	0.025	0.011	0.008	0.008	0.008	0.008
Sale of space heating units by type - Gas	0.59	0.404	0.118	0.054	0.052	0.052	0.052
Sales of cooking units - Electric Resistance	0.557	0.651	0.94	0.997	1	1	1
Sales of cooking units - Gas	0.443	0.349	0.06	0.003	0	0	0
Sales of water heating units by type - Electric Heat Pump	0	0.093	0.494	0.584	0.588	0.588	0.588
Sales of water heating units by type - Electric Resistance	0.371	0.509	0.423	0.404	0.403	0.402	0.402
Sales of water heating units by type - Gas Furnace	0.614	0.387	0.073	0.003	0	0	0
Sales of water heating units by type - Other	0.015	0.011	0.01	0.009	0.01	0.01	0.01

Table 2: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

variable_name	2020	2025	2030	2035	2040	2045	2050
End-use technology sales by technology - HDV - diesel	0.972	0.921	0.67	0.233	0.042	0.006	0
End-use technology sales by technology - HDV - EV	0.006	0.038	0.19	0.456	0.574	0.596	0.6
End-use technology sales by technology - HDV - gasoline	0.002	0.002	0.002	0.001	0	0	0
End-use technology sales by technology - HDV - hybrid	0.001	0.001	0.001	0	0	0	0
End-use technology sales by technology - HDV - hydrogen FC	0.004	0.025	0.127	0.304	0.382	0.397	0.4
End-use technology sales by technology - HDV - other	0.015	0.012	0.011	0.006	0.002	0	0
End-use technology sales by technology - LDV - diesel	0.008	0.012	0.01	0.003	0.001	0	0
End-use technology sales by technology - LDV - EV	0.064	0.229	0.572	0.86	0.968	0.993	1
End-use technology sales by technology - LDV - gasoline	0.858	0.692	0.376	0.122	0.027	0.006	0
End-use technology sales by technology - LDV - hybrid	0.068	0.063	0.04	0.014	0.004	0.001	0
End-use technology sales by technology - LDV - hydrogen FC	0.001	0.003	0.001	0	0	0	0
End-use technology sales by technology - LDV - other	0.001	0.001	0	0	0	0	0
End-use technology sales by technology - MDV - diesel	0.647	0.597	0.423	0.144	0.026	0.004	0
End-use technology sales by technology - MDV - EV	0.008	0.051	0.253	0.608	0.765	0.795	0.8
End-use technology sales by technology - MDV - gasoline	0.337	0.333	0.255	0.093	0.018	0.003	0
End-use technology sales by technology - MDV - hybrid	0.004	0.004	0.003	0.001	0	0	0
End-use technology sales by technology - MDV - hydrogen FC	0.002	0.013	0.063	0.152	0.191	0.199	0.2
End-use technology sales by technology - MDV - other	0.003	0.003	0.002	0.001	0	0	0
Light-duty vehicle capital costs - Cumulative 5-yr	0	66260740	173967329	275208300	419545723	453725792	434169911
Number of public EV charging plugs - DC Fast Charging	87	0	98.786	0	395.148	0	631.973
Number of public EV charging plugs - L2 Charging	517	0	2370.9	0	9483.5	0	15167.3

Table 3: *E- scenario - PILLAR 2: Clean Electricity - Generating capacity*

variable_name	2025	2030	2035	2040	2045	2050
Power generation capital investment - Solar PV - Base	0	0	0	0	0	0
Power generation capital investment - Solar PV - Constrained	0.01	0	0	0	0	0

Table 4: *E- scenario - PILLAR 2: Clean Electricity - Transmission*

variable_name	2020	2025	2030	2035	2040	2045	2050
HV transmission for wind and solar - base all	0	0.345	0.345	0.345	0.345	0.345	0.345
HV transmission for wind and solar - base other intra-state	0	0	0	0	0	0	0
HV transmission for wind and solar - base spur intra-state	0	0.162	0.162	0.162	0.162	0.162	0.162
HV transmission for wind and solar - constrained all	0	0	0	0	0	0	0
HV transmission for wind and solar - constrained other intra-state	0	0	0	0	0	0	0
HV transmission for wind and solar - constrained spur intra-state	0	0	0	0	0	0	0

Table 5: *E- scenario - PILLAR 4: CO2 capture, use, storage - CO2 capture*

variable_name	2025	2030	2035	2040	2045	2050
Annual - All	0	0	0	0	0	0
Annual - BECCS	0	0	0	0	0	0
Annual - Cement	0	0	0	0	0	0
Annual - NGCC	0	0	0	0	0	0
Cumulative - All	0	0	0	0	0	0
Cumulative - BECCS	0	0	0	0	0	0
Cumulative - Cement	0	0	0	0	0	0
Cumulative - NGCC	0	0	0	0	0	0

Table 6: *E- scenario - PILLAR 4: CO2 capture, use, storage - CO2 storage*

variable_name	2025	2030	2035	2040	2045	2050
Annual	0	0	0	0	0	0
Injection wells	0	0	0	0	0	0
Resource characterization, appraisal and permitting costs cumulative	0	0	0	0	0	0
Wells and facilities construction costs cumulative	0	0	0	0	0	0

Table 7: *E- scenario - PILLAR 4: CO2 capture, use, storage - CO2 transportation*

variable_name	2025	2030	2035	2040	2045	2050
CO2 pipelines - All	0	0	0	0	0	0
CO2 pipelines - Spur	0	0	0	0	0	0
CO2 pipelines - Trunk	0	0	0	0	0	0

Table 8: *E- scenario - IMPACTS - Jobs*

variable_name	2020	2025	2030	2035	2040	2045	2050
Jobs by economic sector - agriculture	6.778	7.814	15.866	6.064	4.704	3.458	2.57
Jobs by economic sector - construction	88.316	99.262	91.729	176.425	170.038	137.845	138.569
Jobs by economic sector - manufacturing	33.985	35.714	33.395	48.837	44.313	34.567	32.944
Jobs by economic sector - mining	74.884	59.973	41.422	25.805	14.645	6.805	2.933
Jobs by economic sector - other	1.097	1.838	2.08	8.473	8.7	7.357	7.685
Jobs by economic sector - pipeline	23.208	22.953	19.072	14.836	10.745	6.476	4.143
Jobs by economic sector - professional	37.192	42.942	41.988	63.745	59.78	48.262	46.948
Jobs by economic sector - trade	34.442	33.289	27.165	39.097	34.999	27.389	26.305
Jobs by economic sector - utilities	97.774	117.159	111.104	264.287	259.716	212.717	215.46
Jobs by resource sector - Biomass	28.097	33.537	43.745	17.272	14.161	12.61	10.974
Jobs by resource sector - CO2	0	0	0	0	0	0	0
Jobs by resource sector - Grid	42.267	82.924	97.323	450.396	469.015	397.985	423.844
Jobs by resource sector - Natural Gas	224.547	219.884	179.776	140.443	103.426	66.067	42.739
Jobs by resource sector - Nuclear	0	0	0	0	0	0	0
Jobs by resource sector - Oil	102.768	84.6	62.976	39.459	21.039	8.213	0
Median wages - All	73995.3	74627.7	74875.2	75337.5	76224.8	77228.6	78279.6
Required Level of Education - Associates degree or some college	122.51	131.428	118.925	211.432	199.598	159.66	157.686
Required Level of Education - Bachelors degree	86.633	89.018	78.263	124.109	114.551	90.526	88.162
Required Level of Education - Doctoral degree	2.747	2.841	2.54	3.539	3.207	2.518	2.405
Required Level of Education - High school diploma or less	165.19	176.305	165.114	278.155	262.169	209.865	207.519
Required Level of Education - Masters or professional degree	20.597	21.352	18.977	30.334	28.116	22.306	21.786
Wage income - All	29426860	31414903	28739386	48788442	46319471	37448010	37384900

Table 9: *E- scenario - IMPACTS - Fossil fuel industries*

variable_name	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption	24007.6	24364.2	20537.6	16472	12399.9	7801.6	5411
Oil consumption	2108.2	1903	1543.7	1047.7	601.463	251.329	0

Table 10: *E- scenario - PILLAR 1: Efficiency/Electrification - Overview*

variable_name	2020	2025	2030	2035	2040	2045	2050
Final energy demand by sector - commercial	0.046	0.046	0.044	0.041	0.038	0.037	0.038
Final energy demand by sector - industry	0.005	0.005	0.005	0.005	0.005	0.005	0.006
Final energy demand by sector - residential	0.02	0.019	0.017	0.015	0.013	0.013	0.012
Final energy demand by sector - transportation	0.031	0.029	0.026	0.023	0.02	0.018	0.017

Table 11: *E- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

variable_name	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr	0	5165585264	5787739977	0	0	0	0
Sales of cooking units - Electric Resistance	0.32	0.46	0.799	0.865	0.869	0.869	0.869
Sales of cooking units - Gas	0.68	0.54	0.201	0.135	0.131	0.131	0.131
Sales of space heating units - Electric Heat Pump	0.02	0.284	0.708	0.841	0.854	0.854	0.854
Sales of space heating units - Electric Resistance	0.024	0.082	0.102	0.123	0.126	0.127	0.127
Sales of space heating units - Fossil	0.011	0.039	0.007	0	0	0	0
Sales of space heating units - Gas Furnace	0.945	0.595	0.182	0.036	0.02	0.019	0.019
Sales of water heating units - Electric Heat Pump	0.001	0.105	0.546	0.645	0.649	0.649	0.649
Sales of water heating units - Electric Resistance	0.022	0.108	0.283	0.323	0.324	0.324	0.324
Sales of water heating units - Gas Furnace	0.966	0.747	0.141	0.006	0	0	0
Sales of water heating units - Other	0.011	0.039	0.029	0.027	0.027	0.027	0.027

Table 12: *E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

variable_name	2025	2030	2035	2040	2045	2050
Electricity distribution peak load (capital invested) - Cumulative 5-yr	0.425	0.429	0.84	0.893	0.835	0.874

Table 13: *RE- scenario - PILLAR 1: Efficiency/Electrification - Residential*

variable_name	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr	0	0.375	0.389	0	0	0	0
Sale of space heating units by type - Electric Heat Pump	0.145	0.421	0.433	0.45	0.463	0.477	0.497
Sale of space heating units by type - Electric Resistance	0.235	0.204	0.199	0.192	0.185	0.172	0.149
Sale of space heating units by type - Fossil	0.017	0.021	0.014	0.011	0.011	0.011	0.012
Sale of space heating units by type - Gas	0.603	0.353	0.354	0.346	0.341	0.34	0.342
Sales of cooking units - Electric Resistance	0.551	0.551	0.551	0.551	0.551	0.551	0.551
Sales of cooking units - Gas	0.449	0.449	0.449	0.449	0.449	0.449	0.449
Sales of water heating units by type - Electric Heat Pump	0	0	0	0	0	0	0
Sales of water heating units by type - Electric Resistance	0.371	0.529	0.528	0.527	0.527	0.526	0.525
Sales of water heating units by type - Gas Furnace	0.614	0.46	0.46	0.461	0.461	0.462	0.462
Sales of water heating units by type - Other	0.015	0.011	0.012	0.012	0.012	0.012	0.012

Table 14: *RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

variable_name	2020	2025	2030	2035	2040	2045	2050
End-use technology sales by technology - HDV - diesel	0.981	0.982	0.979	0.97	0.956	0.935	0.916
End-use technology sales by technology - HDV - EV	0	0	0	0	0	0	0
End-use technology sales by technology - HDV - gasoline	0.002	0.002	0.003	0.003	0.003	0.003	0.003
End-use technology sales by technology - HDV - hybrid	0.001	0.001	0.001	0.001	0.002	0.002	0.002
End-use technology sales by technology - HDV - hydrogen FC	0.001	0.001	0.002	0.002	0.002	0.002	0.003
End-use technology sales by technology - HDV - other	0.015	0.013	0.016	0.024	0.037	0.057	0.076
End-use technology sales by technology - LDV - diesel	0.008	0.013	0.021	0.019	0.017	0.016	0.015
End-use technology sales by technology - LDV - EV	0.06	0.088	0.096	0.119	0.142	0.157	0.171
End-use technology sales by technology - LDV - gasoline	0.862	0.818	0.79	0.764	0.74	0.724	0.711
End-use technology sales by technology - LDV - hybrid	0.069	0.076	0.09	0.095	0.098	0.1	0.1
End-use technology sales by technology - LDV - hydrogen FC	0.001	0.004	0.003	0.003	0.003	0.003	0.003
End-use technology sales by technology - LDV - other	0.001	0.001	0.001	0.001	0.001	0.001	0.001
End-use technology sales by technology - MDV - diesel	0.652	0.635	0.616	0.596	0.58	0.565	0.552
End-use technology sales by technology - MDV - EV	0	0.001	0.003	0.007	0.009	0.01	0.01
End-use technology sales by technology - MDV - gasoline	0.34	0.355	0.37	0.385	0.397	0.408	0.417
End-use technology sales by technology - MDV - hybrid	0.004	0.004	0.005	0.006	0.007	0.008	0.009
End-use technology sales by technology - MDV - hydrogen FC	0.002	0.002	0.002	0.003	0.003	0.004	0.005
End-use technology sales by technology - MDV - other	0.003	0.003	0.003	0.003	0.004	0.005	0.007

Table 15: *RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

variable_name	2020	2025	2030	2035	2040	2045	2050
Final energy demand by sector - commercial	0.046	0.047	0.047	0.047	0.047	0.049	0.051
Final energy demand by sector - industry	0.005	0.005	0.005	0.006	0.006	0.007	0.007
Final energy demand by sector - residential	0.02	0.019	0.019	0.019	0.019	0.019	0.02
Final energy demand by sector - transportation	0.031	0.029	0.027	0.026	0.027	0.027	0.028

Table 16: *RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

variable_name	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr	0	5088685943	5291575294	0	0	0	0
Sales of cooking units - Electric Resistance	0.32	0.343	0.343	0.343	0.344	0.343	0.343
Sales of cooking units - Gas	0.68	0.657	0.657	0.657	0.656	0.657	0.657
Sales of space heating units - Electric Heat Pump	0.02	0.243	0.487	0.688	0.721	0.724	0.724
Sales of space heating units - Electric Resistance	0.024	0.086	0.126	0.198	0.247	0.256	0.257
Sales of space heating units - Fossil	0.011	0.043	0.032	0.014	0.002	0	0
Sales of space heating units - Gas Furnace	0.945	0.627	0.355	0.1	0.029	0.02	0.019
Sales of water heating units - Electric Heat Pump	0.001	0.003	0.003	0.003	0.003	0.003	0.003
Sales of water heating units - Electric Resistance	0.022	0.067	0.066	0.066	0.067	0.067	0.067
Sales of water heating units - Gas Furnace	0.966	0.889	0.888	0.889	0.888	0.888	0.888
Sales of water heating units - Other	0.011	0.042	0.043	0.042	0.043	0.043	0.043

Table 17: *RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

variable_name	2025	2030	2035	2040	2045	2050
Electricity distribution peak load (capital invested) - Cumulative 5-yr	0.398	0.398	0.818	0.868	0.949	1.003

Table 18: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

variable_name	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr	0	0.401	0.411	0	0	0	0
Sale of space heating units by type - Electric Heat Pump	0.165	0.266	0.316	0.458	0.673	0.813	0.862
Sale of space heating units by type - Electric Resistance	0.228	0.247	0.23	0.186	0.122	0.081	0.067
Sale of space heating units by type - Fossil	0.016	0.028	0.026	0.022	0.015	0.01	0.009
Sale of space heating units by type - Gas	0.59	0.459	0.427	0.334	0.19	0.096	0.063
Sales of cooking units - Electric Resistance	0.555	0.567	0.607	0.715	0.864	0.956	0.988
Sales of cooking units - Gas	0.445	0.433	0.393	0.285	0.136	0.044	0.012
Sales of water heating units by type - Electric Heat Pump	0	0.016	0.062	0.193	0.395	0.526	0.572
Sales of water heating units by type - Electric Resistance	0.371	0.526	0.515	0.486	0.443	0.415	0.406
Sales of water heating units by type - Gas Furnace	0.614	0.447	0.412	0.31	0.152	0.049	0.013
Sales of water heating units by type - Other	0.015	0.011	0.011	0.011	0.01	0.01	0.01

Table 19: *REF scenario - PILLAR 1: Efficiency/Electrification - Transportation*

variable_name	2020	2025	2030	2035	2040	2045	2050
End-use technology sales by technology - HDV - diesel	0.974	0.96	0.913	0.798	0.582	0.321	0.137
End-use technology sales by technology - HDV - EV	0.005	0.015	0.041	0.108	0.236	0.394	0.51
End-use technology sales by technology - HDV - gasoline	0.002	0.002	0.002	0.002	0.002	0.001	0.001
End-use technology sales by technology - HDV - hybrid	0.001	0.001	0.001	0.001	0.001	0.001	0
End-use technology sales by technology - HDV - hydrogen FC	0.003	0.01	0.027	0.072	0.157	0.263	0.34
End-use technology sales by technology - HDV - other	0.015	0.013	0.015	0.019	0.022	0.02	0.011
End-use technology sales by technology - LDV - diesel	0.008	0.014	0.019	0.015	0.009	0.005	0.002
End-use technology sales by technology - LDV - EV	0.028	0.066	0.155	0.317	0.546	0.759	0.892
End-use technology sales by technology - LDV - gasoline	0.891	0.837	0.738	0.593	0.392	0.208	0.093
End-use technology sales by technology - LDV - hybrid	0.071	0.079	0.084	0.073	0.051	0.028	0.013
End-use technology sales by technology - LDV - hydrogen FC	0.001	0.004	0.003	0.002	0.001	0.001	0
End-use technology sales by technology - LDV - other	0.001	0.001	0.001	0.001	0	0	0
End-use technology sales by technology - MDV - diesel	0.648	0.622	0.577	0.494	0.356	0.196	0.084
End-use technology sales by technology - MDV - EV	0.007	0.019	0.055	0.143	0.314	0.526	0.68
End-use technology sales by technology - MDV - gasoline	0.338	0.347	0.347	0.319	0.244	0.142	0.063
End-use technology sales by technology - MDV - hybrid	0.004	0.004	0.005	0.005	0.004	0.003	0.001

Table 19: *REF scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

variable_name	2020	2025	2030	2035	2040	2045	2050
End-use technology sales by technology - MDV - hydrogen FC	0.002	0.005	0.014	0.036	0.079	0.132	0.17
End-use technology sales by technology - MDV - other	0.003	0.003	0.003	0.003	0.003	0.002	0.001
Light-duty vehicle capital costs - Cumulative 5-yr	0	0	11442643	22436320	77316008	238424814	349041472
Number of public EV charging plugs - DC Fast Charging	87	0	35.719	0	150.577	0	404.778
Number of public EV charging plugs - L2 Charging	517	0	857.252	0	3613.8	0	9714.7

Table 20: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

variable_name	2020	2025	2030	2035	2040	2045	2050
Final energy demand by sector - commercial	0.046	0.046	0.046	0.045	0.043	0.042	0.041
Final energy demand by sector - industry	0.005	0.005	0.005	0.005	0.005	0.006	0.006
Final energy demand by sector - residential	0.02	0.019	0.018	0.018	0.017	0.015	0.014
Final energy demand by sector - transportation	0.031	0.029	0.027	0.026	0.025	0.023	0.021

Table 21: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial*

variable_name	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr	0	5158721990	5727804783	0	0	0	0
Sales of cooking units - Electric Resistance	0.32	0.362	0.409	0.534	0.71	0.817	0.855
Sales of cooking units - Gas	0.68	0.638	0.591	0.466	0.29	0.183	0.145
Sales of space heating units - Electric Heat Pump	0.02	0.204	0.252	0.393	0.615	0.771	0.831
Sales of space heating units - Electric Resistance	0.024	0.079	0.081	0.088	0.102	0.116	0.124
Sales of space heating units - Fossil	0.011	0.045	0.042	0.031	0.015	0.005	0.001
Sales of space heating units - Gas Furnace	0.945	0.673	0.625	0.488	0.268	0.108	0.044
Sales of water heating units - Electric Heat Pump	0.001	0.02	0.071	0.215	0.436	0.581	0.631
Sales of water heating units - Electric Resistance	0.022	0.074	0.093	0.151	0.24	0.297	0.317
Sales of water heating units - Gas Furnace	0.966	0.864	0.795	0.597	0.292	0.093	0.024
Sales of water heating units - Other	0.011	0.041	0.041	0.037	0.032	0.029	0.027

Table 22: *REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

variable_name	2025	2030	2035	2040	2045	2050
Electricity distribution peak load (capital invested) - Cumulative 5-yr	0.36	0.356	0.467	0.477	0.862	0.916

Table 23: *E+ scenario - PILLAR 2: Clean Electricity - Transmission*

variable_name	2020	2025	2030	2035	2040	2045	2050
HV transmission for wind and solar - base all	0	0.345	0.345	0.345	0.345	0.345	0.345
HV transmission for wind and solar - base other intra-state	0	0	0	0	0	0	0
HV transmission for wind and solar - base spur intra-state	0	0.162	0.162	0.162	0.162	0.162	0.162

Table 24: *RE+ scenario - PILLAR 4: CO2 capture, use, storage - CO2 capture*

variable_name	2025	2030	2035	2040	2045	2050
Annual - All	0	0	0	0	0	0
Annual - BECCS	0	0	0	0	0	0
Annual - Cement	0	0	0	0	0	0
Annual - NGCC	0	0	0	0	0	0
Cumulative - All	0	0	0	0	0	0
Cumulative - BECCS	0	0	0	0	0	0
Cumulative - Cement	0	0	0	0	0	0
Cumulative - NGCC	0	0	0	0	0	0

Table 25: *RE+ scenario - PILLAR 4: CO2 capture, use, storage - CO2 storage*

variable_name	2025	2030	2035	2040	2045	2050
Annual	0	0	0	0	0	0
Injection wells	0	0	0	0	0	0
Resource characterization, appraisal and permitting costs cumulative	0	0	0	0	0	0
Wells and facilities construction costs cumulative	0	0	0	0	0	0

Table 26: *RE+ scenario - PILLAR 4: CO2 capture, use, storage - CO2 transportation*

variable_name	2025	2030	2035	2040	2045	2050
CO2 pipelines - All	0	0	0	0	0	0
CO2 pipelines - Spur	0	0	0	0	0	0
CO2 pipelines - Trunk	0	0	0	0	0	0