Net-Zero America - nevada state report v2

Larson et al. 2020

February 2021

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	3.209	3.394	0	0	0	0
Sale of space heating units by type - Electric Heat Pump	0.085	0.278	0.285	0.296	0.306	0.318	0.334
Sale of space heating units by type - Electric Resistance	0.138	0.202	0.199	0.196	0.189	0.179	0.163
Sale of space heating units by type - Fossil	0.023	0.028	0.028	0.028	0.026	0.025	0.026
Sale of space heating units by type - Gas	0.755	0.492	0.488	0.481	0.479	0.478	0.477
Sales of cooking units - Electric Resistance	0.659	0.659	0.659	0.659	0.659	0.659	0.659
Sales of cooking units - Gas	0.341	0.341	0.341	0.341	0.341	0.341	0.341
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	0.232	0.388	0.389	0.389	0.39	0.39	0.39
Sales of water heating units by type - Gas Furnace	0.751	0.594	0.593	0.593	0.592	0.592	0.592
Sales of water heating units by type - Other	0.017	0.018	0.018	0.018	0.018	0.018	0.018

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	0.981	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	0.014	0.019	0.022	0.02	0.018	0.017	0.016
End-use technology sales by technology - LDV - EV	0.039	0.061	0.069	0.085	0.103	0.118	0.13
End-use technology sales by technology - LDV - gasoline	0.896	0.86	0.837	0.817	0.796	0.776	0.761
End-use technology sales by technology - LDV - hybrid	0.048	0.056	0.069	0.074	0.08	0.085	0.089
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 3: *E- scenario - PILLAR 6: Land carbon sinks - Agriculture*

variable_name	2020	2030	2050
Carbon sink enhancement potential - Accelerate regeneration	0	0	2764.6
Carbon sink enhancement potential - All (not counting overlap)	0	0	17213.6
Carbon sink enhancement potential - Avoid deforestation	0	0	1094.707
Carbon sink enhancement potential - Extend rotation length	0	0	7956.9
Carbon sink enhancement potential - Improve plantations	0	0	4.348
Carbon sink enhancement potential - Increase retention of HWP	0	0	7.614
Carbon sink enhancement potential - Increase trees outside forests	0	0	311.692
Carbon sink enhancement potential - Reforest cropland	0	0	0
Carbon sink enhancement potential - Reforest pasture	0	0	911.382
Carbon sink enhancement potential - Restore productivity	0	0	4162.4
Land impacted for carbon sink enhancement - Accelerate regeneration	0	0	1114.223
Land impacted for carbon sink enhancement - All (not counting overlap)	0	0	3666.5
Land impacted for carbon sink enhancement - Avoid deforestation	0	0	293.858
Land impacted for carbon sink enhancement - Extend rotation length	0	0	4383.302
Land impacted for carbon sink enhancement - Improve plantations	0	0	2.416
Land impacted for carbon sink enhancement - Increase retention of HWP	0	0	1.523
Land impacted for carbon sink enhancement - Increase trees outside forests	0	0	87.925
Land impacted for carbon sink enhancement - Natural uptake	0.51	1.501	0.43
Land impacted for carbon sink enhancement - Reforest cropland	0	0	0
Land impacted for carbon sink enhancement - Reforest pasture	0	0	68.915
Land impacted for carbon sink enhancement - Restore productivity	0	0	2348.921
Land impacted for carbon sink enhancement - Retained in Hardwood Products	-0.001	-0.003	-0.003
Land impacted for carbon sink enhancement - Total	0.509	1.499	0.428
Land impacted for carbon sink enhancement - Total impacted (over 30 years)	0	0	4634.6

Table 4: *E- scenario - PILLAR 6: Land carbon sinks - Forests*

variable_name	2050
Business-as-usual carbon sink - Accelerate regeneration	258.371
Business-as-usual carbon sink - Avoid deforestation	93.61
Business-as-usual carbon sink - Extend rotation length	2398
Business-as-usual carbon sink - Improve plantations	0.918

Table 4: *E- scenario - PILLAR 6: Land carbon sinks - Forests (continued)*

variable_name	2050
Business-as-usual carbon sink - Increase retention of HWP	0
Business-as-usual carbon sink - Increase trees outside forests	17.678
Business-as-usual carbon sink - Reforest cropland	0
Business-as-usual carbon sink - Reforest pasture	16.836
Business-as-usual carbon sink - Restore productivity	826.876
Business-as-usual carbon sink - Total impacted (over 30 years)	0

Table 5: *E- scenario - PILLAR 1: Efficiency/Electrification - Overview*

variable_name	2020	2025	2030	2035	2040	2045	2050
Final energy demand by sector - commercial	0.089	0.091	0.092	0.092	0.093	0.096	0.1
Final energy demand by sector - industry	0.074	0.077	0.078	0.082	0.086	0.092	0.099
Final energy demand by sector - residential	0.094	0.093	0.095	0.097	0.101	0.105	0.108
Final energy demand by sector - transportation	0.291	0.28	0.269	0.263	0.267	0.277	0.288

Table 6: *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	7364794766	7705761084	0	0	0	0
Sales of cooking units - Electric Resistance	0.419	0.447	0.447	0.446	0.444	0.445	0.446
Sales of cooking units - Gas	0.581	0.553	0.553	0.554	0.556	0.555	0.554
Sales of space heating units - Electric Heat Pump	0.033	0.239	0.634	0.771	0.787	0.788	0.788
Sales of space heating units - Electric Resistance	0.033	0.05	0.106	0.16	0.2	0.206	0.207
Sales of space heating units - Fossil	0.01	0.002	0.001	0	0	0	0
Sales of space heating units - Gas Furnace	0.924	0.709	0.259	0.069	0.013	0.006	0.005
Sales of water heating units - Electric Heat Pump	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Sales of water heating units - Gas Furnace	0.981	0.981	0.981	0.981	0.981	0.981	0.981
Sales of water heating units - Other	0.004	0.004	0.004	0.004	0.004	0.004	0.004

Table 7: *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	2.145	2.249	2.49	2.61	2.896	3.036

Table 8: *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	3.411	4.547	0	0	0	0
Sale of space heating units by type - Electric Heat Pump	0.097	0.274	0.688	0.889	0.914	0.915	0.914
Sale of space heating units by type - Electric Resistance	0.135	0.202	0.108	0.062	0.057	0.057	0.057
Sale of space heating units by type - Fossil	0.022	0.034	0.019	0.012	0.01	0.01	0.01
Sale of space heating units by type - Gas	0.746	0.49	0.185	0.037	0.019	0.018	0.018
Sales of cooking units - Electric Resistance	0.664	0.735	0.955	0.998	1	1	1
Sales of cooking units - Gas	0.336	0.265	0.045	0.002	0	0	0
Sales of water heating units by type - Electric Heat Pump	0	0.084	0.466	0.609	0.624	0.625	0.625
Sales of water heating units by type - Electric Resistance	0.232	0.375	0.328	0.351	0.357	0.358	0.358
Sales of water heating units by type - Gas Furnace	0.751	0.523	0.188	0.022	0.001	0	0
Sales of water heating units by type - Other	0.017	0.018	0.018	0.018	0.018	0.018	0.018

Table 9: *RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

variable_name	2020	2025	2030	2035	2040	2045	2050
End-use technology sales by technology - HDV - diesel	0.972	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	0.014	0.017	0.012	0.004	0.001	0	0
End-use technology sales by technology - LDV - EV	0.043	0.163	0.481	0.825	0.964	0.993	1
End-use technology sales by technology - LDV - gasoline	0.893	0.768	0.471	0.158	0.032	0.006	0
End-use technology sales by technology - LDV - hybrid	0.048	0.048	0.033	0.012	0.003	0.001	0
End-use technology sales by technology - LDV - hydrogen FC	0.001	0.003	0.002	0.001	0	0	0
End-use technology sales by technology - LDV - other	0.001	0.001	0.001	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	477420642	1240044350	1982925687	3014272601	3269176577	3123183399
Number of public EV charging plugs - DC Fast Charging	256	0	745.837	0	3105.7	0	4991.5
Number of public EV charging plugs - L2 Charging	619	0	17936.3	0	74688	0	120038.6

Table 10: *RE- scenario - PILLAR 2: Clean Electricity - Generating capacity*

variable_name	2020	2025	2030	2035	2040	2045	2050
Power generation capital investment - biomass power plant	0	0	0	0	0	0	0
Power generation capital investment - biomass w/ccu allam power plant	0	0	0	0	0	0	0
Power generation capital investment - biomass w/ccu power plant	0	0	0	0	0	0	0
Power generation capital investment - Solar PV - Base	0	0	0	9.55	6.1	4.807	4.059
Power generation capital investment - Solar PV - Constrained	0	3.931	0	4.617	3.696	2.115	1.576
Power generation capital investment - Wind - Base	0	0.755	3.614	4.445	2.111	0.898	2.836
Power generation capital investment - Wind - Constrained	0	0.262	1.014	0.429	0.94	0.089	0.787

Table 11: *RE- scenario - PILLAR 2: Clean Electricity - Generation*

variable_name	2020	2025	2030	2035	2040	2045	2050
Power generation by technology - biomass power plant	0	0	0	0	0	0	0
Power generation by technology - biomass w/ccu allam power plant	0	0	0	0	0	0	0
Power generation by technology - biomass w/ccu power plant	0	0	0	0	0	0	0

Table 12: *RE- scenario - PILLAR 2: Clean Electricity - Transmission*

variable_name	2020	2025	2030	2035	2040	2045	2050
HV transmission for wind and solar - base all	0	1437.7	4704.2	10932.2	15263.9	18435.7	22687.3
HV transmission for wind and solar - base other intra-state	0	41.585	117.337	1051	1707.1	2097.1	2780.2
HV transmission for wind and solar - base spur intra-state	0	340.435	634.322	1671.1	2666	3438.9	4539.7
HV transmission for wind and solar - constrained all	0	2063.1	5843.2	8587.5	11954.8	13835.3	16359.6
HV transmission for wind and solar - constrained other intra-state	0	7.824	10.582	97.629	100.285	100.285	118.986
HV transmission for wind and solar - constrained spur intra-state	0	246.703	271.633	511	548.219	767.896	974.648

Table 13: *RE- scenario - PILLAR 3: Bioenergy and Hydrogen - Bioconversion*

variable_name	2020	2025	2030	2035	2040	2045	2050
Biomass purchases	0	0	0	0	0	0	0
Capital investment	0	0	0	0	0	0	0
Number of facilities - allam power w ccu	0	0	0	0	0	0	0
Number of facilities - beccs hydrogen	0	0	0	0	0	0	0
Number of facilities - diesel	0	0	0	0	0	0	0
Number of facilities - diesel ccu	0	0	0	0	0	0	0
Number of facilities - power	0	0	0	0	0	0	0
Number of facilities - power ccu	0	0	0	0	0	0	0
Number of facilities - pyrolysis	0	0	0	0	0	0	0
Number of facilities - pyrolysis ccu	0	0	0	0	0	0	0
Number of facilities - sng	0	0	0	0	0	0	0
Number of facilities - sng ccu	0	0	0	0	0	0	0

Table 14: *RE- scenario - PILLAR 4: CO2 capture, use, storage - CO2 capture*

variable_name	2025	2030	2035	2040	2045	2050
Annual - All	0	0.01	0.03	0.05	0.04	0.03
Annual - BECCS	0	0	0	0	0	0
Annual - Cement	0	0	0	0	0	0
Annual - NGCC	0	0.01	0.03	0.05	0.04	0.03
Cumulative - All	0	0.01	0.04	0.09	0.13	0.16
Cumulative - BECCS	0	0	0	0	0	0
Cumulative - Cement	0	0	0	0	0	0
Cumulative - NGCC	0	0.01	0.04	0.09	0.13	0.16

Table 15: *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 16: *RE- scenario - PILLAR 4: CO2 capture, use, storage - CO2 transportation*

variable_name	2025	2030	2035	2040	2045	2050
CO2 pipelines - All	0	26665.015	53445.13	53549.53	53465.83	53400.63
CO2 pipelines - Spur	0	26665.015	53445.13	53549.53	53465.83	53400.63
CO2 pipelines - Trunk	0	0	0	0	0	0

Table 17: *RE- scenario - IMPACTS - Jobs*

variable_name	2020	2025	2030	2035	2040	2045	2050
Jobs by economic sector - agriculture	4.105	4.732	9.608	3.672	2.849	2.094	1.556
Jobs by economic sector - construction	7390	6041.1	7275.7	15231.7	15003.8	14345.3	16625.8
Jobs by economic sector - manufacturing	3003.5	3127.2	5003.5	6672.8	6273.1	5545.5	6319.4

Table 17: *RE- scenario - IMPACTS - Jobs (continued)*

variable_name	2020	2025	2030	2035	2040	2045	2050
Jobs by economic sector - mining	1285.6	999.682	705.151	460.057	277.698	153.631	81.364
Jobs by economic sector - other	1025.4	730.982	874.067	2559.7	2642.3	2749.6	3657.5
Jobs by economic sector - pipeline	268.086	263.75	236.395	202.98	156.312	109.466	61.429
Jobs by economic sector - professional	2702.1	2457.3	3296.9	6882.8	7165	7158.8	8679.1
Jobs by economic sector - trade	2038.3	1734.3	2077.4	4319.5	4514.4	4619.3	5832.1
Jobs by economic sector - utilities	4071	5030.5	6498.9	10551.6	11485.2	11333	12432.8
Jobs by resource sector - Biomass	17.015	20.309	26.491	10.459	8.575	7.636	6.646
Jobs by resource sector - CO2	0	0	116.141	233.419	232.323	231.38	61.179
Jobs by resource sector - Coal	341.419	172.657	32.127	0	0	0	0
Jobs by resource sector - Grid	4947.3	7639.7	10855.3	19009.5	20735	20480.1	23582.4
Jobs by resource sector - Natural Gas	3506.8	2984.2	2543.7	2231.6	2373.4	2272	1564.4
Jobs by resource sector - Nuclear	0	0	0.004	0.007	0	0	0
Jobs by resource sector - Oil	2431.1	2072.4	1639.4	1165.4	766.9	485.122	276.375
Jobs by resource sector - Solar	9605.5	5502.2	5726.3	17179.9	16389.6	16259.8	21032.3
Jobs by resource sector - Wind	938.76	1998.1	5038.3	7054.5	7014.7	6280.7	7167.8
Median wages - All	58769.6	60295.7	60802.5	61168.6	62340.9	63412.9	64215.1
Required Level of Education - Associates degree or some college	6954	6552.3	8393.8	15220.3	15479.8	15019	17508.7
Required Level of Education - Bachelors degree	4267.2	4038.8	5139.7	9091.2	9252.5	8989.4	10524.9
Required Level of Education - Doctoral degree	148.942	132.907	168.551	330.034	337.404	332.395	397.947
Required Level of Education - High school diploma or less	9399.6	8698	11043.3	19997	20143	19413.2	22591.1
Required Level of Education - Masters or professional degree	1018.3	967.557	1232.2	2246.3	2307.8	2262.6	2668.5
Wage income - All	1280628726	1229524705	1579655757	2868297364	2962917512	2918508433	3448393277

Table 18: *RE- scenario - PILLAR 6: Land carbon sinks - Agriculture*

variable_name	2050
Carbon sink enhancement potential - Accelerate regeneration	2764.6
Carbon sink enhancement potential - All (not counting overlap)	17213.6
Carbon sink enhancement potential - Avoid deforestation	1094.707
Carbon sink enhancement potential - corn-ethanol to energy grasses	0
Carbon sink enhancement potential - cropland measures	-341.373
Carbon sink enhancement potential - Extend rotation length	7956.9
Carbon sink enhancement potential - Improve plantations	4.348
Carbon sink enhancement potential - Increase retention of HWP	7.614
Carbon sink enhancement potential - Increase trees outside forests	311.692
Carbon sink enhancement potential - permanent conservation cover	-2.42
Carbon sink enhancement potential - Reforest cropland	0
Carbon sink enhancement potential - Reforest pasture	911.382
Carbon sink enhancement potential - Restore productivity	4162.4
Carbon sink enhancement potential - total	-343.794
Land impacted for carbon sink enhancement - Accelerate regeneration	1114.223
Land impacted for carbon sink enhancement - All (not counting overlap)	3666.5
Land impacted for carbon sink enhancement - Avoid deforestation	293.858
Land impacted for carbon sink enhancement - corn-ethanol to energy grasses	0
Land impacted for carbon sink enhancement - cropland measures	479.686
Land impacted for carbon sink enhancement - Extend rotation length	4383.302
Land impacted for carbon sink enhancement - Improve plantations	2.416
Land impacted for carbon sink enhancement - Increase retention of HWP	1.523
Land impacted for carbon sink enhancement - Increase trees outside forests	87.925
Land impacted for carbon sink enhancement - permanent conservation cover	3.713
Land impacted for carbon sink enhancement - Reforest cropland	0
Land impacted for carbon sink enhancement - Reforest pasture	68.915
Land impacted for carbon sink enhancement - Restore productivity	2348.921
Land impacted for carbon sink enhancement - total	483.398
Land impacted for carbon sink enhancement - Total impacted (over 30 years)	4634.6

Table 19: *RE- scenario - PILLAR 6: Land carbon sinks - Forests*

variable_name	2050
Business-as-usual carbon sink - Accelerate regeneration	258.371
Business-as-usual carbon sink - Avoid deforestation	93.61
Business-as-usual carbon sink - Extend rotation length	2398
Business-as-usual carbon sink - Improve plantations	0.918
Business-as-usual carbon sink - Increase retention of HWP	0
Business-as-usual carbon sink - Increase trees outside forests	17.678
Business-as-usual carbon sink - Reforest cropland	0
Business-as-usual carbon sink - Reforest pasture	16.836
Business-as-usual carbon sink - Restore productivity	826.876
Business-as-usual carbon sink - Total impacted (over 30 years)	0

Table 20: *RE- scenario - IMPACTS - Fossil fuel industries*

variable_name	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption	228619.5	232014.8	195575.4	156859.5	118081.5	74292.9	51527.6
Oil consumption	48308.2	44941.1	38523.1	29298.6	20635.2	13809.6	8320.8

Table 21: *RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

variable_name	2020	2025	2030	2035	2040	2045	2050
Final energy demand by sector - commercial	0.089	0.089	0.086	0.08	0.075	0.072	0.072
Final energy demand by sector - industry	0.074	0.074	0.072	0.073	0.076	0.077	0.079
Final energy demand by sector - residential	0.094	0.092	0.088	0.079	0.072	0.067	0.066
Final energy demand by sector - transportation	0.291	0.274	0.249	0.218	0.19	0.171	0.162

Table 22: *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	7465401276	8313581077	0	0	0	0
Sales of cooking units - Electric Resistance	0.419	0.546	0.83	0.886	0.889	0.889	0.889
Sales of cooking units - Gas	0.581	0.454	0.17	0.114	0.111	0.111	0.111
Sales of space heating units - Electric Heat Pump	0.033	0.202	0.634	0.889	0.925	0.926	0.927
Sales of space heating units - Electric Resistance	0.033	0.034	0.042	0.064	0.068	0.069	0.068
Sales of space heating units - Fossil	0.01	0.002	0	0	0	0	0
Sales of space heating units - Gas Furnace	0.924	0.761	0.324	0.048	0.007	0.005	0.005
Sales of water heating units - Electric Heat Pump	0	0.081	0.454	0.613	0.632	0.633	0.633
Sales of water heating units - Electric Resistance	0.015	0.051	0.23	0.346	0.362	0.363	0.363
Sales of water heating units - Gas Furnace	0.981	0.864	0.311	0.037	0.002	0	0
Sales of water heating units - Other	0.004	0.004	0.004	0.004	0.004	0.004	0.004

Table 23: *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	2.234	2.348	3.091	3.28	3.082	3.225

Table 24: *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	3.394	4.486	0	0	0	0
Sale of space heating units by type - Electric Heat Pump	0.097	0.203	0.25	0.389	0.621	0.804	0.882
Sale of space heating units by type - Electric Resistance	0.135	0.218	0.206	0.176	0.124	0.082	0.064
Sale of space heating units by type - Fossil	0.022	0.036	0.035	0.029	0.02	0.014	0.011
Sale of space heating units by type - Gas	0.746	0.543	0.508	0.406	0.235	0.101	0.042
Sales of cooking units - Electric Resistance	0.662	0.671	0.702	0.784	0.897	0.967	0.991
Sales of cooking units - Gas	0.338	0.329	0.298	0.216	0.103	0.033	0.009
Sales of water heating units by type - Electric Heat Pump	0	0.015	0.059	0.185	0.39	0.54	0.601
Sales of water heating units by type - Electric Resistance	0.232	0.386	0.382	0.367	0.351	0.35	0.354
Sales of water heating units by type - Gas Furnace	0.751	0.58	0.542	0.429	0.241	0.092	0.027
Sales of water heating units by type - Other	0.017	0.018	0.018	0.018	0.018	0.018	0.018

Table 25: *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	0.015	0.019	0.02	0.016	0.01	0.005	0.002
End-use technology sales by technology - LDV - EV	0.02	0.05	0.124	0.268	0.494	0.727	0.878
End-use technology sales by technology - LDV - gasoline	0.914	0.869	0.787	0.655	0.451	0.242	0.107
End-use technology sales by technology - LDV - hybrid	0.05	0.057	0.064	0.058	0.043	0.025	0.012
End-use technology sales by technology - LDV - hydrogen FC	0.001	0.004	0.003	0.002	0.002	0.001	0
End-use technology sales by technology - LDV - other	0.001	0.001	0.001	0.001	0.001	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
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	80094589	161939820	552995049	1720891425	2513805949
Number of public EV charging plugs - DC Fast Charging	256	0	253.197	0	1169.4	0	3197
Number of public EV charging plugs - L2 Charging	619	0	6089	0	28122	0	76884.6

Table 26: *REF scenario - PILLAR 6: Land carbon sinks - Agriculture*

variable_name	2050
Carbon sink enhancement potential - Accelerate regeneration	2764.6
Carbon sink enhancement potential - All (not counting overlap)	17213.6
Carbon sink enhancement potential - Avoid deforestation	1094.707
Carbon sink enhancement potential - corn-ethanol to energy grasses	0

Table 26: *REF scenario - PILLAR 6: Land carbon sinks - Agriculture (continued)*

variable_name	2050
Carbon sink enhancement potential - cropland measures	-341.373
Carbon sink enhancement potential - Extend rotation length	7956.9
Carbon sink enhancement potential - Improve plantations	4.348
Carbon sink enhancement potential - Increase retention of HWP	7.614
Carbon sink enhancement potential - Increase trees outside forests	311.692
Carbon sink enhancement potential - permanent conservation cover	-2.42
Carbon sink enhancement potential - Reforest cropland	0
Carbon sink enhancement potential - Reforest pasture	911.382
Carbon sink enhancement potential - Restore productivity	4162.4
Carbon sink enhancement potential - total	-343.794
Land impacted for carbon sink enhancement - Accelerate regeneration	1114.223
Land impacted for carbon sink enhancement - All (not counting overlap)	3666.5
Land impacted for carbon sink enhancement - Avoid deforestation	293.858
Land impacted for carbon sink enhancement - corn-ethanol to energy grasses	0
Land impacted for carbon sink enhancement - cropland measures	479.686
Land impacted for carbon sink enhancement - Extend rotation length	4383.302
Land impacted for carbon sink enhancement - Improve plantations	2.416
Land impacted for carbon sink enhancement - Increase retention of HWP	1.523
Land impacted for carbon sink enhancement - Increase trees outside forests	87.925
Land impacted for carbon sink enhancement - permanent conservation cover	3.713
Land impacted for carbon sink enhancement - Reforest cropland	0
Land impacted for carbon sink enhancement - Reforest pasture	68.915
Land impacted for carbon sink enhancement - Restore productivity	2348.921
Land impacted for carbon sink enhancement - total	483.398
Land impacted for carbon sink enhancement - Total impacted (over 30 years)	4634.6

Table 27: *REF scenario - PILLAR 6: Land carbon sinks - Forests*

variable_name	2050
Business-as-usual carbon sink - Accelerate regeneration	258.371
Business-as-usual carbon sink - Avoid deforestation	93.61
Business-as-usual carbon sink - Extend rotation length	2398
Business-as-usual carbon sink - Improve plantations	0.918
Business-as-usual carbon sink - Increase retention of HWP	0
Business-as-usual carbon sink - Increase trees outside forests	17.678
Business-as-usual carbon sink - Reforest cropland	0
Business-as-usual carbon sink - Reforest pasture	16.836
Business-as-usual carbon sink - Restore productivity	826.876
Business-as-usual carbon sink - Total impacted (over 30 years)	0

Table 28: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

variable_name	2020	2025	2030	2035	2040	2045	2050
Final energy demand by sector - commercial	0.089	0.089	0.088	0.087	0.085	0.082	0.079
Final energy demand by sector - industry	0.074	0.074	0.072	0.074	0.077	0.078	0.08
Final energy demand by sector - residential	0.094	0.093	0.092	0.09	0.086	0.08	0.074
Final energy demand by sector - transportation	0.291	0.276	0.258	0.242	0.229	0.214	0.195

Table 29: *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	7460418052	8285106283	0	0	0	0
Sales of cooking units - Electric Resistance	0.419	0.462	0.502	0.608	0.754	0.846	0.878
Sales of cooking units - Gas	0.581	0.538	0.498	0.392	0.246	0.154	0.122
Sales of space heating units - Electric Heat Pump	0.033	0.13	0.18	0.326	0.578	0.789	0.885
Sales of space heating units - Electric Resistance	0.033	0.034	0.035	0.038	0.046	0.058	0.065
Sales of space heating units - Fossil	0.01	0.002	0.002	0.002	0.001	0	0
Sales of space heating units - Gas Furnace	0.924	0.833	0.783	0.634	0.375	0.153	0.05
Sales of water heating units - Electric Heat Pump	0	0.015	0.058	0.182	0.386	0.542	0.606
Sales of water heating units - Electric Resistance	0.015	0.022	0.043	0.104	0.21	0.302	0.345
Sales of water heating units - Gas Furnace	0.981	0.959	0.896	0.71	0.399	0.153	0.045
Sales of water heating units - Other	0.004	0.004	0.004	0.004	0.004	0.004	0.004

Table 30: *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	2.003	2.09	2.432	2.55	2.986	3.141

Table 31: *E+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

variable_name	2025	2030	2035	2040	2045	2050
Power generation capital investment - Solar PV - Base	0	1.541	12.484	7.668	7.203	6.578
Power generation capital investment - Wind - Base	1.348	3.981	5.692	4.12	3.059	6.922

Table 32: *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	1106.9	4204.8	11151.6	16662.4	21325.9	28794.5
HV transmission for wind and solar - base other intra-state	0	51.545	265.283	1608.4	2337.6	2822.2	3175.3
HV transmission for wind and solar - base spur intra-state	0	339.941	745.138	2668.4	4323.5	5984.1	7697.3

Table 33: *E+ scenario - PILLAR 6: Land carbon sinks - Agriculture*

variable_name	2050
Carbon sink enhancement potential - Accelerate regeneration	2764.6
Carbon sink enhancement potential - All (not counting overlap)	17213.6
Carbon sink enhancement potential - Avoid deforestation	1094.707
Carbon sink enhancement potential - corn-ethanol to energy grasses	0
Carbon sink enhancement potential - cropland measures	-341.373
Carbon sink enhancement potential - Extend rotation length	7956.9
Carbon sink enhancement potential - Improve plantations	4.348
Carbon sink enhancement potential - Increase retention of HWP	7.614
Carbon sink enhancement potential - Increase trees outside forests	311.692
Carbon sink enhancement potential - permanent conservation cover	-2.42
Carbon sink enhancement potential - Reforest cropland	0
Carbon sink enhancement potential - Reforest pasture	911.382
Carbon sink enhancement potential - Restore productivity	4162.4
Carbon sink enhancement potential - total	-343.794
Land impacted for carbon sink enhancement - Accelerate regeneration	1114.223
Land impacted for carbon sink enhancement - All (not counting overlap)	3666.5
Land impacted for carbon sink enhancement - Avoid deforestation	293.858
Land impacted for carbon sink enhancement - corn-ethanol to energy grasses	0
Land impacted for carbon sink enhancement - cropland measures	479.686
Land impacted for carbon sink enhancement - Extend rotation length	4383.302
Land impacted for carbon sink enhancement - Improve plantations	2.416
Land impacted for carbon sink enhancement - Increase retention of HWP	1.523
Land impacted for carbon sink enhancement - Increase trees outside forests	87.925
Land impacted for carbon sink enhancement - permanent conservation cover	3.713
Land impacted for carbon sink enhancement - Reforest cropland	0
Land impacted for carbon sink enhancement - Reforest pasture	68.915
Land impacted for carbon sink enhancement - Restore productivity	2348.921
Land impacted for carbon sink enhancement - total	483.398
Land impacted for carbon sink enhancement - Total impacted (over 30 years)	4634.6

Table 34: *E+ scenario - PILLAR 6: Land carbon sinks - Forests*

variable_name	2050
Business-as-usual carbon sink - Accelerate regeneration	258.371
Business-as-usual carbon sink - Avoid deforestation	93.61
Business-as-usual carbon sink - Extend rotation length	2398
Business-as-usual carbon sink - Improve plantations	0.918
Business-as-usual carbon sink - Increase retention of HWP	0
Business-as-usual carbon sink - Increase trees outside forests	17.678
Business-as-usual carbon sink - Reforest cropland	0
Business-as-usual carbon sink - Reforest pasture	16.836
Business-as-usual carbon sink - Restore productivity	826.876
Business-as-usual carbon sink - Total impacted (over 30 years)	0

Table 35: *RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

variable_name	2020	2025	2030	2035	2040	2045	2050
Power generation capital investment - biomass power plant	0	0	0	0	0	0	0
Power generation capital investment - biomass w/ccu allam power plant	0	0	0	0	0	0	0
Power generation capital investment - biomass w/ccu power plant	0	0	0	0	0	0	0

Table 36: *RE+ scenario - PILLAR 2: Clean Electricity - Generation*

variable_name	2020	2025	2030	2035	2040	2045	2050
Power generation by technology - biomass power plant	0	0	0	0	0	0	0
Power generation by technology - biomass w/ccu allam power plant	0	0	0	0	0	0	0
Power generation by technology - biomass w/ccu power plant	0	0	0	0	0	0	0

Table 37: *RE+ scenario - PILLAR 3: Bioenergy and Hydrogen - Bioconversion*

variable_name	2020	2025	2030	2035	2040	2045	2050
Biomass purchases	0	0	0	0	0	0	0
Capital investment	0	0	0	0	0	0	0
Number of facilities - allam power w ccu	0	0	0	0	0	0	0
Number of facilities - beccs hydrogen	0	0	0	0	0	0	0
Number of facilities - diesel	0	0	0	0	0	0	0
Number of facilities - diesel ccu	0	0	0	0	0	0	0
Number of facilities - power	0	0	0	0	0	0	0
Number of facilities - power ccu	0	0	0	0	0	0	0
Number of facilities - pyrolysis	0	0	0	0	0	0	0
Number of facilities - pyrolysis ccu	0	0	0	0	0	0	0
Number of facilities - sng	0	0	0	0	0	0	0
Number of facilities - sng ccu	0	0	0	0	0	0	0

Table 38: *RE+ scenario - PILLAR 4: CO2 capture, use, storage - CO2 capture*

variable_name	2025	2030	2035	2040	2045	2050
Annual - All	0	0.01	0.04	0.06	0.04	0.05
Annual - BECCS	0	0	0	0	0	0
Annual - Cement	0	0	0	0	0	0
Annual - NGCC	0	0.01	0.04	0.06	0.04	0.05
Cumulative - All	0	0.01	0.05	0.11	0.15	0.2
Cumulative - BECCS	0	0	0	0	0	0
Cumulative - Cement	0	0	0	0	0	0
Cumulative - NGCC	0	0.01	0.05	0.11	0.15	0.2

Table 39: *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 40: *RE+ scenario - PILLAR 4: CO2 capture, use, storage - CO2 transportation*

variable_name	2025	2030	2035	2040	2045	2050
CO2 pipelines - All	0	26635.815	53463.33	53622.73	53472.13	53538.23
CO2 pipelines - Spur	0	26635.815	53463.33	53622.73	53472.13	53538.23
CO2 pipelines - Trunk	0	0	0	0	0	0

Table 41: *RE+ scenario - PILLAR 6: Land carbon sinks - Agriculture*

variable_name	2050
Carbon sink enhancement potential - Accelerate regeneration	2764.6
Carbon sink enhancement potential - All (not counting overlap)	17213.6
Carbon sink enhancement potential - Avoid deforestation	1094.707
Carbon sink enhancement potential - corn-ethanol to energy grasses	0
Carbon sink enhancement potential - cropland measures	-341.373
Carbon sink enhancement potential - Cropland to woody energy crops	0
Carbon sink enhancement potential - Extend rotation length	7956.9
Carbon sink enhancement potential - Improve plantations	4.348
Carbon sink enhancement potential - Increase retention of HWP	7.614
Carbon sink enhancement potential - Increase trees outside forests	311.692
Carbon sink enhancement potential - pasture to energy crops	0
Carbon sink enhancement potential - permanent conservation cover	-2.42
Carbon sink enhancement potential - Reforest cropland	0
Carbon sink enhancement potential - Reforest pasture	911.382
Carbon sink enhancement potential - Restore productivity	4162.4
Carbon sink enhancement potential - total	-343.794
Land impacted for carbon sink enhancement - Accelerate regeneration	1114.223
Land impacted for carbon sink enhancement - All (not counting overlap)	3666.5
Land impacted for carbon sink enhancement - Avoid deforestation	293.858
Land impacted for carbon sink enhancement - corn-ethanol to energy grasses	0
Land impacted for carbon sink enhancement - cropland measures	948.895

Table 41: *RE+ scenario - PILLAR 6: Land carbon sinks - Agriculture (continued)*

variable_name	2050
Land impacted for carbon sink enhancement - Cropland to woody energy crops	0
Land impacted for carbon sink enhancement - Extend rotation length	4383.302
Land impacted for carbon sink enhancement - Improve plantations	2.416
Land impacted for carbon sink enhancement - Increase retention of HWP	1.523
Land impacted for carbon sink enhancement - Increase trees outside forests	87.925
Land impacted for carbon sink enhancement - pasture to energy crops	0
Land impacted for carbon sink enhancement - permanent conservation cover	3.713
Land impacted for carbon sink enhancement - Reforest cropland	0
Land impacted for carbon sink enhancement - Reforest pasture	68.915
Land impacted for carbon sink enhancement - Restore productivity	2348.921
Land impacted for carbon sink enhancement - total	952.607
Land impacted for carbon sink enhancement - Total impacted (over 30 years)	4634.6

Table 42: *RE+ scenario - PILLAR 6: Land carbon sinks - Forests*

variable_name	2050
Business-as-usual carbon sink - Accelerate regeneration	258.371
Business-as-usual carbon sink - Avoid deforestation	93.61
Business-as-usual carbon sink - Extend rotation length	2398
Business-as-usual carbon sink - Improve plantations	0.918
Business-as-usual carbon sink - Increase retention of HWP	0
Business-as-usual carbon sink - Increase trees outside forests	17.678
Business-as-usual carbon sink - Reforest cropland	0
Business-as-usual carbon sink - Reforest pasture	16.836
Business-as-usual carbon sink - Restore productivity	826.876
Business-as-usual carbon sink - Total impacted (over 30 years)	0

Table 43: *B+ scenario - PILLAR 6: Land carbon sinks - Agriculture*

variable_name	2050
Carbon sink enhancement potential - Accelerate regeneration	2764.6
Carbon sink enhancement potential - All (not counting overlap)	17213.6
Carbon sink enhancement potential - Avoid deforestation	1094.707
Carbon sink enhancement potential - corn-ethanol to energy grasses	0
Carbon sink enhancement potential - cropland measures	-341.373
Carbon sink enhancement potential - Extend rotation length	7956.9
Carbon sink enhancement potential - Improve plantations	4.348
Carbon sink enhancement potential - Increase retention of HWP	7.614
Carbon sink enhancement potential - Increase trees outside forests	311.692
Carbon sink enhancement potential - permanent conservation cover	-2.42
Carbon sink enhancement potential - Reforest cropland	0
Carbon sink enhancement potential - Reforest pasture	911.382
Carbon sink enhancement potential - Restore productivity	4162.4
Carbon sink enhancement potential - total	-343.794
Land impacted for carbon sink enhancement - Accelerate regeneration	1114.223
Land impacted for carbon sink enhancement - All (not counting overlap)	3666.5
Land impacted for carbon sink enhancement - Avoid deforestation	293.858
Land impacted for carbon sink enhancement - corn-ethanol to energy grasses	0
Land impacted for carbon sink enhancement - cropland measures	479.686
Land impacted for carbon sink enhancement - Extend rotation length	4383.302
Land impacted for carbon sink enhancement - Improve plantations	2.416
Land impacted for carbon sink enhancement - Increase retention of HWP	1.523
Land impacted for carbon sink enhancement - Increase trees outside forests	87.925
Land impacted for carbon sink enhancement - permanent conservation cover	3.713
Land impacted for carbon sink enhancement - Reforest cropland	0
Land impacted for carbon sink enhancement - Reforest pasture	68.915
Land impacted for carbon sink enhancement - Restore productivity	2348.921
Land impacted for carbon sink enhancement - total	483.398
Land impacted for carbon sink enhancement - Total impacted (over 30 years)	4634.6

Table 44: *B+ scenario - PILLAR 6: Land carbon sinks - Forests*

variable_name	2050
Business-as-usual carbon sink - Accelerate regeneration	258.371
Business-as-usual carbon sink - Avoid deforestation	93.61
Business-as-usual carbon sink - Extend rotation length	2398
Business-as-usual carbon sink - Improve plantations	0.918
Business-as-usual carbon sink - Increase retention of HWP	0
Business-as-usual carbon sink - Increase trees outside forests	17.678
Business-as-usual carbon sink - Reforest cropland	0
Business-as-usual carbon sink - Reforest pasture	16.836
Business-as-usual carbon sink - Restore productivity	826.876
Business-as-usual carbon sink - Total impacted (over 30 years)	0