
ERTAC EGU Growth

High and Low Natural Gas Case Study White Paper

DRAFT – 4-15-2013

1. Purpose

This case study will explore the effect of a faster or slower future growth in natural gas usage for electrical generation.

2. Overview

This case study will provide results from two scenarios to determine the effect of high and low natural gas usage on emissions. The ERTAC reference cases are version 1.7, using base year (BY) 2007 and version 2.1L1, using BY 2011. The 1.7 reference case was initially run using gas growth rates that were not adjusted to account for annual boiler-gas growth rate of 1. Therefore, the 1.7 reference case was re-run, using reference case growth rates that had both peak and annual growth rate adjustments for annual boiler-gas growth equivalent to 1. The projected FYs are 2018 and 2020 for these analyses. Base year 2007 reference case is designated 1.7wa (with adjustment), to distinguish it from the previous reference case where boiler-gas growth rates were not adjusted. The approach to the development of each reference case is described in documentation posted on the MARAMA website at the following location:

<http://marama.org/2013-ertac-egu-forecasting-tool-documentation>

The two scenarios built off these reference cases are summarized in Table 1.

Table 1. Summary of Scenarios

Scenario #	Scenario Name	Scenario Description
1 (lo)	Low NG	Low growth rate (higher cost of gas) gas resource case
2 (hi)	High NG	High growth rate (lower cost of gas) gas resource case

3. Background

The Energy Information Agency (EIA) annually prepares a projection of future electrical generation called the annual energy outlook (AEO). The base case is what EIA considers most likely to occur in future years. ERTAC uses this base case to develop reference growth factors. In addition to the base case, EIA prepares a number of alternate cases. These include the Low and High Oil and Gas Resource cases, described as follows:

*The **Low Oil and Gas Resource case** assumes that the estimated ultimate recovery (EUR) per shale gas, tight gas, or tight oil well is 50 percent lower than in the Reference Case. In 2040, delivered natural gas prices to the electric power sector are 26 percent higher than in the Reference case.*

*The **High Oil and Gas Resource case** assumes that the EUR per shale gas, tight gas, or tight oil well is 100 percent higher than in the Reference case, and the maximum well spacing for shale gas, tight gas, and tight oil plays is assumed to be 40 acres. This case also assumes that the EUR for wells in the Alaska offshore and the Federal Gulf of Mexico is 50 percent higher than in the Reference case, that there is development of kerogen (oil shale) resources in the lower 48 states, and that the schedule for development of Alaskan resources is accelerated. In 2040, delivered natural gas prices are 39 percent lower than projected in the Reference case.*

High and Low Oil and Gas ERTAC growth tables will be developed using these alternate EIA cases. The approach to the development of these growth rates is identical to the approach taken to the base case as described in the document posted on the MARAMA web page.

4. Approach

4.1. Base Case

The study will use two base cases as follows:

ERTAC tool results version 1.7wa, which uses a 2007 base year.

ERTAC tool results version 2.1L1, which uses a 2011 base year.

The following table contains the specific input file names used for the case study.

2007 Base Year	
File Name	File Description
UAF for 1-7wa_2018_V2.xlsx UAF for 1-7wa_2020_V2.xlsx	UAF for version 1.7
CONUS1_7wa_2018 Growth Rates 04-08-2014.xlsx CONUS1_7wa_2018 Growth Rates 04-08-2014 lo.xlsx CONUS1_7wa_2018 Growth Rates 04-08-2014 hi.xlsx CONUS1_7wa_2020 Growth Rates 04-08-2014.xlsx CONUS1_7wa_2020 Growth Rates 04-08-2014 lo.xlsx CONUS1_7wa_2020 Growth Rates 04-14-2014 hi.xlsx	Growth rate files for 1.7, hi and lo gas scenarios
Controls File for 1-7wa_2018_V2.xlsx Controls File for 1-7wa_2020_V2.xlsx	Controls file for version 1.7
Input Variables for 1-7wa_2018_V2.xlsx Input Variables for 1-7wa_2020_V2.xlsx	Input variables file for version 1.7
nonCAMD hourly for 1-7wa_2018_V2.xlsx nonCAMD hourly for 1-7wa_2020_V2.xlsx	Non-CAMD input file for version 1.7

2007 Base Year	
File Name	File Description
CAIR_State_Totals_1-7wa_2018_V2.xlsx CAIR_State_Totals_1-7wa_2020_V2.xlsx	State cap input file for version 1.7 based on state specific rules
CAIR_Group_Totals_1-7wa_2018_V2.xlsx CAIR_Group_Totals_1-7wa_2020_V2.xlsx	Group cap input file for version 1.7 based on CAIR
camd_hourly_base_CONUS_49states_non4140-B3.csv	Base year CAMD hourly data file for version 1.7
2011 Base Year	
File Name	File Description
HI-LO_UAF_03032014-CONUS2_1L1.xlsx	UAF for version 2.1L1
CONUS2_1L1_2018 Growth Rates 03-31-2014 lo.xlsx CONUS2_1L1_2018 Growth Rates 03-31-2014 hi.xlsx CONUS2_1_2018 Growth Rates 12-30-2013.xlsx CONUS2_1L1_2020 Growth Rates 03-31-2014 lo.xlsx CONUS2_1L1_2020 Growth Rates 03-31-2014 hi.xlsx CONUS2_1_2020_Growth_Rates_03-28-2014.xlsx	Growth rate files for hi and lo gas and oil scenarios as well as reference cases
HI-LO_controls_file_03032014-CONUS2_1L1.xlsx	Controls file for version 2.1L1
HI-LO_CONUS2_1L1_2018_Input_Variables	Input variables file for version 2.1L1
HI-LO_nonCAMD_hourly_file.xlsx	Non-CAMD input file for version 2.1L1
HI-LO_State_totals.xlsx	State cap input file for version 2.1L1 based on state specific rules
HI-LO_Group_totals.xlsx	Group cap input file for version 2.1L1 based on CAIR
camd_2011_hourly_camd_ertac_CONUS.csv	Base year CAMD hourly data file for version 2.1L1

Reference case growth rates for 1.7wa were extracted from *v2Working Doc 2_v8 Growth Rates Regional Template_ERTAC Derived from Round 1 6_Active for Base and Future Selected Yr.xlsx*. The tab used for the 1.7 reference case was “It 7 v2.1.2 ref w- Adj”. Reference case growth rates for 2.1L1 were extracted from *v3b_Merged_gas-EGU-emissions plus capacity_region.xlsx*. The reference case growth rates for 2.1L1 contained annual growth rate adjustments for boiler-gas growth equivalent to 1. However, no peak adjustments were made.

4.2. Future Years Analyzed

Future years analyzed by this case study will be 2018 and 2020.

4.3. Assumptions

No additional assumptions have been noted.

4.4. *Low Oil & Gas Scenario*

4.4.1. Growth input file

The only input files that change from the reference cases of 1.7wa and 2.1L1 are the growth rate tables. The annual growth rates derived from the EIA ***Low Oil and Gas Resource case*** will be applied. These annual growth rates were calculated following the procedures outlined in **Annual and Peak Growth Factor Table Development** for Annual Electrical Generation Growth Factors. The FY growth rates for the low gas and oil scenarios were extracted from *v2Working Doc 2_v8 Growth Rates Regional Template_ERTAC Derived from Round 1 6_Active for Base and Future Selected Yr.xlsx*. The tab used for the low oil and gas scenarios was “It 7 v2.1.2 Low Gas w- Adj”. Attachment A and Attachment B provide charts showing the various low gas and oil growth rates for 2018 and 2020.

4.4.2. Other input files including UAF & Controls files

Unchanged.

4.5. *Hi Oil & Gas Scenario*

4.5.1. Growth input file

The only input file that will change from the base case is the growth rate table. The growth rates derived from the EIA ***High Oil and Gas Resource case*** will be applied. These annual growth rates were calculated following the procedures outlined in **Annual and Peak Growth Factor Table Development** for Annual Electrical Generation Growth Factors. The FY growth rates for this case study were extracted from *v2Working Doc 2_v8 Growth Rates Regional Template_ERTAC Derived from Round 1 6_Active for Base and Future Selected Yr.xlsx*. The tab used for the low oil and gas scenarios was “It 7 v2.1.2 High Gas w- Adj”. Attachment A and Attachment B provide charts showing the various high gas and oil growth rates for 2018 and 2020.

4.5.2. Other input files including UAF & Controls files

Unchanged.

5. **Post Processors**

The enhance unit level activity post processor will be used to analyze all data sets.

6. Case Study Output File Location

The input and output files for this case study will be available on the ERTAC tool website:

<http://marama.org/2013-ertac-egu-forecasting-tool-documentation>

7. Case Study Timeline

Milestone	Expected Completion Date	Comments
Review and input of case study by MJO staff, state staff, and industry	December 2013	.
Runs completed	March-April 2014	
Data files, including enhanced unit activity file, available for download	April 2014	

Attachment A: 2018 Growth Rate Comparison

2018 Comparison		1.7wa 2018 Ref		1.7wa 2018 lo		1.7wa 2018 hi		2.1L1 2018 Ref		2.1L1 2018 Lo		2.1L1 2018 Hi	
ERTAC Region	Fuel Source	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate
AZNM	Boiler Gas	0.742	0.645	0.742	0.645	0.742	0.645	1.000	0.586	1.000	0.991	1.000	0.991
AZNM	Coal	1.321	1.149	1.332	1.159	1.255	1.091	1.024	1.015	1.033	1.024	0.972	0.964
AZNM	Combined Cycle Gas	0.449	0.391	0.436	0.379	0.589	0.512	0.570	0.586	0.553	0.548	0.746	0.740
AZNM	Simple Cycle Gas	0.609	0.530	0.591	0.514	0.798	0.694	0.570	0.586	0.553	0.548	0.746	0.740
CAMX	Boiler Gas	0.522	0.511	0.522	0.511	0.522	0.511	1.000	1.628	1.000	1.077	1.000	1.077
CAMX	Coal	0.887	0.869	0.887	0.869	0.836	0.819	0.979	1.054	0.979	1.054	0.923	0.994
CAMX	Combined Cycle Gas	1.189	1.165	1.088	1.066	1.330	1.302	1.590	1.628	1.451	1.562	1.773	1.909
CAMX	Simple Cycle Gas	1.655	1.621	1.514	1.483	1.850	1.812	1.590	1.628	1.451	1.562	1.773	1.909
ERCT	Boiler Gas	0.579	0.569	0.579	0.569	0.579	0.569	1.000	1.070	1.000	0.974	1.000	0.974
ERCT	Coal	0.935	0.919	1.165	1.145	0.504	0.495	0.881	0.858	1.097	1.068	0.474	0.462
ERCT	Combined Cycle Gas	1.236	1.215	0.951	0.935	1.755	1.725	1.110	1.070	0.854	0.831	1.575	1.534
ERCT	Simple Cycle Gas	1.316	1.293	1.012	0.995	1.868	1.835	1.110	1.070	0.854	0.831	1.575	1.534
FRCC	Boiler Gas	0.415	0.417	0.415	0.417	0.415	0.417	1.000	0.905	1.000	1.007	1.000	1.007
FRCC	Coal	0.678	0.682	0.772	0.777	0.368	0.370	0.962	0.969	1.096	1.104	0.522	0.526
FRCC	Combined Cycle Gas	1.431	1.440	1.313	1.321	1.866	1.877	0.890	0.905	0.820	0.826	1.165	1.174
FRCC	Oil	0.015	0.015	0.016	0.016	0.011	0.011	0.093	0.094	0.099	0.099	0.071	0.071
FRCC	Simple Cycle Gas	0.816	0.822	0.749	0.754	1.064	1.071	0.890	0.905	0.820	0.826	1.165	1.174
MROE	Boiler Gas	0.167	0.185	0.167	0.185	0.167	0.185	1.000	3.432	1.000	1.068	1.000	1.068
MROE	Coal	0.614	0.682	0.741	0.822	0.522	0.580	0.581	0.620	0.700	0.748	0.494	0.527
MROE	Combined Cycle Gas	2.584	2.869	1.990	2.209	2.731	3.031	3.280	3.432	0.114	0.122	3.463	3.699
MROE	Simple Cycle Gas	3.125	3.469	2.406	2.671	3.302	3.666	3.280	3.432	2.523	2.695	3.463	3.699
MROW	Boiler Gas	0.194	0.205	0.194	0.205	0.194	0.205	1.000	1.949	1.000	1.064	1.000	1.064
MROW	Coal	0.803	0.846	0.821	0.866	0.731	0.771	0.990	1.053	1.013	1.077	0.901	0.959
MROW	Combined Cycle Gas	0.855	0.901	0.250	0.263	1.719	1.812	1.840	1.949	0.538	0.572	3.703	3.939
MROW	Oil	0.302	0.319	0.304	0.321	0.289	0.305	1.680	1.787	1.684	1.791	1.600	1.703
MROW	Simple Cycle Gas	0.759	0.800	0.222	0.234	1.526	1.609	1.840	1.949	0.538	0.572	3.703	3.939
NEWE	Boiler Gas	0.337	0.359	0.337	0.359	0.337	0.359	1.000	0.931	1.000	0.914	1.000	0.914
NEWE	Coal	0.145	0.154	0.414	0.442	0.068	0.073	0.405	0.370	1.159	1.059	0.191	0.174
NEWE	Combined Cycle Gas	1.216	1.298	1.025	1.094	1.420	1.516	1.020	0.931	0.859	0.785	1.191	1.088
NEWE	Oil	0.026	0.028	0.031	0.033	0.027	0.029	0.277	0.253	0.330	0.301	0.283	0.259
NEWE	Simple Cycle Gas	1.083	1.156	0.912	0.974	1.265	1.350	1.020	0.931	0.859	0.785	1.191	1.088
NWPP	Boiler Gas	0.191	0.188	0.191	0.188	0.191	0.188	1.000	2.355	1.000	1.045	1.000	1.045
NWPP	Coal	0.781	0.770	0.909	0.896	0.724	0.713	0.881	0.921	1.025	1.072	0.816	0.853
NWPP	Combined Cycle Gas	1.826	1.799	1.632	1.608	2.049	2.019	2.270	2.355	2.032	2.124	2.551	2.667
NWPP	Oil	6.839	6.740	7.017	6.916	6.711	6.614						
NWPP	Simple Cycle Gas	1.608	1.584	1.437	1.416	1.804	1.778	2.270	2.355	2.032	2.124	2.551	2.667
NYCW	Boiler Gas	0.748	0.808	0.748	0.808	0.748	0.808	1.000	0.845	1.000	1.003	1.000	1.003
NYCW	Combined Cycle Gas	0.771	0.833	0.709	0.765	0.883	0.954	0.810	0.845	0.743	0.745	0.926	0.929
NYCW	Oil	0.053	0.057	0.052	0.057	0.050	0.054	0.647	0.649	0.646	0.647	0.611	0.613

Attachment A: 2018 Growth Rate Comparison

2018 Comparison		1.7wa 2018 Ref		1.7wa 2018 lo		1.7wa 2018 hi		2.1L1 2018 Ref		2.1L1 2018 Lo		2.1L1 2018 Hi	
ERTAC Region	Fuel Source	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate
NYCW	Simple Cycle Gas	0.429	0.463	0.394	0.426	0.491	0.531	0.810	0.845	0.743	0.745	0.926	0.929
NYLI	Boiler Gas	0.786	0.848	0.786	0.848	0.786	0.848	1.000	0.627	1.000	1.003	1.000	1.003
NYLI	Combined Cycle Gas	1.074	1.160	1.004	1.084	1.208	1.304	0.500	0.627	0.469	0.470	0.564	0.565
NYLI	Oil	0.096	0.103	0.095	0.103	0.092	0.099	0.765	0.767	0.763	0.765	0.733	0.735
NYLI	Simple Cycle Gas	0.562	0.607	0.525	0.567	0.632	0.682	0.500	0.627	0.469	0.470	0.564	0.565
NYUP	Boiler Gas							1.000	0.819	1.000	1.003	1.000	1.003
NYUP	Coal	0.483	0.521	0.671	0.725	0.268	0.290	1.042	1.045	1.449	1.453	0.579	0.581
NYUP	Combined Cycle Gas	0.924	0.998	0.845	0.912	1.479	1.597	0.820	0.819	0.747	0.749	1.307	1.311
NYUP	Oil	0.027	0.029	0.033	0.036	0.016	0.017	0.132	0.132	0.160	0.161	0.078	0.078
NYUP	Simple Cycle Gas	0.528	0.570	0.482	0.521	0.844	0.912	0.820	0.819	0.747	0.749	1.307	1.311
RFCE	Boiler Gas	0.452	0.413	0.452	0.413	0.452	0.413	1.000	0.893	1.000	0.855	1.000	0.855
RFCE	Coal	0.555	0.507	0.594	0.542	0.434	0.397	1.016	0.868	1.086	0.928	0.794	0.679
RFCE	Combined Cycle Gas	2.454	2.241	1.880	1.718	3.733	3.410	1.050	0.893	0.801	0.685	1.591	1.359
RFCE	Oil	0.175	0.160	0.180	0.164	0.152	0.139	0.617	0.528	0.637	0.545	0.537	0.459
RFCE	Simple Cycle Gas	1.006	0.919	0.771	0.704	1.530	1.398	1.050	0.893	0.801	0.685	1.591	1.359
RFCM	Boiler Gas	0.479	0.532	0.479	0.532	0.479	0.532	1.000	2.031	1.000	1.068	1.000	1.068
RFCM	Coal	0.830	0.921	0.877	0.974	0.500	0.555	0.968	1.034	1.024	1.094	0.584	0.623
RFCM	Combined Cycle Gas	2.689	2.985	2.236	2.482	5.189	5.760	2.040	2.031	1.700	1.816	3.947	4.215
RFCM	Oil	0.225	0.250	0.220	0.245	0.219	0.244	0.440	0.470	0.436	0.466	0.435	0.464
RFCM	Simple Cycle Gas	2.144	2.380	1.783	1.979	4.139	4.594	2.040	2.031	1.700	1.816	3.947	4.215
RFCW	Boiler Gas	1.000	0.914	1.000	0.914	1.000	0.914	1.000	1.165	1.000	0.855	1.000	0.855
RFCW	Coal	0.847	0.774	0.862	0.788	0.793	0.725	0.959	0.819	0.976	0.834	0.898	0.768
RFCW	Combined Cycle Gas	2.993	2.735	2.386	2.180	4.534	4.142	1.360	1.165	1.087	0.929	2.065	1.765
RFCW	Oil	0.856	0.782	0.834	0.762	0.806	0.736	0.782	0.668	0.762	0.651	0.736	0.629
RFCW	Simple Cycle Gas	0.728	0.665	0.580	0.530	1.103	1.008	1.360	1.165	1.087	0.929	2.065	1.765
RMPA	Boiler Gas	1.000	0.941	1.000	0.941	1.000	0.941	1.000	0.792	1.000	1.104	1.000	1.104
RMPA	Coal	1.062	0.999	1.063	1.000	0.997	0.938	1.067	1.178	1.068	1.179	1.002	1.106
RMPA	Combined Cycle Gas	0.440	0.414	0.275	0.258	0.669	0.629	0.720	0.792	0.448	0.495	1.091	1.205
RMPA	Simple Cycle Gas	0.436	0.410	0.272	0.256	0.663	0.624	0.720	0.792	0.448	0.495	1.091	1.205
SPPR	Boiler Gas	0.928	0.897	0.928	0.897	0.928	0.897	1.000	0.709	1.000	0.906	1.000	0.906
SPPR	Coal	0.863	0.834	1.187	1.148	1.610	1.557	0.812	0.736	1.095	0.992	1.485	1.346
SPPR	Combined Cycle Gas	1.566	1.514	1.408	1.362	2.193	2.120	1.290	0.709	1.156	1.048	1.800	1.631
SPPR	Oil							1.173	1.063	1.095	0.992	1.485	1.346
SPPR	Simple Cycle Gas	1.556	1.505	1.400	1.353	2.179	2.107	1.290	0.709	1.156	1.048	1.800	1.631
SRCE	Boiler Gas							1.000	1.452	1.000	1.042	1.000	1.042
SRCE	Coal	0.608	0.653	0.899	0.965	0.795	0.853	0.845	0.880	0.934	0.973	0.826	0.861
SRCE	Combined Cycle Gas	2.991	3.213	2.298	2.468	4.322	4.642	1.520	1.452	1.171	1.219	2.201	2.293
SRCE	Oil	3.071	3.299	0.168	0.181	0.161	0.173	2.867	2.986	0.254	0.265	0.243	0.253
SRCE	Simple Cycle Gas	2.721	2.923	2.091	2.246	3.932	4.224	1.520	1.452	1.171	1.219	2.201	2.293

Attachment A: 2018 Growth Rate Comparison

2018 Comparison		1.7wa 2018 Ref		1.7wa 2018 lo		1.7wa 2018 hi		2.1L1 2018 Ref		2.1L1 2018 Lo		2.1L1 2018 Hi	
ERTAC Region	Fuel Source	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate
SRDA	Boiler Gas	1.038	0.989	1.038	0.989	1.038	0.989	1.000	1.184	1.000	1.001	1.000	1.001
SRDA	Coal	1.153	1.099	1.153	1.099	0.620	0.591	1.129	1.130	1.129	1.130	0.607	0.607
SRDA	Combined Cycle Gas	1.693	1.613	1.321	1.259	2.366	2.254	1.340	1.184	1.044	1.045	1.869	1.870
SRDA	Oil	0.078	0.074	0.077	0.074	0.042	0.040	0.099	0.100	0.099	0.099	0.053	0.053
SRDA	Simple Cycle Gas	2.670	2.544	2.083	1.985	3.730	3.554	1.340	1.184	1.044	1.045	1.869	1.870
SRGW	Boiler Gas	1.899	1.833	1.899	1.833	1.899	1.833	1.000	0.783	1.000	0.930	1.000	0.930
SRGW	Coal	0.730	0.704	0.756	0.729	0.635	0.613	0.934	0.868	0.967	0.899	0.813	0.756
SRGW	Combined Cycle Gas	0.370	0.357	0.027	0.026	2.265	2.186	0.840	0.783	0.062	0.058	5.141	4.780
SRGW	Oil	2.300	2.220	2.306	2.225	2.451	2.365	2.875	2.673	2.919	2.714	3.103	2.885
SRGW	Simple Cycle Gas	0.167	0.162	0.012	0.012	1.025	0.989	0.840	0.783	0.062	0.058	5.141	4.780
SRSE	Boiler Gas	0.880	0.816	0.880	0.816	0.880	0.816	1.000	1.472	1.000	0.966	1.000	0.966
SRSE	Coal	0.852	0.790	0.707	0.655	0.430	0.399	0.886	0.856	0.982	0.948	0.598	0.577
SRSE	Combined Cycle Gas	2.700	2.502	2.211	2.049	3.416	3.166	1.400	1.472	1.143	1.104	1.765	1.706
SRSE	Oil	0.165	0.153	3.517	3.259	2.259	2.093	0.250	0.242	3.326	3.214	2.136	2.064
SRSE	Simple Cycle Gas	2.248	2.084	1.841	1.706	2.845	2.636	1.400	1.472	1.143	1.104	1.765	1.706
SRVC	Boiler Gas	0.565	0.593	0.565	0.593	0.565	0.593	1.000	1.614	1.000	1.024	1.000	1.024
SRVC	Coal	0.683	0.716	0.815	0.855	0.480	0.503	0.847	0.868	1.012	1.036	0.595	0.610
SRVC	Combined Cycle Gas	4.054	4.251	2.974	3.118	5.899	6.185	1.580	1.614	1.159	1.187	2.299	2.354
SRVC	Oil	0.351	0.368	0.383	0.402	0.309	0.324	1.093	1.119	1.193	1.221	0.962	0.985
SRVC	Simple Cycle Gas	2.261	2.371	1.659	1.739	3.290	3.450	1.580	1.614	1.159	1.187	2.299	2.354

Attachment B: 2020 Growth Rate Comparison

2020 Comparison		1.7wa 2020 ref		1.7wa 2020 lo		1.7wa 2020 hi		2.1L1 2020 ref		2.1L1 2020 lo		2.1L1 2020 hi	
ERTAC Region	Fuel Source	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate
AZNM	Boiler Gas	0.742	0.634	0.742	0.634	0.742	0.634	1.000	0.756	1.000	0.974	1.000	0.974
AZNM	Coal	1.294	1.106	1.335	1.141	1.246	1.065	1.003	0.977	1.034	1.008	0.966	0.941
AZNM	Combined Cycle Gas	0.603	0.515	0.582	0.498	0.679	0.580	0.764	0.756	0.738	0.719	0.861	0.839
AZNM	Simple Cycle Gas	0.817	0.698	0.789	0.674	0.920	0.786	0.764	0.756	0.738	0.719	0.861	0.839
CAMX	Boiler Gas	0.522	0.512	0.522	0.512	0.522	0.512	1.000	1.352	1.000	1.078	1.000	1.078
CAMX	Coal	0.815	0.799	0.887	0.870	0.843	0.826	0.900	0.969	0.979	1.055	0.930	1.002
CAMX	Combined Cycle Gas	0.969	0.949	0.935	0.917	1.086	1.065	1.291	1.352	1.247	1.344	1.448	1.561
CAMX	Simple Cycle Gas	1.348	1.321	1.302	1.275	1.512	1.481	1.291	1.352	1.247	1.344	1.448	1.561
ERCT	Boiler Gas	0.579	0.564	0.579	0.564	0.579	0.564	1.000	1.071	1.000	0.965	1.000	0.965
ERCT	Coal	0.993	0.967	1.206	1.175	0.537	0.523	0.935	0.903	1.136	1.096	0.506	0.488
ERCT	Combined Cycle Gas	1.249	1.217	0.972	0.947	1.810	1.763	1.121	1.071	0.873	0.843	1.625	1.569
ERCT	Simple Cycle Gas	1.330	1.295	1.035	1.008	1.927	1.877	1.121	1.071	0.873	0.843	1.625	1.569
FRCC	Boiler Gas	0.415	0.416	0.415	0.416	0.415	0.416	1.000	0.923	1.000	1.004	1.000	1.004
FRCC	Coal	0.709	0.712	0.802	0.805	0.328	0.330	1.007	1.011	1.138	1.143	0.466	0.468
FRCC	Combined Cycle Gas	1.465	1.471	1.337	1.342	2.023	2.030	0.915	0.923	0.835	0.839	1.264	1.269
FRCC	Oil	0.015	0.015	0.016	0.016	0.011	0.011	0.093	0.094	0.099	0.099	0.068	0.068
FRCC	Simple Cycle Gas	0.836	0.839	0.763	0.766	1.154	1.158	0.915	0.923	0.835	0.839	1.264	1.269
MROE	Boiler Gas	0.167	0.187	0.167	0.187	0.167	0.187	1.000	3.465	1.000	1.078	1.000	1.078
MROE	Coal	0.632	0.709	0.892	1.000	0.479	0.537	0.598	0.644	0.843	0.909	0.453	0.489
MROE	Combined Cycle Gas	2.583	2.895	0.688	0.771	2.854	3.199	3.276	3.465	0.872	0.940	3.619	3.903
MROE	Simple Cycle Gas	3.124	3.501	0.831	0.932	3.451	3.868	3.276	3.465	0.872	0.940	3.619	3.903
MROW	Boiler Gas	0.194	0.206	0.194	0.206	0.194	0.206	1.000	1.567	1.000	1.073	1.000	1.073
MROW	Coal	0.831	0.883	0.847	0.900	0.733	0.779	1.024	1.099	1.044	1.120	0.904	0.970
MROW	Combined Cycle Gas	0.681	0.724	0.347	0.369	1.764	1.875	1.467	1.567	0.747	0.802	3.800	4.076
MROW	Oil	0.310	0.329	0.311	0.331	0.289	0.308	1.720	1.845	1.723	1.849	1.601	1.717
MROW	Simple Cycle Gas	0.605	0.643	0.308	0.327	1.566	1.665	1.467	1.567	0.747	0.802	3.800	4.076
NEWE	Boiler Gas	0.337	0.361	0.337	0.361	0.337	0.361	1.000	0.971	1.000	0.919	1.000	0.919
NEWE	Coal	0.152	0.163	0.442	0.474	0.106	0.114	0.426	0.391	1.236	1.136	0.297	0.273
NEWE	Combined Cycle Gas	1.261	1.354	1.021	1.096	1.544	1.657	1.057	0.971	0.856	0.786	1.294	1.189
NEWE	Oil	0.026	0.028	0.032	0.034	0.028	0.030	0.277	0.254	0.335	0.308	0.293	0.269
NEWE	Simple Cycle Gas	1.123	1.205	0.909	0.976	1.374	1.476	1.057	0.971	0.856	0.786	1.294	1.189
NWPP	Boiler Gas	0.191	0.188	0.191	0.188	0.191	0.188	1.000	2.373	1.000	1.046	1.000	1.046
NWPP	Coal	0.974	0.960	1.014	0.999	0.888	0.875	1.098	1.148	1.143	1.195	1.001	1.047
NWPP	Combined Cycle Gas	1.839	1.813	1.628	1.604	2.141	2.111	2.290	2.373	2.027	2.119	2.666	2.788
NWPP	Oil	7.442	7.335	7.400	7.294	7.314	7.209						
NWPP	Simple Cycle Gas	1.620	1.597	1.434	1.413	1.886	1.859	2.290	2.373	2.027	2.119	2.666	2.788
NYCW	Boiler Gas	0.748	0.809	0.748	0.809	0.748	0.809	1.000	0.857	1.000	1.004	1.000	1.004
NYCW	Combined Cycle Gas	0.783	0.846	0.713	0.771	0.668	0.722	0.821	0.857	0.748	0.751	0.700	0.703

Attachment B: 2020 Growth Rate Comparison

2020 Comparison		1.7wa 2020 ref		1.7wa 2020 lo		1.7wa 2020 hi		2.1L1 2020 ref		2.1L1 2020 lo		2.1L1 2020 hi	
ERTAC Region	Fuel Source	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate
NYCW	Oil	0.053	0.057	0.049	0.053	0.050	0.054	0.647	0.650	0.604	0.607	0.610	0.613
NYCW	Simple Cycle Gas	0.435	0.471	0.397	0.429	0.371	0.402	0.821	0.857	0.748	0.751	0.700	0.703
NYLI	Boiler Gas	0.786	0.850	0.786	0.850	0.786	0.850	1.000	0.398	1.000	1.004	1.000	1.004
NYLI	Combined Cycle Gas	0.427	0.462	0.309	0.335	0.000	0.000	0.199	0.398	0.144	0.145	0.000	0.000
NYLI	Oil	0.005	0.005	0.004	0.004	0.005	0.006	0.039	0.039	0.032	0.032	0.042	0.042
NYLI	Simple Cycle Gas	0.224	0.242	0.162	0.175	0.000	0.000	0.199	0.398	0.144	0.145	0.000	0.000
NYUP	Boiler Gas							1.000	0.969	1.000	1.004	1.000	1.004
NYUP	Coal	0.491	0.530	0.704	0.761	0.147	0.158	1.059	1.064	1.520	1.526	0.316	0.318
NYUP	Combined Cycle Gas	1.091	1.180	0.918	0.993	0.751	0.813	0.965	0.969	0.811	0.815	0.664	0.667
NYUP	Oil	0.022	0.023	0.032	0.035	0.008	0.008	0.105	0.106	0.157	0.158	0.038	0.038
NYUP	Simple Cycle Gas	0.623	0.674	0.524	0.567	0.429	0.464	0.965	0.969	0.811	0.815	0.664	0.667
RFCE	Boiler Gas	0.452	0.410	0.452	0.410	0.452	0.410	1.000	0.889	1.000	0.849	1.000	0.849
RFCE	Coal	0.556	0.505	0.604	0.549	0.405	0.368	1.017	0.864	1.106	0.939	0.741	0.629
RFCE	Combined Cycle Gas	2.459	2.232	1.761	1.598	3.616	3.283	1.048	0.889	0.750	0.637	1.541	1.308
RFCE	Oil	0.175	0.159	0.183	0.166	0.147	0.134	0.617	0.524	0.648	0.550	0.521	0.442
RFCE	Simple Cycle Gas	1.008	0.915	0.722	0.655	1.482	1.345	1.048	0.889	0.750	0.637	1.541	1.308
RFCM	Boiler Gas	0.479	0.537	0.479	0.537	0.479	0.537	1.000	2.050	1.000	1.078	1.000	1.078
RFCM	Coal	0.833	0.934	0.897	1.006	0.484	0.542	0.973	1.049	1.048	1.130	0.565	0.609
RFCM	Combined Cycle Gas	2.688	3.012	2.145	2.405	5.315	5.957	2.044	2.050	1.632	1.760	4.042	4.359
RFCM	Oil	0.225	0.252	0.223	0.250	0.222	0.249	0.440	0.475	0.442	0.477	0.441	0.475
RFCM	Simple Cycle Gas	2.143	2.402	1.711	1.918	4.239	4.751	2.044	2.050	1.632	1.760	4.042	4.359
RFCW	Boiler Gas	1.000	0.908	1.000	0.908	1.000	0.908	1.000	1.064	1.000	0.849	1.000	0.849
RFCW	Coal	0.864	0.785	0.893	0.811	0.810	0.736	0.979	0.831	1.011	0.859	0.917	0.779
RFCW	Combined Cycle Gas	2.751	2.498	1.916	1.739	4.647	4.219	1.253	1.064	0.872	0.741	2.117	1.797
RFCW	Oil	0.867	0.787	0.848	0.769	0.836	0.759	0.793	0.673	0.775	0.658	0.764	0.649
RFCW	Simple Cycle Gas	0.669	0.607	0.466	0.423	1.130	1.026	1.253	1.064	0.872	0.741	2.117	1.797
RMPA	Boiler Gas	1.000	0.933	1.000	0.933	1.000	0.933	1.000	0.291	1.000	1.095	1.000	1.095
RMPA	Coal	1.014	0.945	1.042	0.972	0.975	0.910	1.019	1.115	1.047	1.147	0.980	1.073
RMPA	Combined Cycle Gas	0.163	0.152	0.074	0.069	0.589	0.549	0.265	0.291	0.120	0.132	0.960	1.052
RMPA	Simple Cycle Gas	0.161	0.150	0.073	0.068	0.584	0.544	0.265	0.291	0.120	0.132	0.960	1.052
SPPR	Boiler Gas	0.928	0.908	0.928	0.908	0.928	0.908	1.000	0.751	1.000	0.917	1.000	0.917
SPPR	Coal	0.914	0.894	1.188	1.162	1.637	1.602	0.860	0.789	1.096	1.005	1.510	1.385
SPPR	Combined Cycle Gas	1.603	1.568	1.410	1.380	2.242	2.194	1.316	0.751	1.158	1.062	1.840	1.688
SPPR	Oil							1.191	1.093	1.096	1.005	1.510	1.385
SPPR	Simple Cycle Gas	1.593	1.559	1.402	1.372	2.229	2.181	1.316	0.751	1.158	1.062	1.840	1.688
SRCE	Boiler Gas							1.000	1.467	1.000	1.053	1.000	1.053
SRCE	Coal	0.616	0.669	0.960	1.043	0.839	0.911	0.855	0.901	0.998	1.051	0.872	0.918
SRCE	Combined Cycle Gas	3.100	3.367	1.886	2.048	4.653	5.054	1.579	1.467	0.960	1.012	2.370	2.496

Attachment B: 2020 Growth Rate Comparison

2020 Comparison		1.7wa 2020 ref		1.7wa 2020 lo		1.7wa 2020 hi		2.1L1 2020 ref		2.1L1 2020 lo		2.1L1 2020 hi	
ERTAC Region	Fuel Source	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate	Annual Growth Rate	Peak Growth Rate
SRCE	Oil	3.214	3.491	0.176	0.191	0.166	0.181	3.000	3.160	0.265	0.279	0.251	0.264
SRCE	Simple Cycle Gas	2.821	3.064	1.716	1.864	4.234	4.599	1.579	1.467	0.960	1.012	2.370	2.496
SRDA	Boiler Gas	1.038	0.990	1.038	0.990	1.038	0.990	1.000	1.207	1.000	1.001	1.000	1.001
SRDA	Coal	1.154	1.100	1.154	1.100	0.620	0.591	1.130	1.131	1.130	1.131	0.608	0.608
SRDA	Combined Cycle Gas	1.747	1.666	1.284	1.224	2.972	2.833	1.381	1.207	1.014	1.015	2.348	2.350
SRDA	Oil	0.078	0.074	0.077	0.074	0.042	0.040	0.099	0.100	0.099	0.099	0.053	0.053
SRDA	Simple Cycle Gas	2.755	2.626	2.024	1.930	4.685	4.466	1.381	1.207	1.014	1.015	2.348	2.350
SRGW	Boiler Gas	1.899	1.829	1.899	1.829	1.899	1.829	1.000	0.865	1.000	0.928	1.000	0.928
SRGW	Coal	0.737	0.709	0.810	0.780	0.542	0.522	0.943	0.875	1.036	0.962	0.693	0.643
SRGW	Combined Cycle Gas	0.411	0.396	0.020	0.019	1.560	1.502	0.932	0.865	0.044	0.041	3.540	3.284
SRGW	Oil	2.300	2.215	2.335	2.249	2.327	2.241	2.875	2.668	2.955	2.742	2.945	2.733
SRGW	Simple Cycle Gas	0.186	0.179	0.009	0.009	0.705	0.679	0.932	0.865	0.044	0.041	3.540	3.284
SRSE	Boiler Gas	0.880	0.811	0.880	0.811	0.880	0.811	1.000	1.516	1.000	0.960	1.000	0.960
SRSE	Coal	0.881	0.812	0.718	0.662	0.506	0.466	0.916	0.880	0.998	0.958	0.703	0.675
SRSE	Combined Cycle Gas	2.698	2.485	2.263	2.084	3.492	3.216	1.394	1.516	1.169	1.123	1.804	1.732
SRSE	Oil	0.172	0.159	3.680	3.389	2.604	2.398	0.260	0.250	3.481	3.342	2.463	2.365
SRSE	Simple Cycle Gas	2.247	2.069	1.884	1.735	2.908	2.678	1.394	1.516	1.169	1.123	1.804	1.732
SRVC	Boiler Gas	0.565	0.593	0.565	0.593	0.565	0.593	1.000	1.593	1.000	1.023	1.000	1.023
SRVC	Coal	0.757	0.793	0.831	0.871	0.510	0.535	0.940	0.962	1.031	1.056	0.633	0.648
SRVC	Combined Cycle Gas	4.003	4.195	2.893	3.033	6.322	6.627	1.560	1.593	1.128	1.154	2.464	2.522
SRVC	Oil	0.372	0.390	0.389	0.408	0.320	0.335	1.160	1.187	1.212	1.240	0.996	1.020
SRVC	Simple Cycle Gas	2.232	2.340	1.614	1.692	3.526	3.696	1.560	1.593	1.128	1.154	2.464	2.522