CASCADE NATURAL GAS CORPORATION
A Subsidiary of MDU Resources Group, Inc.
In the Community to Serve®

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November 17th, 2021

Oregon Public Utility Commission
Attn: Filing Center
P.O. Box 1088
Salem, OR 97308-1088

RE: UM 2178 Natural Gas Fact Finding Per EO 20-04

Attention: Filing Center

Enclosed for filing is Cascade Natural Gas Corporation's (Cascade or Company) UM 2178 alternative scenario results, along with scenario data source documentation. Additionally, Cascade will outline in this document its understanding and assumptions related to the sensitivities in the two alternative scenarios, as well as the specific documents in this filing that comply with the various deliverables presented by OPUC Staff (Staff) in its October 1st filing.

Alternative Scenario 1. Accelerated Innovation / Electrification / High Social Cost of Greenhouse Gas

Cascade has modeled the tax credit associated with Accelerated Innovation sensitivity in the workbook titled "UM 2178 CNGC Green Hydrogen Incentive Analysis.xlsx" For all projects starting before 2026, the workbook calculates a new levelized cost of hydrogen by incorporating a rolling five-year tax credit, as detailed in the documentation sourced by Staff. As of 2026, the price of Community Climate Investment (CCI) credits are set to align with Social Cost of Carbon (SCC) at the 95th percentile. The values used are in real $2007, to align with starting value outlined by Staff. With regards to electrification, customer growth in Cascade's residential and commercial rate classes gradually slows to zero growth in 2030. Then, residential and commercial customers fall to 10 percent by 2050. Light industrial customers gradually reduced to 10% by 2050. Cascade is unsure what is meant by "Light industry" in Staff's guidance, so the Company interprets this as applying the scenario modifications to its general industrial customers with no modification to its large volume industrial customers.

Alternative Scenario 2. Delayed Innovation / Accelerated Electrification

Cascade reached out to the Energy Trust of Oregon for assistance in modeling slower energy efficiency technology adoption curves. The results of this analysis are in a workbook titled "UM 2178 CNGC CNG_Slow Innovation EE Scenario Results.xlsx". To model renewable natural gas (RNG) supply competition, the Company calculated its throughput share of total US gas use as of EIAs 2020 throughput data, applied it to the ICF Low RNG Resource Potential case from the 2019

American Gas Foundation RNG Study, and then used these 2040 RNG potential values to develop RNG potential curves for the entire planning horizon. The result of this analysis can be found in the "UM 2178 CNGC Low RNG Analysis.xlsx" file. In modeling very rapid electrification, customer growth in Cascade's residential and commercial rate classes gradually slows to zero growth in 2025, and thereafter residential and commercial customer counts are reduced until it is 10% by 2040.

Deliverables

Updated graphics and tables in the format submitted for the base case and associated sensitivities can be found in the file labeled "UM 2178 CNGC OPUC Fact Finding Results Summary.xlsx" Cascade has also provided its results in the format shared by NW Natural as requested and is in the file labeled "UM 2178 CNGC Scenario Results - NWN Format.xlsx" One difference to note is that Cascade provides its marginal renewable supply portfolio cost versus the absolute costs, and its model calculates all costs as marginal costs. Load that is transferred to another resource is provided in the file labeled "UM 2178 Electrified Load Analysis.xlsx" In addition to requested deliverable, Cascade has also provided what the projected load transfer would be on peak day and peak hour, using factors filed with the OPUC in docket UM 1893, as well as the Company's 2020 IRP.

Cascade is also including in its filing summary data from study performed by the Company regarding potential costs of converting a home with natural gas water and space heating to all electric, for Staff's consideration in its analysis of the estimated costs of the transferred load. For example, In Scenario #2, Cascade modeling identifies that a little over 60,000 residential customers project to be converted to all electric from 2021 to 2040. At an average cost of $22,500 per home, the total cost of conversion would be approximately $1.35 Billion. The supporting data can be found in the file labeled "UM 2178 CNGC Cascade_2021_Electrification_Constractor_Survey_Raw_Data_Redacted.xlsx". This cost is in line with results found in the report published by the City of San Francisco in April 2021 on costs for decarbonization of homes and buildings. Cascade's data regarding low and moderate income customers is informed by analysis done by one of the Company's consultants, Applied Energy Group. This can be found in the files "UM 2178 OR CNGC Map Series.pdf" and "UM 2178 OPUC – Oregon Low Income Analysis 2021-06-30.pptx" Bill impacts are calculated separately for each of the two scenarios. They can be found in files labeled "UM 2178 Additional Scenario 1 Rate Impact Analysis.xlsx" and "UM 2178 Additional Scenario 2 Rate Impact Analysis.xlsx"

If there are any questions regarding this request, please contact me at (509) 734-4546 or via email at Brian.Robertson@cngc.com.

Sincerely,
CASCADE NATURAL GAS CORPORATION
/s/ Brian Robertson
Brian Robertson
Supervisor, Resource Planning

UM 2178 CNGC Enclosed

UM 2178 CNGC Additional Scenario 1 Rate Impact Analysis.xlsx
UM 2178 CNGC Additional Scenario 2 Rate Impact Analysis.xlsx
UM 2178 CNGC Cascade_2021_Electrification_Constractor_Survey_Raw_Data_Redacted.xlsx
UM 2178 CNGC CNG Slow Innovation EE Scenario Results.xlsx
UM 2178 CNGC Electrified Load Analysis.xlsx
UM 2178 CNGC Green Hydrogen Incentive Analysis.xlsx
UM 2178 CNGC Low RNG Analysis.xlsx
UM 2178 CNGC OPUC - Oregon Low Income Analysis 2021-06-30.pptx
UM 2178 CNGC OPUC Fact Finding Results Summary.xlsx
UM 2178 CNGC OR CNGC Map Series.pdf
UM 2178 CNGC Scenario Results - NWN Format.xlsx

AEG
APPLIED ENERGY GROUP

CNGC Oregon Low Income Customer Analysis

Date: June 30, 2021

Prepared For: Oregon Public Utilities Commission Staff

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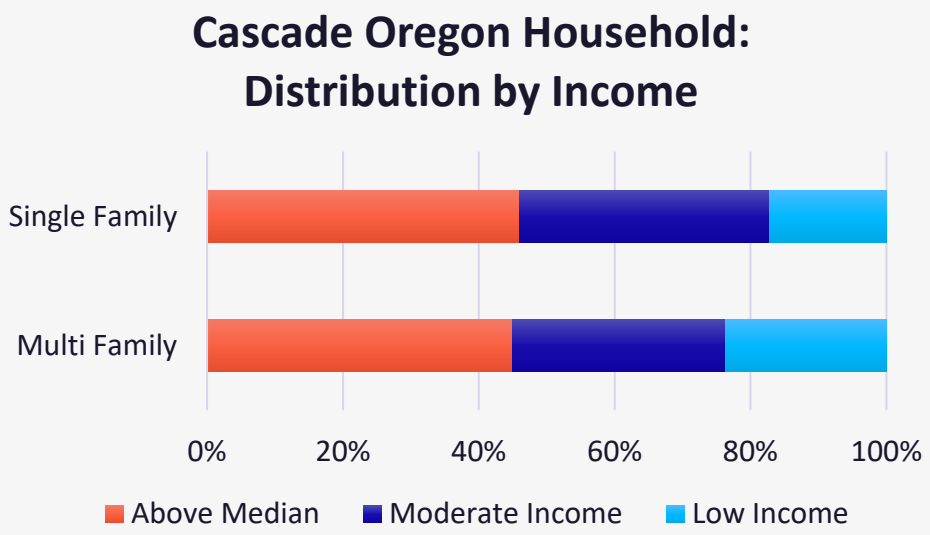
- In order to better serve all customers, and glean additional insights into Cascade's financially disadvantaged customers, Cascade requested analysis to identify and characterize low-income communities in their service territory.
- AEG developed the approach described below to leverage secondary data sources to provide deeper insight into Cascade's Oregon customer base by income level.
- AEG worked with Cascade to develop the definitions for low-income and moderate-income households used in this analysis:

HH Size	Low Income Threshold	Moderate Income Threshold
1	$25,520	$25,027
2	$34,480	$50,054
3	$43,440	$75,081
4	$52,400	$100,108
5	$61,360	$125,135
6	$70,320	$150,163
7	$79,280	$175,190
8	$88,240	$200,217

Low income is based on 200% FPL;
Moderate income are customers > 200% FPL up to state median income

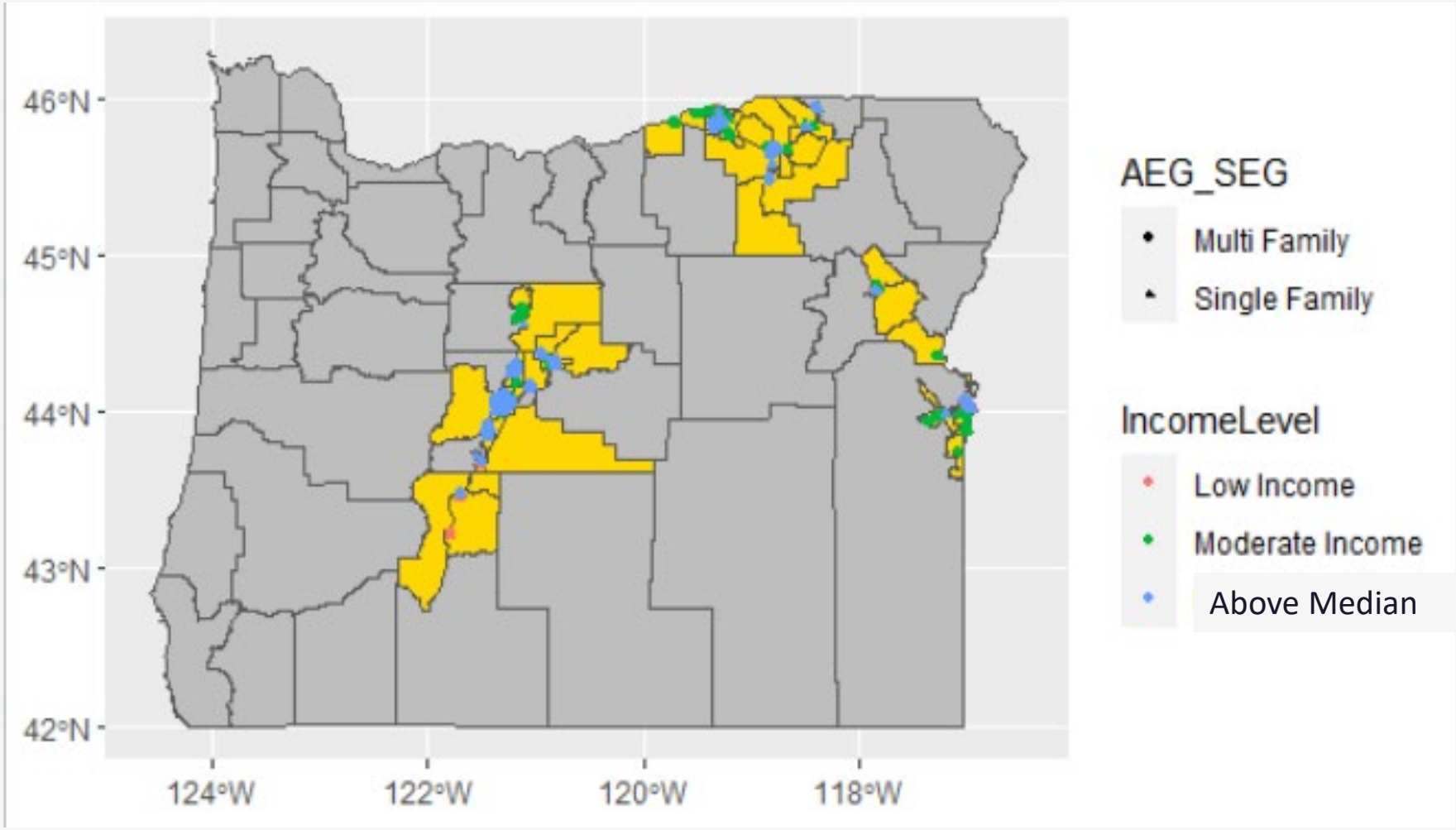
Part 1: US Census Analysis

- Address data from CNGC residential accounts was mapped back to corresponding geographic "blocks" in the census data.
  - Each of these blocks was then processed to analyze average household size and income, producing a distribution of households into income buckets for places **where CNGC customers reside**. (see next slide)



Housing Type	Income Group	Oregon		
		Accounts	% of SF or MF	% of All HH
Single Family	Above Median	35,417	46%	43%
	Moderate Income	28,434	37%	34%
	Low Income	13,251	17%	16%
Multi Family	Above Median	2,605	45%	3%
	Moderate Income	1,819	31%	2%
	Low Income	1,369	24%	2%
Total		**82,895**		**100%**

Map – Cascade OR Residential Customers



- Yellow areas are counties where CNGC customers reside. The colored dots show the average income group assignment for a census geo-block.

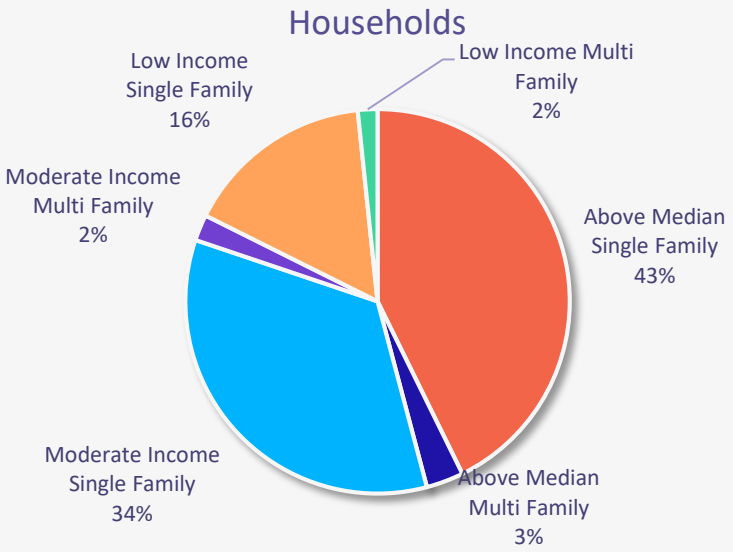
Part 2: RBSA Analysis

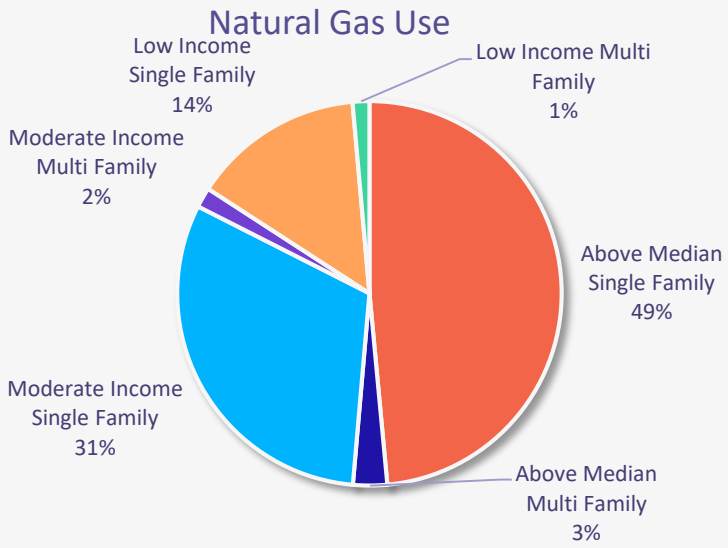
- The NEEA Residential Building Stock Assessment II (2016) includes household income and many usage characteristics, which allows insight into household energy use in different income groups.
- Differences in gas use per household correlate with differences in average home size, but home size and building shell alone do not account for *all* the intensity difference
- Overall insulation and infiltration levels are similar between income levels, in contrast to Cascade's WA territory.
  - R-values for roof/attic, walls, and floors are within +/- 1
  - Average low/moderate income air infiltration is actually lower (better) than above-median income homes, which may be the effect of targeted programs

Oregon Gas Customer Characteristics by Income Level – RBSA II

Income Class	Responses	Avg. Therms /HH	Δ	Gas Space Heat	Gas Water Heat	Age of Home (Avg)
Above Median	153	648	n/a	61%	80%	1961
Moderate Income	27	638	-2%	61%	89%	1969
Low Income	55	547	-16%	67%	65%	1958

Results Summary





Row Labels	Households	% of Households	Therms	% of Therms	Therms per HH
Above Median					
Single Family	35,417	42.73%	32,031,069	48.51%	904
Multi Family	2,605	3.14%	1,891,766	2.87%	726
Moderate Income					
Single Family	28,434	34.30%	20,525,481	31.09%	722
Multi Family	1,819	2.19%	1,113,780	1.69%	612
Low Income					
Single Family	13,251	15.99%	9,534,721	14.44%	720
Multi Family	1,369	1.65%	929,208	1.41%	679
Grand Total	**82,895**	**100.00%**	**66,026,026**	**100.00%**	797

Thank You.

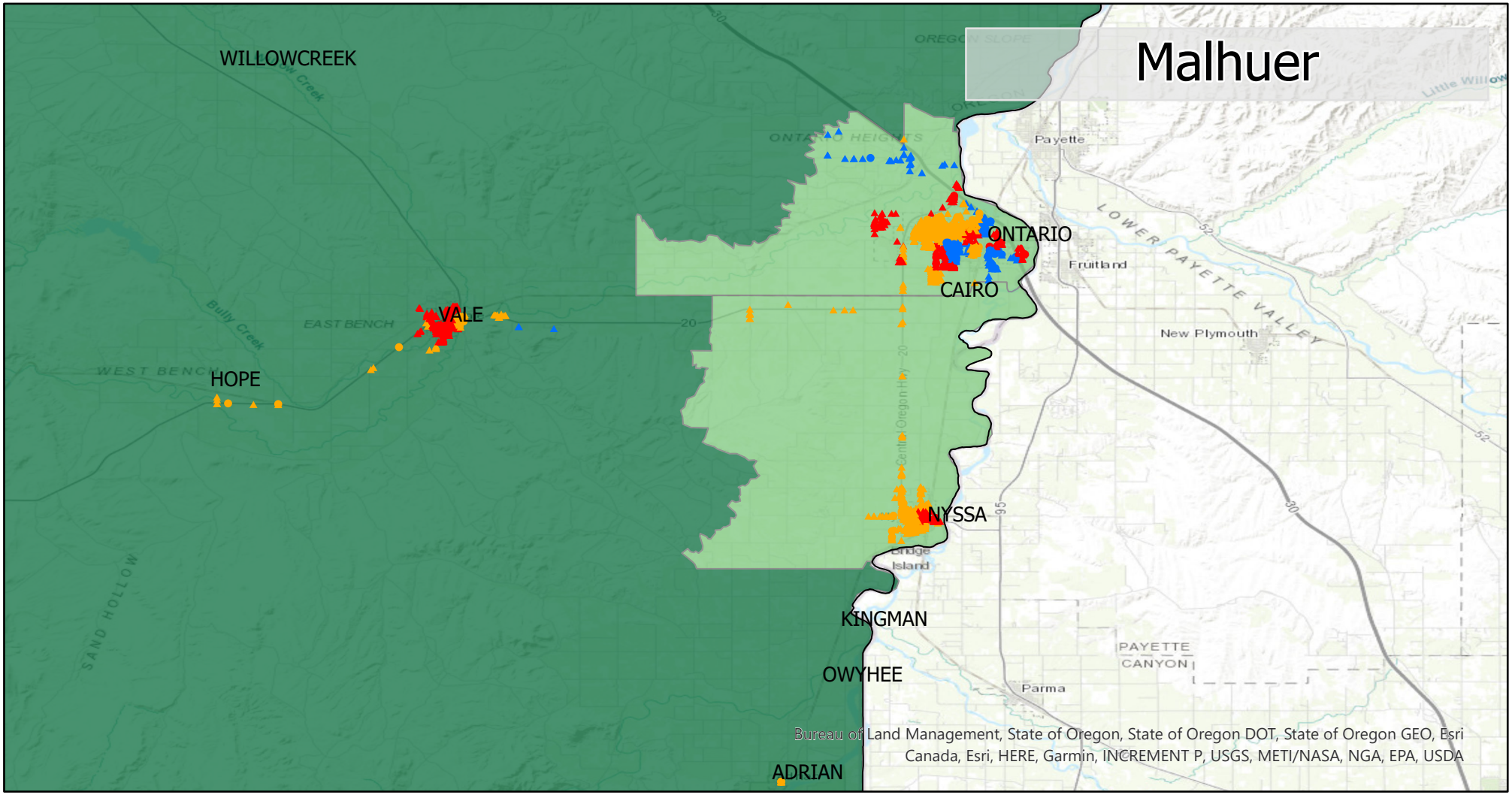
Eli Morris, Managing Director
emorris@appliedenergygroup.com

Ken Walter, Project Manager
kwalter@appliedenergygroup.com

Phone 510-982-3530

AEG
APPLIED ENERGY GROUP

Income by Structure Type and Urban/Rural Areas

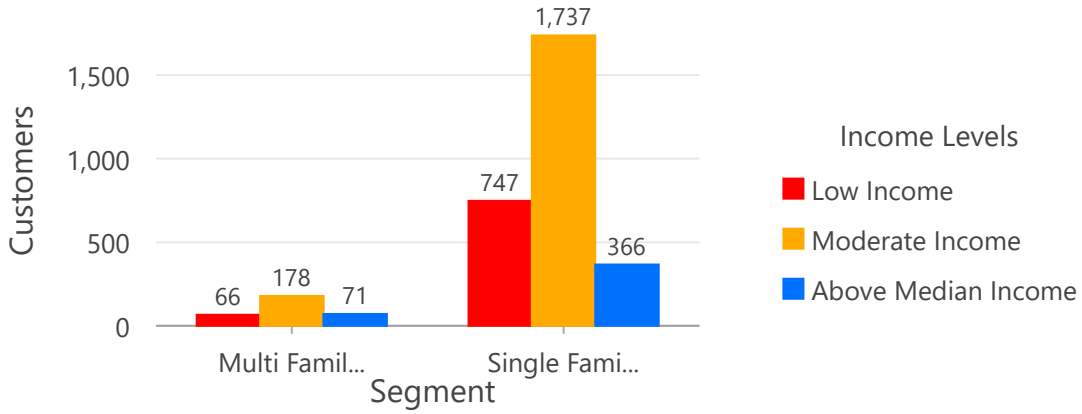


Rural Urban Commuting Areas

- 1 (Least Rural)
- 2- 3
- 4-5
- 6-8
- 9-10 (Most Rural)

Residential Segmentation

- Multi Family,Low Income
- Single Family,Low Income
- Multi Family,Moderate Income
- Single Family,Moderate Income
- Multi Family,Above Median Income
- Single Family,Above Median Income



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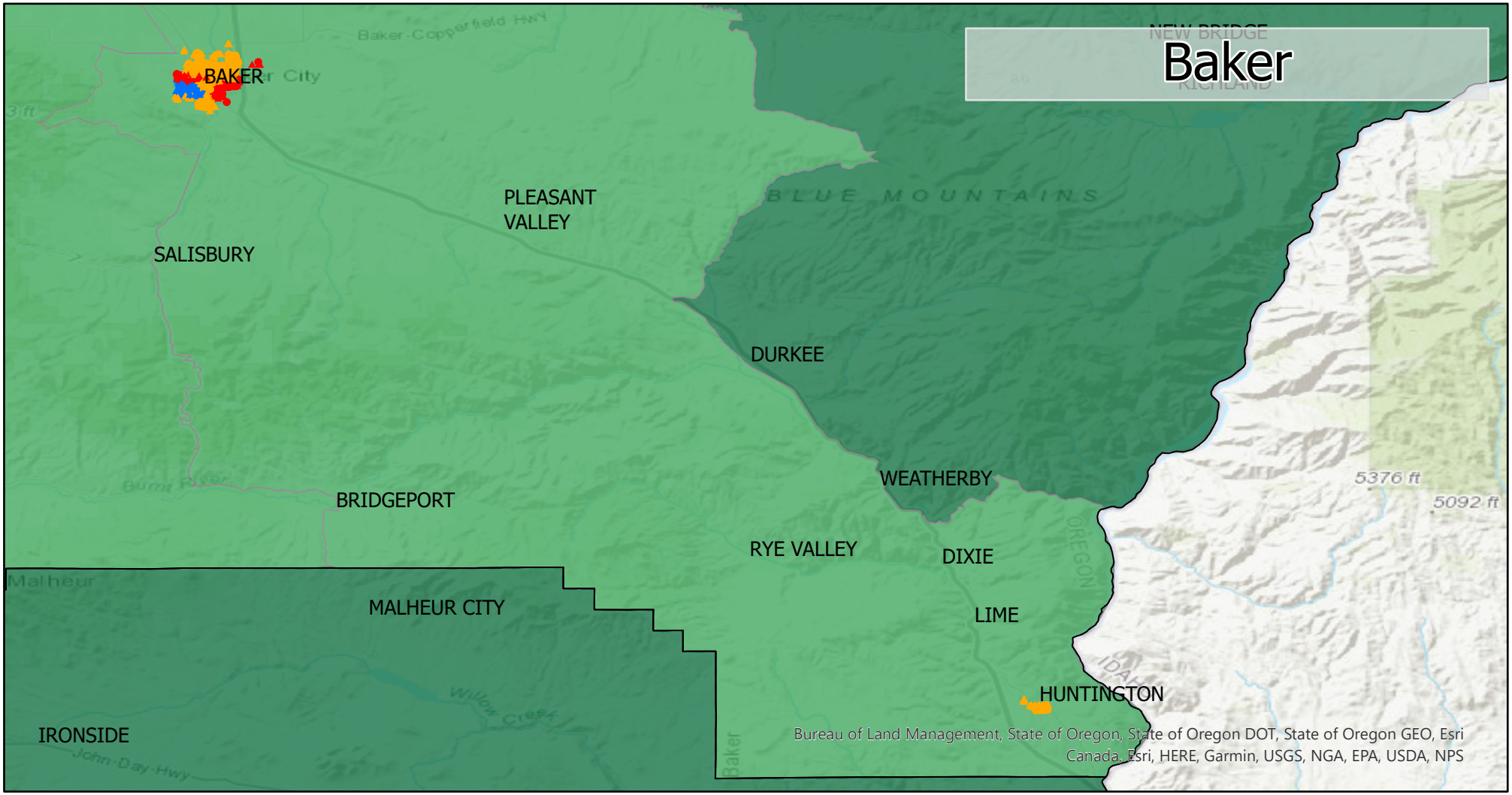

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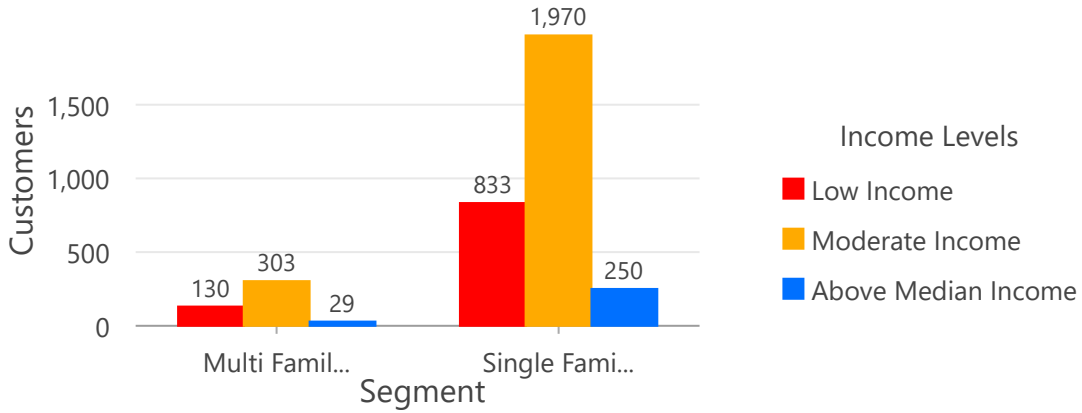

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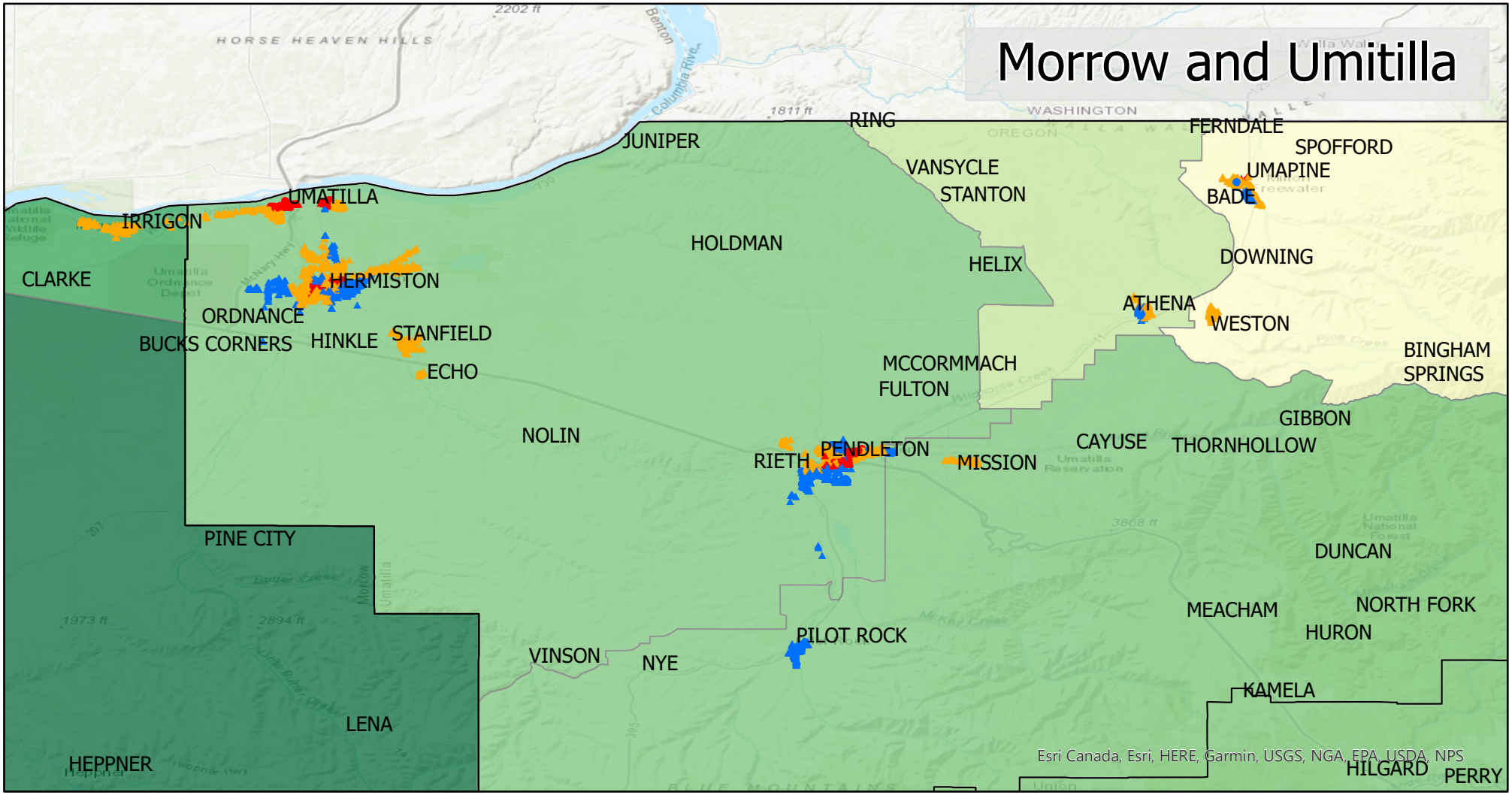

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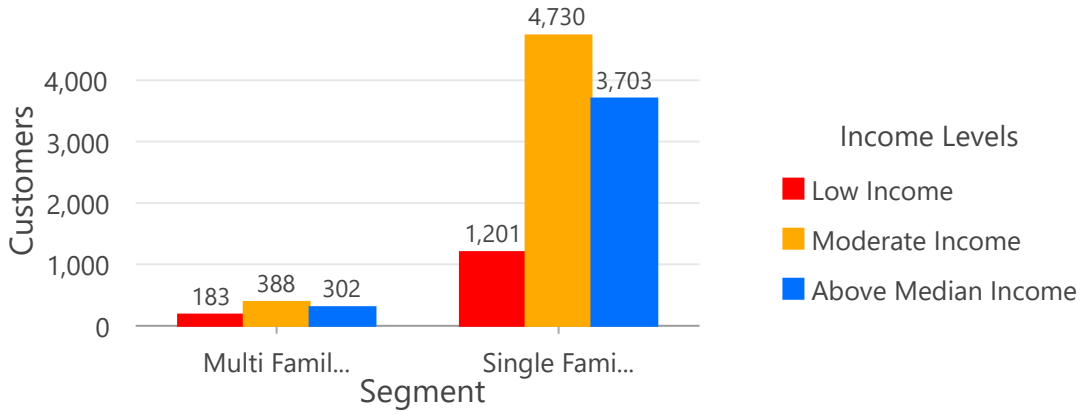

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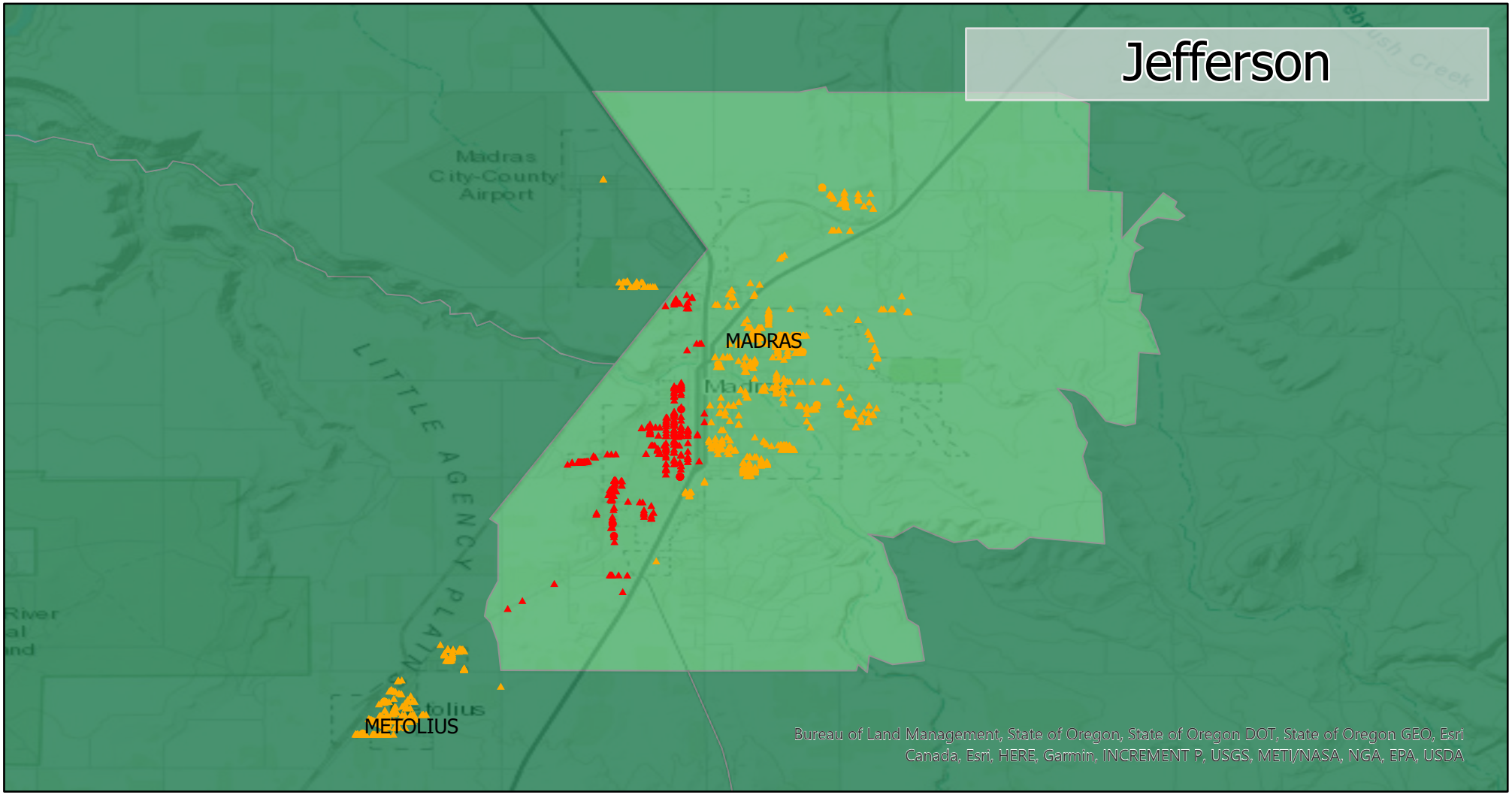

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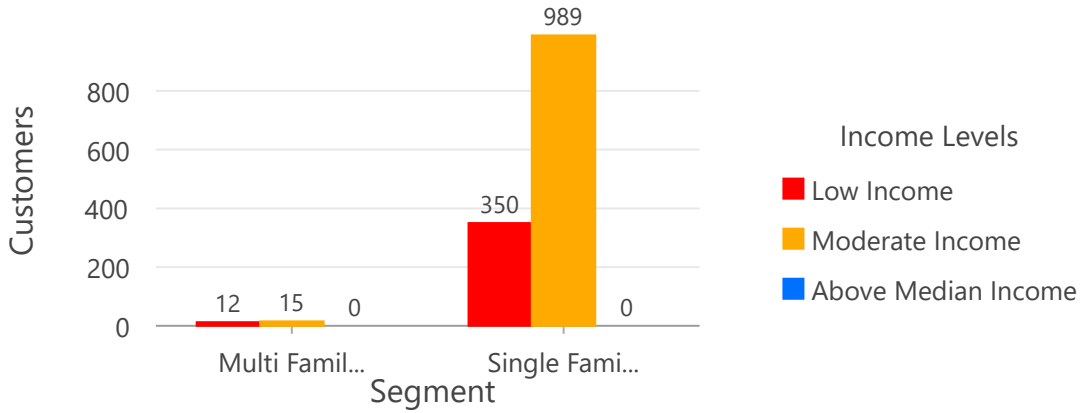

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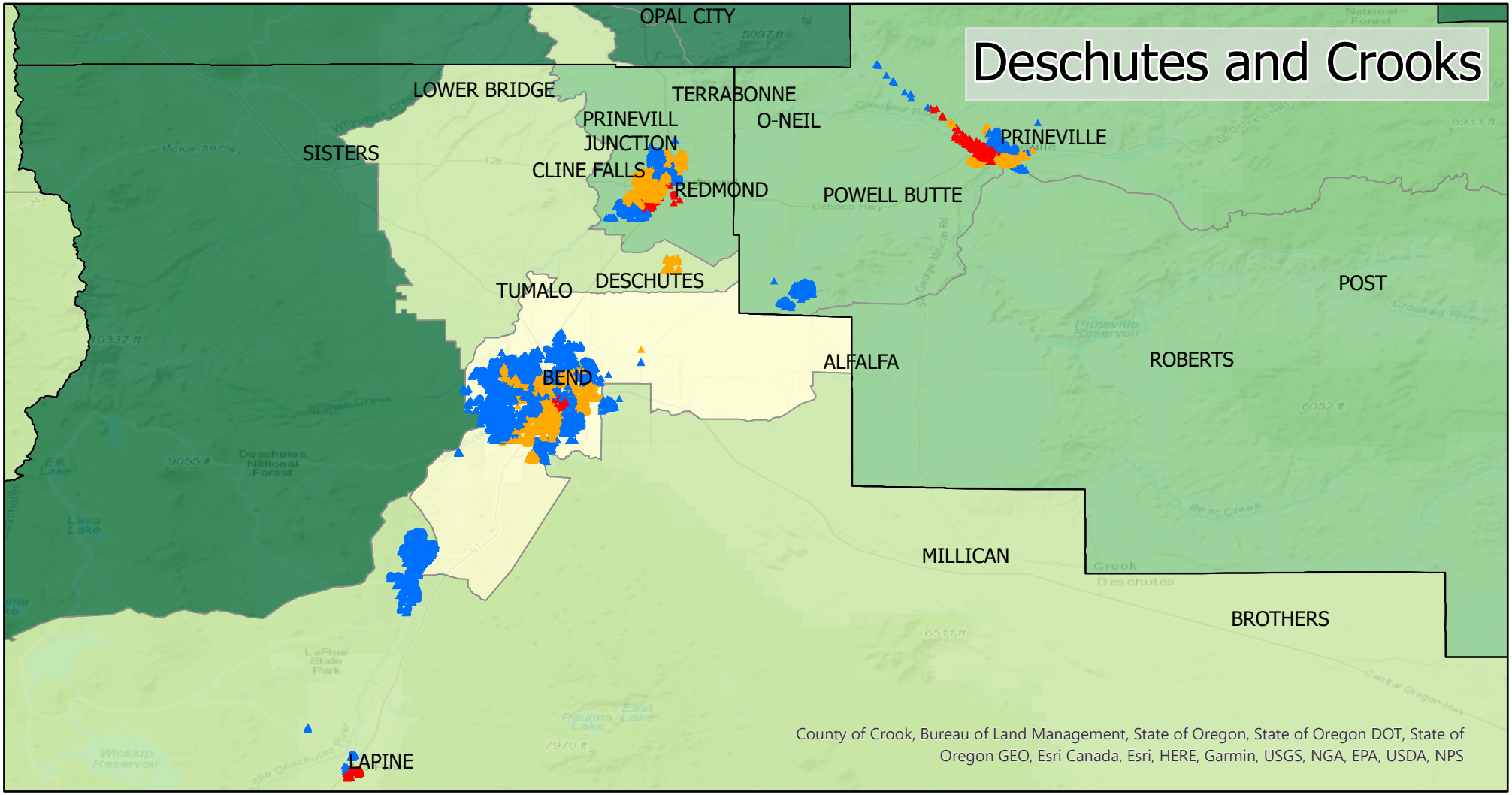

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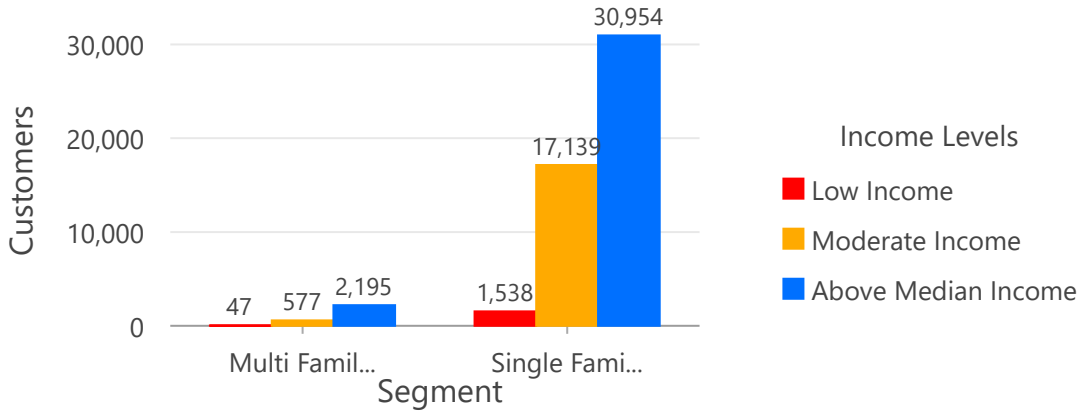

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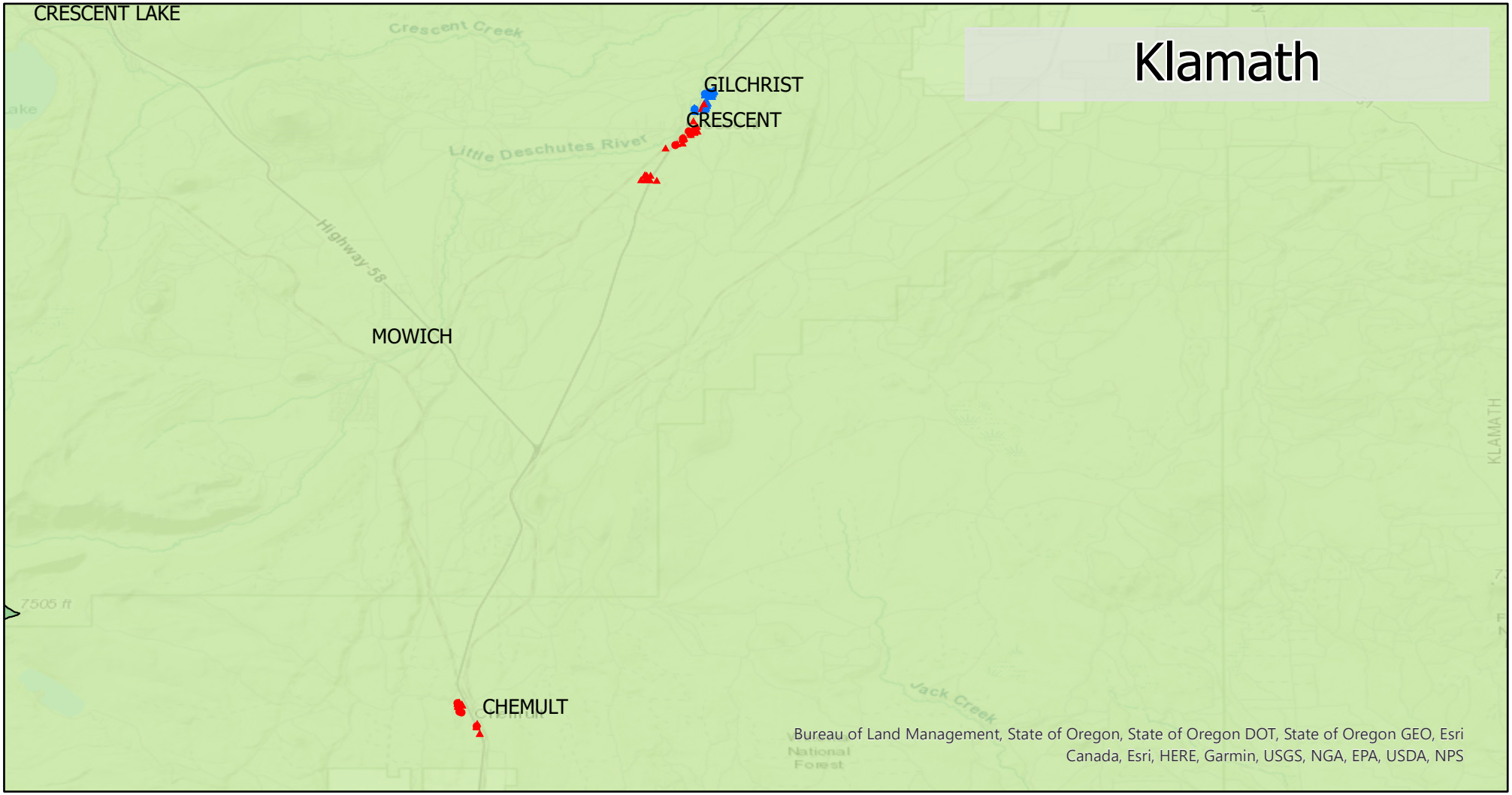

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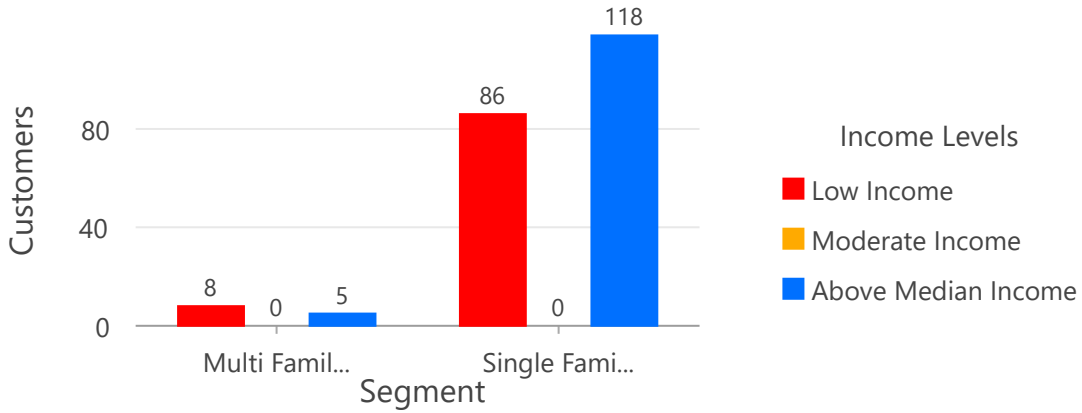

	2015	2016	2017	2018	2019
Customers					
RES	59,248	61,056	62,880	64,981	66,704
COM	9,536	9,675	9,865	10,045	10,196
IND	157	161	166	172	176
Total	68,941	70,892	72,911	75,198	77,076

Load					
RES	3,636,792	4,011,631	4,726,818	4,424,849	5,028,223
COM	2,459,892	2,725,442	3,261,760	2,962,081	3,309,093
IND	714,429	774,757	872,996	821,290	888,783
Total	6,811,112	7,511,829	8,861,574	8,208,220	9,226,098

AVG Usage					
RES	61	66	75	68	75
COM	258	282	331	295	325
IND	4,551	4,812	5,259	4,775	5,050
Total	99	106	122	109	120

WACOG					
Without CPP Compliance	2015	2016	2017	2018	2019
RES	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999
COM	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999
IND	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999

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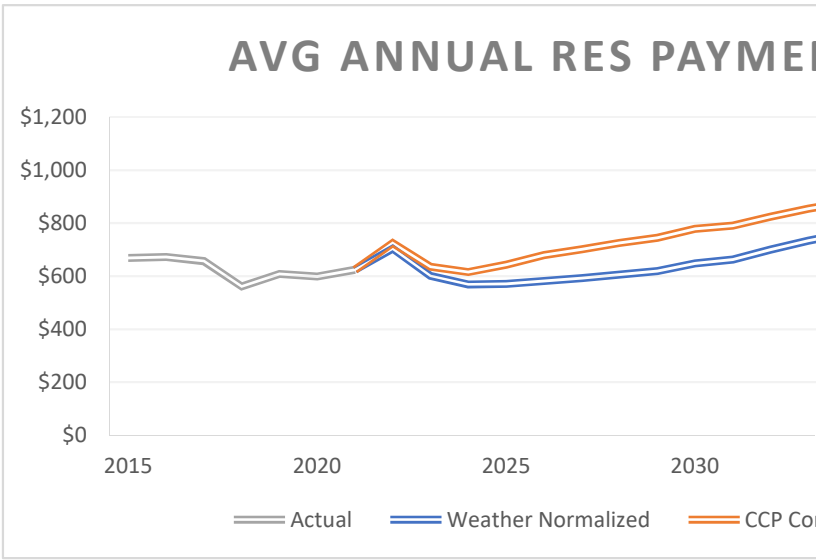
COM	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999
IND	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999

All-In Rate					
Without CPP Compliance	2015	2016	2017	2018	2019
RES	$ 0.90715	$ 0.85293	$ 0.72823	$ 0.68705	$ 0.67238
COM	$ 0.80282	$ 0.74570	$ 0.62488	$ 0.58449	$ 0.55579
IND	$ 0.75567	$ 0.66430	$ 0.55294	$ 0.59391	$ 0.54556

All-In Rate					
With CPP Compliance	2015	2016	2017	2018	2019
RES	$ 0.90715	$ 0.85293	$ 0.72823	$ 0.68705	$ 0.67238
COM	$ 0.80282	$ 0.74570	$ 0.62488	$ 0.58449	$ 0.55579
IND	$ 0.75567	$ 0.66430	$ 0.55294	$ 0.59391	$ 0.54556

AVG Annual RES Payments	2015	2016	2017	2018	2019
Weather Normalized					

CCP Compliance					
Actual	$ 668.20	$ 672.49	$ 656.91	$ 561.42	$ 608.22



AVG RES Rates ($/thm)	2015	2016	2017	2018	2019
WACOG	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999
CPP Compliance WACOG					
All-In Rate	$ 0.90715	$ 0.85293	$ 0.72823	$ 0.68705	$ 0.67238
CPP Compliance All-In Rate					

Projected AVG CPP Increase	2021	2022	2023	2024	2025
System	0.0%	2.8%	5.6%	8.3%	12.7%

2020	2021	2022	2023	2024	2025	2026	2027
68,661	70,507	71,941	73,439	74,708	75,730	76,518	77,073
10,349	10,505	10,609	10,736	10,845	10,933	11,001	11,050
179	183	167	163	160	157	154	150
79,189	81,196	82,717	84,338	85,713	86,820	87,673	88,273

4,700,292	4,928,350	5,059,157	5,175,801	5,303,896	5,358,675	5,423,665	5,471,645
3,047,520	3,167,607	3,212,777	3,252,792	3,304,244	3,316,133	3,338,613	3,355,270
826,466	842,349	835,159	828,127	824,820	814,196	807,159	800,125
8,574,278	8,938,306	9,107,093	9,256,721	9,432,960	9,489,004	9,569,437	9,627,040

68	70	70	70	71	71	71	71
294	302	303	303	305	303	303	304
4,615	4,593	5,001	5,081	5,155	5,186	5,241	5,334
108	110	110	110	110	109	109	109

2020	2021	2022	2023	2024	2025	2026	2027
$ 0.35568	$ 0.41474	$ 0.49692	$ 0.36532	$ 0.31310	$ 0.30855	$ 0.31090	$ 0.31455
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2020	2021	2022	2023	2024	2025	2026	2027
$ 0.35568	$ 0.41474	$ 0.52055	$ 0.40505	$ 0.36825	$ 0.39376	$ 0.42592	$ 0.44191
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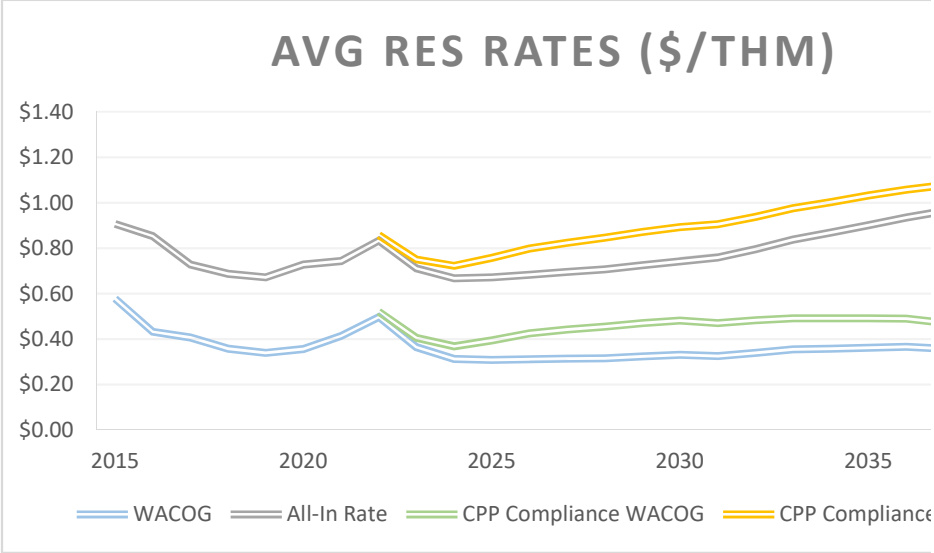
2020	2021	2022	2023	2024	2025	2026	2027
$ 0.72824	$ 0.74390	$ 0.83431	$ 0.71115	$ 0.66757	$ 0.67188	$ 0.68331	$ 0.69628
$ 0.61950	$ 0.62918	$ 0.71672	$ 0.59062	$ 0.54403	$ 0.54525	$ 0.55351	$ 0.56324
$ 0.61979	$ 0.61089	$ 0.69797	$ 0.57140	$ 0.52434	$ 0.52506	$ 0.53282	$ 0.54202

2020	2021	2022	2023	2024	2025	2026	2027
$ 0.72824	$ 0.74390	$ 0.85794	$ 0.75087	$ 0.72272	$ 0.75709	$ 0.79833	$ 0.82364
$ 0.61950	$ 0.62918	$ 0.74035	$ 0.63034	$ 0.59918	$ 0.63046	$ 0.66854	$ 0.69060
$ 0.61979	$ 0.61089	$ 0.72160	$ 0.61113	$ 0.57948	$ 0.61027	$ 0.64784	$ 0.66939

2020	2021	2022	2023	2024	2025	2026	2027
	$ 623.97	$ 704.06	$ 601.44	$ 568.73	$ 570.51	$ 581.20	$ 593.17

		$	623.97	$	724.00	$	635.04	$	615.71	$	642.87	$	679.04	$	701.67			
$	598.23	$	623.97															
											11%		14%		15%			



2020	2021	2022	2023	2024	2025	2026	2027
$ 0.35568	$ 0.41474	$ 0.49692	$ 0.36532	$ 0.31310	$ 0.30855	$ 0.31090	$ 0.31455
		$ 0.52055	$ 0.40505	$ 0.36825	$ 0.39376	$ 0.42592	$ 0.44191
$ 0.72824	$ 0.74390	$ 0.83431	$ 0.71115	$ 0.66757	$ 0.67188	$ 0.68331	$ 0.69628
		$ 0.85794	$ 0.75087	$ 0.72272	$ 0.75709	$ 0.79833	$ 0.82364

2026	2027	2028	2029	2030	2031	2032	2033
16.8%	18.3%	19.8%	20.2%	20.2%	19.2%	17.9%	16.4%

2028	2029	2030	2031	2032	2033	2034	2035
77,404	77,514	74,585	71,390	68,195	65,000	61,804	58,609
11,079	11,090	10,671	10,214	9,756	9,299	8,842	8,385
147	144	141	136	132	129	125	121
88,630	88,748	85,397	81,740	78,083	74,428	70,771	67,115

5,530,222	5,518,307	5,424,126	5,196,612	4,995,335	4,740,675	4,513,239	4,286,428
3,381,937	3,371,472	3,312,629	3,173,661	3,050,099	2,895,106	2,756,194	2,617,743
796,251	786,053	777,056	765,592	757,409	742,528	731,073	719,748
9,708,410	9,675,833	9,513,812	9,135,865	8,802,843	8,378,310	8,000,506	7,623,918

71	71	73	73	73	73	73	73
305	304	310	311	313	311	312	312
5,417	5,459	5,511	5,629	5,738	5,756	5,849	5,948
110	109	111	112	113	113	113	114

2028	2029	2030	2031	2032	2033	2034	2035
$ 0.31524	$ 0.32358	$ 0.33153	$ 0.32470	$ 0.33992	$ 0.35434	$ 0.35794	$ 0.36128
$ 0.31524	$ 0.32358	$ 0.33153	$ 0.32470	$ 0.33992	$ 0.35434	$ 0.35794	$ 0.36128
$ 0.31524	$ 0.32358	$ 0.33153	$ 0.32470	$ 0.33992	$ 0.35434	$ 0.35794	$ 0.36128

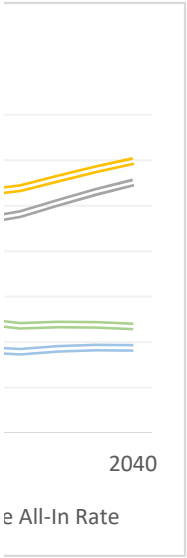
2028	2029	2030	2031	2032	2033	2034	2035
$ 0.45500	$ 0.47020	$ 0.48119	$ 0.47069	$ 0.48249	$ 0.49203	$ 0.49135	$ 0.49205
$ 0.45500	$ 0.47020	$ 0.48119	$ 0.47069	$ 0.48249	$ 0.49203	$ 0.49135	$ 0.49205
$ 0.45500	$ 0.47020	$ 0.48119	$ 0.47069	$ 0.48249	$ 0.49203	$ 0.49135	$ 0.49205

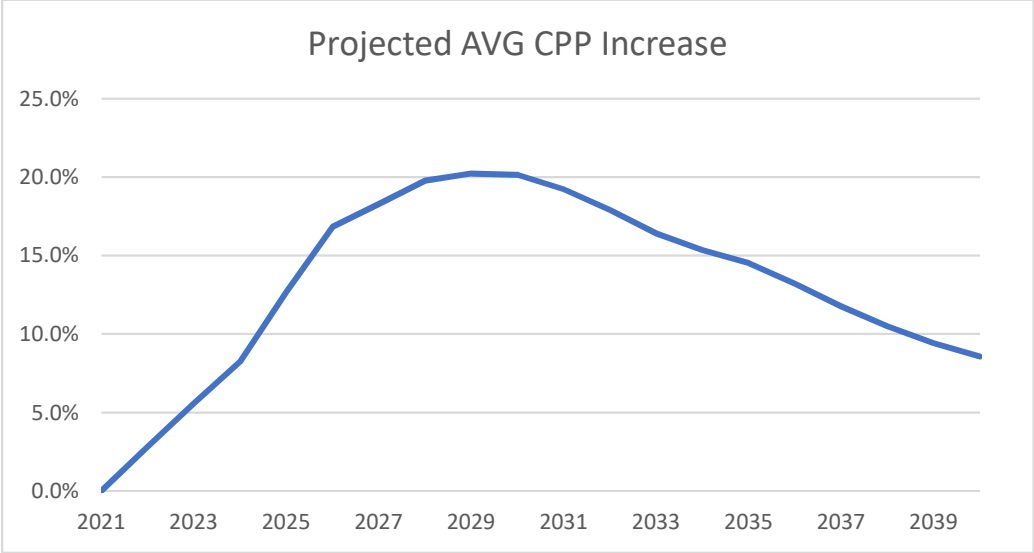
2028	2029	2030	2031	2032	2033	2034	2035
$ 0.70650	$ 0.72463	$ 0.74261	$ 0.75892	$ 0.79592	$ 0.83830	$ 0.86894	$ 0.90114
$ 0.57014	$ 0.58485	$ 0.59934	$ 0.60758	$ 0.63706	$ 0.66964	$ 0.69086	$ 0.71300
$ 0.54840	$ 0.56257	$ 0.57650	$ 0.58085	$ 0.60620	$ 0.63342	$ 0.64884	$ 0.66430

2028	2029	2030	2031	2032	2033	2034	2035
$ 0.84627	$ 0.87125	$ 0.89227	$ 0.90491	$ 0.93848	$ 0.97599	$ 1.00235	$ 1.03191
$ 0.70990	$ 0.73148	$ 0.74900	$ 0.75358	$ 0.77962	$ 0.80733	$ 0.82427	$ 0.84376
$ 0.68816	$ 0.70919	$ 0.72616	$ 0.72684	$ 0.74876	$ 0.77110	$ 0.78225	$ 0.79507

2028	2029	2030	2031	2032	2033	2034	2035
$ 605.72	$ 619.04	$ 648.07	$ 662.92	$ 699.62	$ 733.68	$ 761.45	$ 790.87

$ 725.55	$ 744.30	$ 778.67	$ 790.44	$ 824.94	$ 854.19	$ 878.36	$ 905.64
17%	17%	17%	16%	15%	14%	13%	13%





2028	2029	2030	2031	2032	2033	2034	2035
$ 0.31524	$ 0.32358	$ 0.33153	$ 0.32470	$ 0.33992	$ 0.35434	$ 0.35794	$ 0.36128
$ 0.45500	$ 0.47020	$ 0.48119	$ 0.47069	$ 0.48249	$ 0.49203	$ 0.49135	$ 0.49205
$ 0.70650	$ 0.72463	$ 0.74261	$ 0.75892	$ 0.79592	$ 0.83830	$ 0.86894	$ 0.90114
$ 0.84627	$ 0.87125	$ 0.89227	$ 0.90491	$ 0.93848	$ 0.97599	$ 1.00235	$ 1.03191

2034	2035	2036	2037	2038	2039	2040
15.4%	14.5%	13.2%	11.8%	10.5%	9.4%	8.6%

2036	2037	2038	2039	2040
55,414	52,219	49,023	45,828	42,633
7,928	7,471	7,014	6,557	6,099
117	114	110	106	102
63,459	59,804	56,147	52,491	48,834

4,080,362	3,831,164	3,603,659	3,375,668	3,164,913
2,491,387	2,339,697	2,200,730	2,061,408	1,932,303
711,351	696,808	685,349	673,769	665,179
7,283,100	6,867,669	6,489,738	6,110,845	5,762,395

74	73	74	74	74
314	313	314	314	317
6,080	6,112	6,230	6,356	6,521
115	115	116	116	118

2036	2037	2038	2039	2040
$ 0.36650	$ 0.35839	$ 0.37042	$ 0.37597	$ 0.37463
$ 0.36650	$ 0.35839	$ 0.37042	$ 0.37597	$ 0.37463
$ 0.36650	$ 0.35839	$ 0.37042	$ 0.37597	$ 0.37463

2036	2037	2038	2039	2040
$ 0.49003	$ 0.47179	$ 0.47684	$ 0.47595	$ 0.46898
$ 0.49003	$ 0.47179	$ 0.47684	$ 0.47595	$ 0.46898
$ 0.49003	$ 0.47179	$ 0.47684	$ 0.47595	$ 0.46898

2036	2037	2038	2039	2040
$ 0.93461	$ 0.96361	$ 1.01317	$ 1.06059	$ 1.10240
$ 0.73669	$ 0.75269	$ 0.78918	$ 0.82202	$ 0.84890
$ 0.68074	$ 0.68728	$ 0.71321	$ 0.73357	$ 0.74627

2036	2037	2038	2039	2040
$ 1.05814	$ 1.07701	$ 1.11959	$ 1.16056	$ 1.19675
$ 0.86022	$ 0.86609	$ 0.89560	$ 0.92200	$ 0.94324
$ 0.80427	$ 0.80068	$ 0.81963	$ 0.83355	$ 0.84062

2036	2037	2038	2039	2040
$ 825.83	$ 848.37	$ 893.73	$ 937.47	$ 982.05

$ 934.98	$ 948.21	$ 987.61	$ 1,025.84	$ 1,066.10
12%	11%	10%	9%	8%

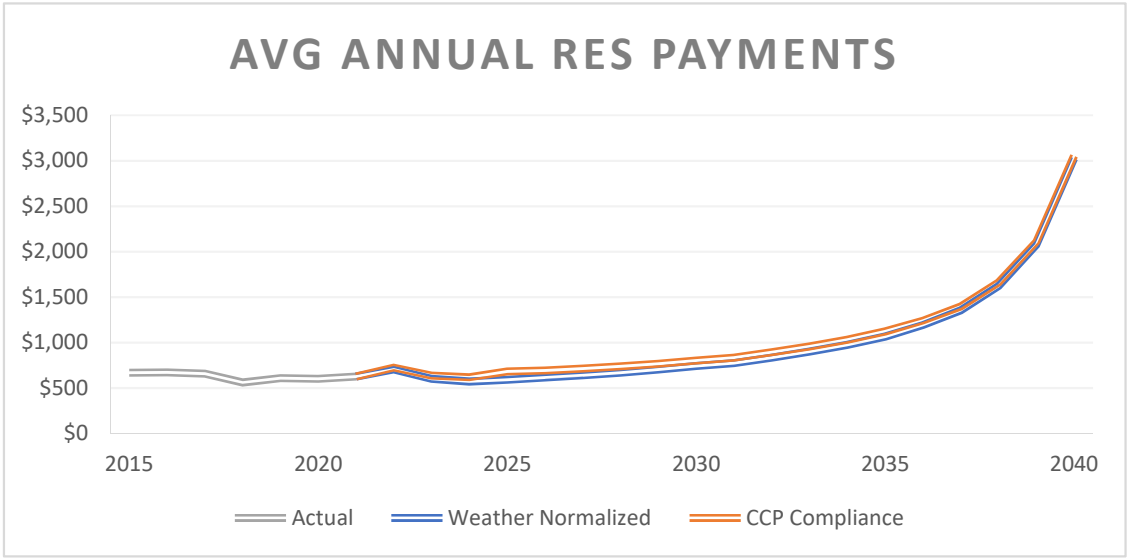
2036	2037	2038	2039	2040
$ 0.36650	$ 0.35839	$ 0.37042	$ 0.37597	$ 0.37463
$ 0.49003	$ 0.47179	$ 0.47684	$ 0.47595	$ 0.46898
$ 0.93461	$ 0.96361	$ 1.01317	$ 1.06059	$ 1.10240
$ 1.05814	$ 1.07701	$ 1.11959	$ 1.16056	$ 1.19675

	2015	2016	2017	2018	2019	2020	2021	2022
Customers								
RES	59,248	61,056	62,880	64,981	66,704	68,358	70,206	71,756
COM	9,536	9,675	9,865	10,045	10,196	10,306	10,462	10,595
IND	157	161	166	172	176	179	183	188
Total	68,941	70,892	72,911	75,198	77,076	78,843	80,851	82,539
Load								
RES	3,636,792	4,011,631	4,726,818	4,424,849	5,028,223	4,700,292	4,928,350	5,054,886
COM	2,459,892	2,725,442	3,261,760	2,962,081	3,309,093	3,047,520	3,167,607	3,211,926
IND	714,429	774,757	872,996	821,290	888,783	833,928	865,915	874,829
Total	6,811,112	7,511,829	8,861,574	8,208,220	9,226,098	8,581,740	8,961,872	9,141,641
AVG Usage								
RES	61	66	75	68	75	69	70	70
COM	258	282	331	295	325	296	303	303
IND	4,551	4,812	5,259	4,775	5,050	4,659	4,732	4,653
Total	99	106	122	109	120	109	111	111
WACOG								
Without CPP Compliance	2015	2016	2017	2018	2019	2020	2021	2022
RES	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999	$ 0.35568	$ 0.41474	$ 0.49692
COM	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999	$ 0.35568	$ 0.41474	$ 0.49692
IND	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999	$ 0.35568	$ 0.41474	$ 0.49692
WACOG								
With CPP Compliance	2015	2016	2017	2018	2019	2020	2021	2022
RES	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999	$ 0.35568	$ 0.41474	$ 0.52148
COM	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999	$ 0.35568	$ 0.41474	$ 0.52148
IND	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999	$ 0.35568	$ 0.41474	$ 0.52148
All-In Rate								
Without CPP Compliance	2015	2016	2017	2018	2019	2020	2021	2022
RES	$ 0.90715	$ 0.85293	$ 0.72823	$ 0.68705	$ 0.67238	$ 0.72824	$ 0.74390	$ 0.83431
COM	$ 0.80282	$ 0.74570	$ 0.62488	$ 0.58449	$ 0.55579	$ 0.61950	$ 0.62918	$ 0.71672
IND	$ 0.75567	$ 0.66430	$ 0.55294	$ 0.59391	$ 0.54556	$ 0.61979	$ 0.61089	$ 0.69797

All-In Rate

With CPP Compliance	2015	2016	2017	2018	2019	2020	2021	2022
RES	$ 0.90715	$ 0.85293	$ 0.72823	$ 0.68705	$ 0.67238	$ 0.72824	$ 0.74390	$ 0.85887
COM	$ 0.80282	$ 0.74570	$ 0.62488	$ 0.58449	$ 0.55579	$ 0.61950	$ 0.62918	$ 0.74128
IND	$ 0.75567	$ 0.66430	$ 0.55294	$ 0.59391	$ 0.54556	$ 0.61979	$ 0.61089	$ 0.72254

AVG Annual RES Payments	2015	2016	2017	2018	2019	2020	2021	2022
Weather Normalized							$ 626.65	$ 705.28
CCP Compliance							$ 626.65	$ 726.04
Actual	$ 668.20	$ 672.49	$ 656.91	$ 561.42	$ 608.22	$ 600.88	$ 626.65	



AVG RES Rates ($/thm)	2015	2016	2017	2018	2019	2020	2021	2022
WACOG	$ 0.57789	$ 0.43166	$ 0.40660	$ 0.35711	$ 0.33999	$ 0.35568	$ 0.41474	$ 0.49692

CPP Compliance WACOG								$ 0.52148
All-In Rate	$ 0.90715	$ 0.85293	$ 0.72823	$ 0.68705	$ 0.67238	$ 0.72824	$ 0.74390	$ 0.83431
CPP Compliance All-In Rate								$ 0.85887

Projected AVG CPP Increase	2021	2022	2023	2024	2025	2026	2027	2028
System	0.0%	2.9%	5.6%	8.1%	15.1%	13.1%	11.6%	10.8%

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
72,684	72,999	69,215	65,087	60,960	56,832	52,704	48,577	44,449	40,321	36,194
10,676	10,705	10,150	9,545	8,939	8,334	7,729	7,124	6,518	5,913	5,308
192	196	200	204	207	211	214	218	222	225	229
83,552	83,900	79,565	74,836	70,106	65,377	60,647	55,919	51,189	46,459	41,731

5,142,906	5,214,020	5,068,472	4,774,916	4,481,367	4,208,784	3,894,055	3,600,495	3,306,939	3,029,404	2,719,147
3,241,771	3,273,216	3,179,092	2,994,919	2,810,759	2,639,072	2,442,370	2,258,209	2,074,053	1,899,557	1,705,285
883,891	897,009	899,546	902,564	905,588	912,191	911,664	914,690	917,719	924,723	923,626
9,268,568	9,384,245	9,147,110	8,672,400	8,197,714	7,760,047	7,248,089	6,773,395	6,298,710	5,853,684	5,348,058

71	71	73	73	74	74	74	74	74	75	75
304	306	313	314	314	317	316	317	318	321	321
4,604	4,577	4,498	4,424	4,375	4,323	4,260	4,196	4,134	4,110	4,033
111	112	115	116	117	119	120	121	123	126	128

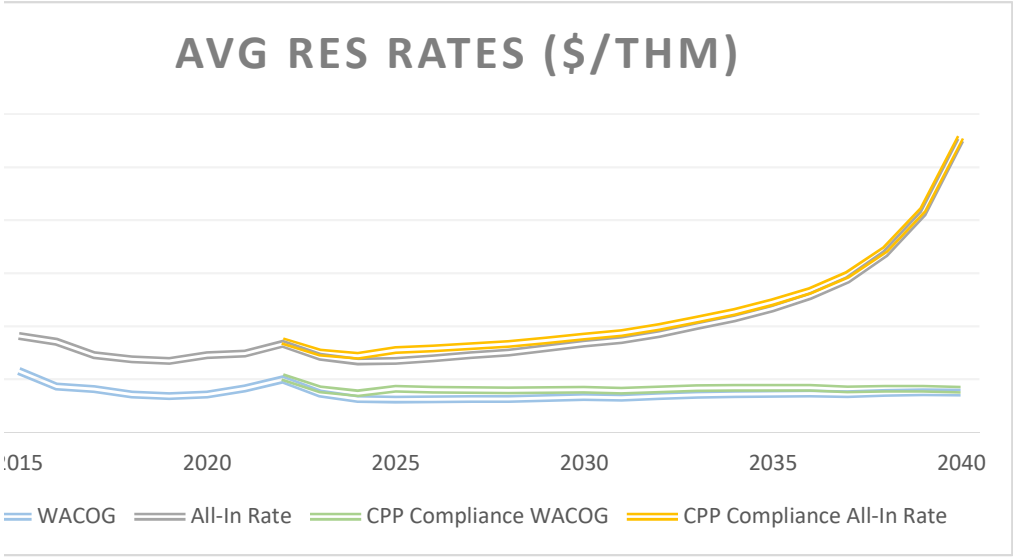
2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
$ 0.36532	$ 0.31310	$ 0.30855	$ 0.31090	$ 0.31455	$ 0.31524	$ 0.32358	$ 0.33153	$ 0.32470	$ 0.33992	$ 0.35434
$ 0.36532	$ 0.31310	$ 0.30855	$ 0.31090	$ 0.31455	$ 0.31524	$ 0.32358	$ 0.33153	$ 0.32470	$ 0.33992	$ 0.35434
$ 0.36532	$ 0.31310	$ 0.30855	$ 0.31090	$ 0.31455	$ 0.31524	$ 0.32358	$ 0.33153	$ 0.32470	$ 0.33992	$ 0.35434

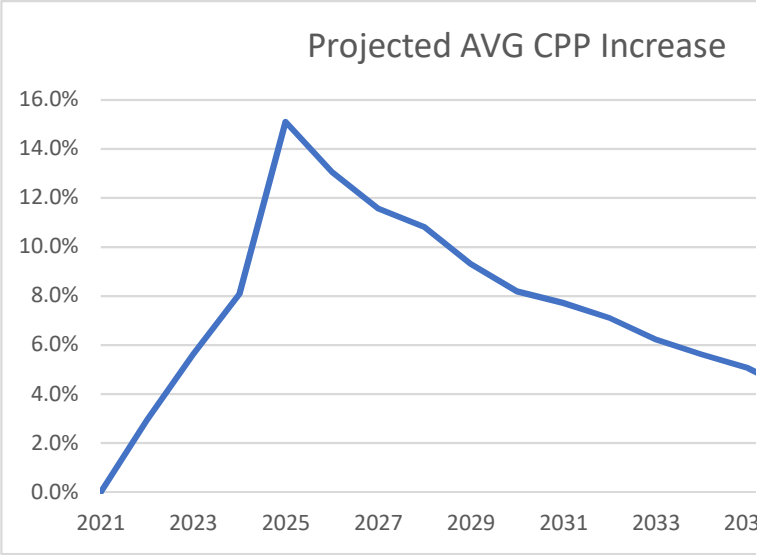
2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
$ 0.40534	$ 0.36713	$ 0.41037	$ 0.40216	$ 0.39866	$ 0.39659	$ 0.39744	$ 0.40000	$ 0.39170	$ 0.40584	$ 0.41676
$ 0.40534	$ 0.36713	$ 0.41037	$ 0.40216	$ 0.39866	$ 0.39659	$ 0.39744	$ 0.40000	$ 0.39170	$ 0.40584	$ 0.41676
$ 0.40534	$ 0.36713	$ 0.41037	$ 0.40216	$ 0.39866	$ 0.39659	$ 0.39744	$ 0.40000	$ 0.39170	$ 0.40584	$ 0.41676

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
$ 0.71115	$ 0.66757	$ 0.67382	$ 0.69841	$ 0.72638	$ 0.75181	$ 0.79259	$ 0.83497	$ 0.86799	$ 0.92703	$ 1.00116
$ 0.59062	$ 0.54403	$ 0.54672	$ 0.56357	$ 0.58309	$ 0.59999	$ 0.62940	$ 0.65982	$ 0.67897	$ 0.72285	$ 0.77616
$ 0.57140	$ 0.52434	$ 0.51824	$ 0.51915	$ 0.52098	$ 0.51867	$ 0.52532	$ 0.53054	$ 0.52074	$ 0.53197	$ 0.54397

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
$ 0.75117	$ 0.72160	$ 0.77563	$ 0.78967	$ 0.81050	$ 0.83317	$ 0.86646	$ 0.90344	$ 0.93498	$ 0.99294	$ 1.06358
$ 0.63064	$ 0.59806	$ 0.64853	$ 0.65483	$ 0.66720	$ 0.68134	$ 0.70327	$ 0.72828	$ 0.74597	$ 0.78877	$ 0.83857
$ 0.61142	$ 0.57836	$ 0.62005	$ 0.61042	$ 0.60509	$ 0.60002	$ 0.59919	$ 0.59900	$ 0.58774	$ 0.59789	$ 0.60639

2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
$ 603.82	$ 572.18	$ 592.11	$ 614.84	$ 640.78	$ 668.12	$ 702.73	$ 742.65	$ 774.92	$ 835.79	$ 902.57
$ 637.80	$ 618.49	$ 681.58	$ 695.18	$ 714.99	$ 740.42	$ 768.22	$ 803.55	$ 834.74	$ 895.22	$ 958.84
		13%	12%	10%	10%	9%	8%	7%	7%	6%





2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
$ 0.36532	$ 0.31310	$ 0.30855	$ 0.31090	$ 0.31455	$ 0.31524	$ 0.32358	$ 0.33153	$ 0.32470	$ 0.33992	$ 0.35434

$ 0.40534	$ 0.36713	$ 0.41037	$ 0.40216	$ 0.39866	$ 0.39659	$ 0.39744	$ 0.40000	$ 0.39170	$ 0.40584	$ 0.41676
$ 0.71115	$ 0.66757	$ 0.67382	$ 0.69841	$ 0.72638	$ 0.75181	$ 0.79259	$ 0.83497	$ 0.86799	$ 0.92703	$ 1.00116
$ 0.75117	$ 0.72160	$ 0.77563	$ 0.78967	$ 0.81050	$ 0.83317	$ 0.86646	$ 0.90344	$ 0.93498	$ 0.99294	$ 1.06358

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
9.3%	8.2%	7.7%	7.1%	6.2%	5.6%	5.1%	4.1%	3.2%	2.4%	1.6%

2034	2035	2036	2037	2038	2039	2040
32,066	27,938	23,811	19,683	15,555	11,428	7,300
4,702	4,097	3,492	2,886	2,281	1,676	1,070
233	236	240	244	247	251	254
37,001	32,271	27,543	22,813	18,083	13,355	8,624
2,425,685	2,132,517	1,848,818	1,545,098	1,251,545	957,876	668,117
1,521,198	1,337,335	1,159,133	968,855	784,700	600,459	418,614
926,660	929,890	936,923	935,987	939,036	941,888	948,981
4,873,543	4,399,743	3,944,874	3,449,941	2,975,280	2,500,223	2,035,712
76	76	78	78	80	84	92
324	326	332	336	344	358	391
3,977	3,940	3,904	3,836	3,802	3,753	3,736
132	136	143	151	165	187	236

2034	2035	2036	2037	2038	2039	2040
$ 0.35794	$ 0.36128	$ 0.36650	$ 0.35839	$ 0.37042	$ 0.37597	$ 0.37463
$ 0.35794	$ 0.36128	$ 0.36650	$ 0.35839	$ 0.37042	$ 0.37597	$ 0.37463
$ 0.35794	$ 0.36128	$ 0.36650	$ 0.35839	$ 0.37042	$ 0.37597	$ 0.37463

2034	2035	2036	2037	2038	2039	2040
$ 0.41838	$ 0.42020	$ 0.41938	$ 0.40455	$ 0.41030	$ 0.40928	$ 0.40169
$ 0.41838	$ 0.42020	$ 0.41938	$ 0.40455	$ 0.41030	$ 0.40928	$ 0.40169
$ 0.41838	$ 0.42020	$ 0.41938	$ 0.40455	$ 0.41030	$ 0.40928	$ 0.40169

2034	2035	2036	2037	2038	2039	2040
$ 1.07426	$ 1.16552	$ 1.28139	$ 1.43731	$ 1.68232	$ 2.06325	$ 2.75456
$ 0.82509	$ 0.88577	$ 0.96330	$ 1.06209	$ 1.22617	$ 1.47679	$ 1.92811
$ 0.54416	$ 0.54395	$ 0.54480	$ 0.53383	$ 0.54220	$ 0.54412	$ 0.53839

2034	2035	2036	2037	2038	2039	2040
$ 1.13469	$ 1.22443	$ 1.33428	$ 1.48348	$ 1.72220	$ 2.09656	$ 2.78163
$ 0.88552	$ 0.94469	$ 1.01619	$ 1.10825	$ 1.26605	$ 1.51009	$ 1.95517
$ 0.60460	$ 0.60286	$ 0.59769	$ 0.58000	$ 0.58209	$ 0.57742	$ 0.56545

2034	2035	2036	2037	2038	2039	2040
$ 975.17	$ 1,067.57	$ 1,193.93	$ 1,353.93	$ 1,624.30	$ 2,075.26	$ 3,025.27
$ 1,030.03	$ 1,121.54	$ 1,243.21	$ 1,397.42	$ 1,662.81	$ 2,108.76	$ 3,054.99
5%	5%	4%	3%	2%	2%	1%

2034	2035	2036	2037	2038	2039	2040
$ 0.35794	$ 0.36128	$ 0.36650	$ 0.35839	$ 0.37042	$ 0.37597	$ 0.37463

$ 0.41838	$ 0.42020	$ 0.41938	$ 0.40455	$ 0.41030	$ 0.40928	$ 0.40169
$ 1.07426	$ 1.16552	$ 1.28139	$ 1.43731	$ 1.68232	$ 2.06325	$ 2.75456
$ 1.13469	$ 1.22443	$ 1.33428	$ 1.48348	$ 1.72220	$ 2.09656	$ 2.78163

2040
1.0%

	CONTRACTOR NAME	HEAT PUMP WATER HEATER	AIR SOURCE HP W/ELEC BACK UP	DUCTLESS HEAT PUMP 4 ZONES
ZONE 1	A	$ 4,220.00	$ 14,478.00	$ 11,500.00
	B	$ 8,000.00	$ 15,000.00	$ 12,000.00
	C	$ 8,000.00	$ 14,000.00	
	D	$ 8,000.00	$ 15,000.00	
	E	$ 8,000.00	$ 20,000.00	$ 12,000.00
ZONE 2	F	$ 8,000.00	$ 21,500.00	$ 17,000.00
	G	$ 5,749.00	$ 20,500.00	$ 11,500.00
	H	$ 6,000.00	$ 18,500.00	$ 15,000.00
	I	$ 4,650.00	$ 18,250.00	$ 17,000.00
	J	$ 6,000.00	$ 18,000.00	$ 17,000.00
ZONE 3	K	$ 5,000.00	$ 20,000.00	$ 15,000.00
	L	$ 5,000.00	$ 21,500.00	$ 12,000.00
	M	$ 6,500.00	$ 18,500.00	$ 15,000.00
	N	$ 5,500.00	$ 20,000.00	$ 12,000.00
	O	$ 6,500.00	$ 21,000.00	$ 14,000.00

Zone 1 - low	$ 4,220.00	$ 14,000.00	$ 11,500.00	Low
Zone 1 - hi	$ 8,000.00	$ 20,000.00	$ 12,000.00	$ 15,720.00
Zone 2 - low	$ 4,650.00	$ 18,000.00	$ 11,500.00	Low
Zone 2 - hi	$ 8,000.00	$ 21,500.00	$ 17,000.00	$ 16,150.00
Zone 3 - low	$ 5,000.00	$ 18,500.00	$ 12,000.00	Low
Zone 3 - hi	$ 6,500.00	$ 21,500.00	$ 15,000.00	$ 17,000.00

Hi	Average	
$ 28,000.00	$ 21,860.00	
Hi		
$ 29,500.00	$ 22,825.00	
Hi		
$ 28,000.00	$ 22,500.00	<------Zone 3 Representative of Oregon territory

20-Year Annual Deployment (Gross Annual Therms) - By Sector

	|----------Budgeted----------|		|----Model/Program Input Forecast------|		
Sector	**2020**	**2021**	**2022**	**2023**	**2024**
Residential	-	-	(2)	(5)	(8)
Commercial	-	(0)	(1)	(6)	(33)
Industrial	-	-	-	-	-
Unclaimed Market Savings	-	-	-	-	-
Large Project Adder	-	-	-	-	-
Total	-	(0)	(3)	(12)	(40)

20-Year Cumulative Deployment (Gross Therms) - By Sector

	|----------Budgeted----------|		|----Model/Program Input Forecast------|		
Sector	**2020**	**2021**	**2022**	**2023**	**2024**
Residential	-	-	(2)	(7)	(15)
Commercial	-	(0)	(2)	(8)	(41)
Industrial	-	-	-	-	-
Unclaimed Market Savings	-	-	-	-	-
Large Project Adder	-	-	-	-	-
Total	-	(0)	(3)	(15)	(56)

20-Year Annual Deployment (Gross Annual Therms) - By Deployment Category

	|----------Budgeted----------|		|----Model/Program Input Forecast------|		
Deployment Category	**2020**	**2021**	**2022**	**2023**	**2024**
Com-New Buildings	-	-	-	-	-
Com-Replacement	-	(0)	(1)	(6)	(33)
Com-SEM	-	-	-	-	-
Com-Retrofit	-	-	-	-	-
Ind-Retrofit	-	-	-	-	-
Ind-Replacement	-	-	-	-	-
Res-Manufactured New Homes	-	-	-	-	-

Res-SF New Homes	-	-	-	-	-
Res-Market Transformation	-	-	-	-	-
Res-Showerheads & Aerators	-	-	-	-	-
Res-Smart Thermostat	-	-	-	-	-
Res-Thermostat Optimization	-	-	-	-	-
Res-WaterHeat	-	-	(2)	(5)	(8)
Res-Insulation	-	-	-	-	-
Res-Heating & Windows	-	-	-	-	-
MF-Showerheads & Aerators	-	-	-	-	-
MF-Retrofit	-	-	-	-	-
MF-Replacement	-	-	-	-	-
Unclaimed Market Savings	-	-	-	-	-
Large-Project Adder	-	-	-	-	-
Total	**-**	**(0)**	**(3)**	**(12)**	**(40)**

20-Year Cumulative Deployment (Gross Therms) - By Deployment Category

	|----------Budgeted----------|		|----Model/Program Input Forecast------|		
Deployment Category	**2020**	**2021**	**2022**	**2023**	**2024**
Com-New Buildings	-	-	-	-	-
Com-Replacement	-	(0)	(2)	(8)	(41)
Com-SEM	-	-	-	-	-
Com-Retrofit	-	-	-	-	-
Ind-Retrofit	-	-	-	-	-
Ind-Replacement	-	-	-	-	-
Res-Manufactured New Homes	-	-	-	-	-
Res-SF New Homes	-	-	-	-	-
Res-Market Transformation	-	-	-	-	-
Res-Showerheads & Aerators	-	-	-	-	-
Res-Smart Thermostat	-	-	-	-	-
Res-Thermostat Optimization	-	-	-	-	-
Res-WaterHeat	-	-	(2)	(7)	(15)
Res-Insulation	-	-	-	-	-
Res-Heating & Windows	-	-	-	-	-

MF-Showerheads & Aerators	-	-	-	-	-
MF-Retrofit	-	-	-	-	-
MF-Replacement	-	-	-	-	-
Unclaimed Market Savings	-	-	-	-	-
Large-Project Adder	-	-	-	-	-
Total	**-**	**(0)**	**(3)**	**(15)**	**(56)**

|--Deployed Model Outputs --->

2025	2026	2027	2028	2029	2030	2031	2032
(14)	(25)	(37)	(48)	(59)	(79)	(96)	(80)
(83)	(150)	(214)	(419)	(640)	(901)	(1,737)	(1,565)
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
(97)	(175)	(251)	(467)	(699)	(981)	(1,833)	(1,645)

|--Deployed Model Outputs --->

2025	2026	2027	2028	2029	2030	2031	2032
(28)	(54)	(90)	(139)	(198)	(277)	(373)	(453)
(124)	(275)	(489)	(907)	(1,548)	(2,449)	(4,185)	(5,751)
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
(153)	(328)	(579)	(1,046)	(1,746)	(2,726)	(4,559)	(6,204)

|--Deployed Model Outputs --->

2025	2026	2027	2028	2029	2030	2031	2032
-	-	-	-	-	-	-	-
(83)	(150)	(214)	(419)	(640)	(901)	(1,737)	(1,565)
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
(14)	(25)	(37)	(48)	(59)	(79)	(96)	(80)
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
(97)	**(175)**	**(251)**	**(467)**	**(699)**	**(981)**	**(1,833)**	**(1,645)**

|--Deployed Model Outputs --->

2025	2026	2027	2028	2029	2030	2031	2032
-	-	-	-	-	-	-	-
(124)	(275)	(489)	(907)	(1,548)	(2,449)	(4,185)	(5,751)
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
(28)	(54)	(90)	(139)	(198)	(277)	(373)	(453)
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
(153)	**(328)**	**(579)**	**(1,046)**	**(1,746)**	**(2,726)**	**(4,559)**	**(6,204)**

2033	2034	2035	2036	2037	2038	2039
(77)	(40)	(23)	(17)	(4)	0	1
(1,211)	(959)	(794)	(439)	(268)	(184)	173
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
(1,287)	(999)	(817)	(456)	(272)	(183)	174

2033	2034	2035	2036	2037	2038	2039
(530)	(570)	(592)	(609)	(613)	(613)	(612)
(6,961)	(7,920)	(8,714)	(9,154)	(9,422)	(9,605)	(9,432)
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
(7,491)	(8,490)	(9,307)	(9,763)	(10,035)	(10,218)	(10,044)

2033	2034	2035	2036	2037	2038	2039
-	-	-	-	-	-	-
(1,211)	(959)	(794)	(439)	(268)	(184)	173
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
(77)	(40)	(23)	(17)	(4)	0	1
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
(1,287)	**(999)**	**(817)**	**(456)**	**(272)**	**(183)**	**174**

2033	2034	2035	2036	2037	2038	2039
-	-	-	-	-	-	-
(6,961)	(7,920)	(8,714)	(9,154)	(9,422)	(9,605)	(9,432)
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
(530)	(570)	(592)	(609)	(613)	(613)	(612)
-	-	-	-	-	-	-
-	-	-	-	-	-	-

-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
(7,491)	**(8,490)**	**(9,307)**	**(9,763)**	**(10,035)**	**(10,218)**	**(10,044)**

	2022	2023	2024	2025	2026	2027
Base Load (Dth)	15,295,726	15,515,537	15,786,140	15,958,457	16,179,160	16,400,070
Scenario 5 Load (Dth)	15,242,827	15,423,133	15,630,205	15,717,235	15,828,809	15,917,709
Scenario 6 Load (Dth)	15,277,375	15,434,981	15,581,490	15,375,340	14,931,772	14,488,383
Scenario 5 Annual Load Electified	52,899.41	92,403.52	155,935.02	241,221.98	350,351.23	482,361.04
Scenario 6 Annual Load Electified	18,351.13	80,555.99	204,649.77	583,116.66	1,247,388.38	1,911,686.58
Scenario 5 Peak Day Load Electified	548.94	963.72	1,628.35	2,521.61	3,594.81	4,973.87
Scenario 6 Peak Day Load Electified	190.43	840.15	2,137.05	6,095.61	12,798.95	19,712.37
Scenario 5 Peak Hour Load Electified	28.35	49.58	82.13	127.67	188.52	259.80
Scenario 6 Peak Hour Load Electified	9.84	43.22	107.78	308.63	671.21	1,029.63

Peak Day to Annual Ratio	0.010377126	0.010429435	0.010442468	0.010453502	0.010260596	0.01031151
Peak Hour to Annual Ratio	0.000536002	0.000536568	0.000526667	0.00052928	0.000538093	0.0005386
*Sourced from UM 1893 Distribution System Planning Costs Calculations used in 2020 OR IRP						

2028	2029	2030	2031	2032	2033	2034
16,670,550	16,843,197	17,064,676	17,286,309	17,564,872	17,729,014	17,951,082
16,030,532	16,029,566	15,899,313	15,553,294	15,252,359	14,860,073	14,514,678
14,082,169	13,601,821	13,158,896	12,716,139	12,303,200	11,829,822	11,387,716
640,017.83	813,631.20	1,165,362.98	1,733,015.08	2,312,513.43	2,868,940.59	3,436,404.21
2,588,381.30	3,241,375.59	3,905,779.99	4,570,170.00	5,261,672.68	5,899,191.78	6,563,366.38
6,709.44	8,537.49	12,195.49	18,217.75	23,959.25	29,750.30	36,074.13
27,134.52	34,012.00	40,873.88	48,042.41	54,514.60	61,173.36	68,899.86
343.79	439.02	619.75	922.43	1,246.06	1,553.47	1,862.20
1,390.37	1,748.98	2,077.11	2,432.57	2,835.17	3,194.28	3,556.72

0.010483201	0.010493077	0.010464972	0.010512171	0.010360699	0.010369787	0.01049764
0.000537157	0.00053958	0.000531805	0.000532271	0.000538834	0.000541478	0.000541904

2035	2036	2037	2038	2039	2040	2041
18,175,267	18,458,395	18,621,162	18,844,009	19,064,981	19,352,842	19,646,098
14,170,662	13,862,577	13,480,043	13,135,175	12,789,508	12,474,452	12,179,431
10,946,486	10,524,351	10,062,315	9,620,716	9,178,886	8,747,768	8,403,118
4,004,605.44	4,595,818.10	5,141,118.16	5,708,834.26	6,275,472.22	6,878,390.41	7,466,667.27
7,228,781.06	7,934,043.90	8,558,846.61	9,223,292.57	9,886,094.23	10,605,073.57	11,242,980.18
42,245.23	48,520.16	54,310.10	59,208.01	66,391.64	72,822.02	79,117.76
76,257.59	83,763.34	90,414.53	95,657.49	104,590.38	112,276.68	119,132.05
2,171.43	2,446.58	2,791.82	3,102.32	3,413.16	3,700.94	4,012.83
3,919.69	4,223.68	4,647.78	5,012.16	5,376.94	5,706.09	6,042.35

0.010549163	0.010557458	0.010563869	0.010371295	0.010579545	0.010587072	0.010596128
0.000542233	0.000532349	0.000543038	0.000543424	0.000543889	0.000538053	0.000537433

Sensitivity Request: Accelerated Innovation: Assume a 30 percent six-year production tax credit for the production of green hydrogen and syngas for which construction begins before 2026.1 It is anticipated that projects may be outside the ordinary course of business and would result in near-term and aggressive emission reductions.

Supporting Information: The credit would be indexed annually for inflation measured after the facility is placed into service, based upon the initial amount of $3.00 per kilogram of hydrogen between 2022 and 2024 and $2.00 per kilogram between 2025 and 2027.

kg per MMBtu 7.5

Year		Expected Price of H2 (per MMBtu)
2022	$	22.75
2023	$	21.31
2024	$	19.88
2025	$	18.44
2026	$	17.00
2027	$	15.56
2028	$	14.13
2029	$	12.69
2030	$	11.25
2031	$	10.97
2032	$	10.69
2033	$	10.41
2034	$	10.13
2035	$	9.84
2036	$	9.56
2037	$	9.28
2038	$	9.00
2039	$	8.72
2040	$	8.44
2041	$	8.16
2042	$	7.88
2043	$	7.59
2044	$	7.31

2045	$	7.03
2046	$	6.75
2047	$	6.47
2048	$	6.19
2049	$	5.91
2050	$	5.63

1.556
1.413
1.269
1.125
1.097
1.069
1.041
1.013
0.984
0.956
0.928
0.9
0.872
0.844
0.816

	Production Tax Credit by year					6 years of credits - Cost Strips				
						$1.13	$1.06	$1.00	$0.94	$0.87
						$11.27	$10.59	$9.97	$9.42	$8.74
						H2 A	H2 B	H2 C	H2 D	H2 E
	Tax Credit ($ per kg)			Credit per kg	Credit per MMBtu	2022	2023	2024	2025	2026
	2022	3	$ 2.00	$ 0.9000	$ 6.7500	$ 16.00				
	2023	3.06	$ 2.04	$ 0.9180	$ 6.8850	$ 14.43	$ 14.43			
	2024	3.1212	$ 2.08	$ 0.9364	$ 7.0227	$ 12.86	$ 12.86	$ 12.86		
	2025		$ 2.12	$ 0.6367	$ 4.7754	$ 13.66	$ 13.66	$ 13.66	$ 13.66	
	2026		$ 2.16	$ 0.6495	$ 4.8709	$ 12.13	$ 12.13	$ 12.13	$ 12.13	$ 12.13
$ 1.56	2027		$ 2.21	$ 0.6624	$ 4.9684	$ 10.59	$ 10.59	$ 10.59	$ 10.59	$ 10.59
$ 1.41	2028		$ 2.25	$ 0.6757	$ 5.0677	$ 14.13	$ 9.06	$ 9.06	$ 9.06	$ 9.06
$ 1.27	2029		$ 2.30	$ 0.6892	$ 5.1691	$ 12.69	$ 12.69	$ 7.52	$ 7.52	$ 7.52
$ 1.13	2030		$ 2.34	$ 0.7030	$ 5.2725	$ 11.25	$ 11.25	$ 11.25	$ 5.98	$ 5.98
$ 1.10	2031		$ 2.39	$ 0.7171	$ 5.3779	$ 10.97	$ 10.97	$ 10.97	$ 10.97	$ 5.59
$ 1.07						$ 10.69	$ 10.69	$ 10.69	$ 10.69	$ 10.69
$ 1.04						$ 10.41	$ 10.41	$ 10.41	$ 10.41	$ 10.41
$ 1.01						$ 10.13	$ 10.13	$ 10.13	$ 10.13	$ 10.13
$ 0.98						$ 9.84	$ 9.84	$ 9.84	$ 9.84	$ 9.84
$ 0.96						$ 9.56	$ 9.56	$ 9.56	$ 9.56	$ 9.56
$ 0.93						$ 9.28	$ 9.28	$ 9.28	$ 9.28	$ 9.28
$ 0.90						$ 9.00	$ 9.00	$ 9.00	$ 9.00	$ 9.00
$ 0.87						$ 8.72	$ 8.72	$ 8.72	$ 8.72	$ 8.72
$ 0.84						$ 8.44	$ 8.44	$ 8.44	$ 8.44	$ 8.44
$ 0.82						$ 8.16	$ 8.16	$ 8.16	$ 8.16	$ 8.16
$ 0.79						$ 7.88	$ 7.88	$ 7.88	$ 7.88	$ 7.88
$ 0.76						$ 7.59	$ 7.59	$ 7.59	$ 7.59	$ 7.59
$ 0.73						$ 7.31	$ 7.31	$ 7.31	$ 7.31	$ 7.31

$ 0.70						$ 7.03	$ 7.03	$ 7.03	$ 7.03	$ 7.03
$ 0.68						$ 6.75	$ 6.75	$ 6.75	$ 6.75	$ 6.75
$ 0.65						$ 6.47	$ 6.47	$ 6.47	$ 6.47	$ 6.47
$ 0.62						$ 6.19	$ 6.19	$ 6.19	$ 6.19	$ 6.19
$ 0.59						$ 5.91	$ 5.91	$ 5.91	$ 5.91	$ 5.91
$ 0.56						$ 5.63	$ 5.63	$ 5.63	$ 5.63	$ 5.63
	1.56	1.413	1.269	1.125	1.097	1.069	1.041	1.013	0.984	0.956

Association of cost of supply to demand.

Year	Expected Supply in Base case - MMBtu	H2 A	H2 B	Projects Exam H2 C
2022	$ 33,964	$ 543,428		
2023	$ 69,936	$ 489,935	$ 518,895	
2024	$ 142,599	$ 436,689	$ 462,502	$ 934,250
2025	$ 280,628	$ 464,107	$ 491,540	$ 992,908
2026	$ 529,558	$ 411,955	$ 436,305	$ 881,333
2027	$ 919,771	$ 359,737	$ 381,001	$ 769,620
2028	$ 1,428,766	$ 479,915	$ 325,987	$ 658,491
2029	$ 1,929,477	$ 431,007	$ 456,484	$ 546,492
2030	$ 2,330,082	$ 382,098	$ 404,684	$ 817,458
2031	$ 2,592,262	$ 372,588	$ 394,612	$ 797,113
2032	$ 2,757,927	$ 363,078	$ 384,540	$ 776,767
2033	$ 2,830,725	$ 353,568	$ 374,468	$ 756,422
2034	$ 2,878,285	$ 344,058	$ 364,395	$ 736,076
2035	$ 2,907,210	$ 334,208	$ 353,964	$ 715,004
2036	$ 2,940,676	$ 324,698	$ 343,891	$ 694,658
2037	$ 2,942,114	$ 315,188	$ 333,819	$ 674,312
2038	$ 2,954,847	$ 305,678	$ 323,747	$ 653,967
2039	$ 2,966,227	$ 296,168	$ 313,675	$ 633,621
2040	$ 2,992,954	$ 286,658	$ 303,603	$ 613,276
2041	$ 2,988,094	$ 277,148	$ 293,531	$ 592,930
2042	$ 2,998,197	$ 267,469	$ 283,279	$ 572,221
2043	$ 3,008,287	$ 257,916	$ 273,162	$ 551,784
2044	$ 3,031,865	$ 248,364	$ 263,045	$ 531,348

	2045	$	3,026,436	$	238,811	$	252,927	$	510,912
	2046	$	3,043,482	$	229,259	$	242,810	$	490,475
	2047	$	3,060,714	$	219,706	$	232,693	$	470,039
	2048	$	3,093,020	$	210,154	$	222,576	$	449,602
	2049	$	3,095,871	$	200,601	$	212,459	$	429,166
	2050	$	3,113,599	$	191,049	$	202,342	$	408,729
0.928		0.9	0.872		0.844		0.816		

ple			
H2 D	H2 E	Other Demand	Total Cost
			$ 543,428
			$ 1,008,829
			$ 1,833,440
$ 1,886,098			$ 3,834,653
$ 1,674,154	$ 3,019,293		$ 6,423,040
$ 1,461,947	$ 2,636,583	$ 4,132,995	$ 5,608,888
$ 1,250,851	$ 2,255,876	$ 8,148,867	$ 4,971,120
$ 1,038,100	$ 1,872,186	$ 10,528,667	$ 4,344,268
$ 825,069	$ 1,487,991	$ 10,762,688	$ 3,917,301
$ 1,514,172	$ 1,392,041	$ 11,534,814	$ 4,470,525
$ 1,475,524	$ 2,661,068	$ 23,821,262	$ 5,660,977
$ 1,436,876	$ 2,591,368	$ 23,955,149	$ 5,512,701
$ 1,398,228	$ 2,521,667	$ 23,792,601	$ 5,364,424
$ 1,358,199	$ 2,449,477	$ 23,396,098	$ 5,210,852
$ 1,319,552	$ 2,379,777	$ 23,050,289	$ 5,062,576
$ 1,280,904	$ 2,310,076	$ 22,388,521	$ 4,914,300
$ 1,242,256	$ 2,240,376	$ 21,827,597	$ 4,766,024
$ 1,203,608	$ 2,170,675	$ 21,247,752	$ 4,617,747
$ 1,164,960	$ 2,100,974	$ 20,791,058	$ 4,469,471
$ 1,126,312	$ 2,031,274	$ 20,061,654	$ 4,321,195
$ 1,086,974	$ 1,960,329	$ 19,440,533	$ 4,170,271
$ 1,048,153	$ 1,890,317	$ 18,822,849	$ 4,021,332
$ 1,009,333	$ 1,820,305	$ 18,298,117	$ 3,872,394

Year	Expected Supply in Base case - MMBtu	H2 A
2022	33,964	-
2023	69,936	33,964
2024	142,599	33,964
2025	280,628	33,964
2026	529,558	33,964
2027	919,771	33,964
2028	1,428,766	33,964
2029	1,929,477	33,964
2030	2,330,082	33,964
2031	2,592,262	33,964
2032	2,757,927	33,964
2033	2,830,725	33,964
2034	2,878,285	33,964
2035	2,907,210	33,964
2036	2,940,676	33,964
2037	2,942,114	33,964
2038	2,954,847	33,964
2039	2,966,227	33,964
2040	2,992,954	33,964
2041	2,988,094	33,964
2042	2,998,197	33,964
2043	3,008,287	33,964
2044	3,031,865	33,964

$ 970,512	$ 1,750,293	$ 17,556,175	$ 3,723,456
$ 931,692	$ 1,680,282	$ 16,968,986	$ 3,574,518
$ 892,871	$ 1,610,270	$ 16,373,414	$ 3,425,579
$ 854,051	$ 1,540,258	$ 15,861,418	$ 3,276,641
$ 815,230	$ 1,470,246	$ 15,157,288	$ 3,127,703
$ 776,410	$ 1,400,235	$ 14,535,227	$ 2,978,765

2045	3,026,436	33,964
2046	3,043,482	33,964
2047	3,060,714	33,964
2048	3,093,020	33,964
2049	3,095,871	33,964
2050	3,113,599	33,964

	Projects Example				
H2 B	H2 C	H2 D	H2 E	Other Demand	Total Cost
					-
-					33,964
35,972	-				69,936
35,972	72,663	-			142,599
35,972	72,663	138,028	248,931	-	529,558
35,972	72,663	138,028	248,931	390,213	919,771
35,972	72,663	138,028	248,931	899,208	1,428,766
35,972	72,663	138,028	248,931	1,399,918	1,929,477
35,972	72,663	138,028	248,931	1,800,523	2,330,082
35,972	72,663	138,028	248,931	2,062,704	2,592,262
35,972	72,663	138,028	248,931	2,228,369	2,757,927
35,972	72,663	138,028	248,931	2,301,167	2,830,725
35,972	72,663	138,028	248,931	2,348,727	2,878,285
35,972	72,663	138,028	248,931	2,377,652	2,907,210
35,972	72,663	138,028	248,931	2,411,118	2,940,676
35,972	72,663	138,028	248,931	2,412,556	2,942,114
35,972	72,663	138,028	248,931	2,425,289	2,954,847
35,972	72,663	138,028	248,931	2,436,669	2,966,227
35,972	72,663	138,028	248,931	2,463,396	2,992,954
35,972	72,663	138,028	248,931	2,458,536	2,988,094
35,972	72,663	138,028	248,931	2,468,639	2,998,197
35,972	72,663	138,028	248,931	2,478,729	3,008,287
35,972	72,663	138,028	248,931	2,502,307	3,031,865

35,972	72,663	138,028	248,931	2,496,878	3,026,436
35,972	72,663	138,028	248,931	2,513,924	3,043,482
35,972	72,663	138,028	248,931	2,531,156	3,060,714
35,972	72,663	138,028	248,931	2,563,462	3,093,020
35,972	72,663	138,028	248,931	2,566,313	3,095,871
35,972	72,663	138,028	248,931	2,584,040	3,113,599

Workbook Contents

Natural Gas Consumption

Click worksheet name or tab at bottom for data

Worksheet Name	Description	# Of Series	Frequency
Data 1	Natural Gas Consumption	53	Annual

Release Date: 10/29/2021
Next Release Date: 11/30/2021

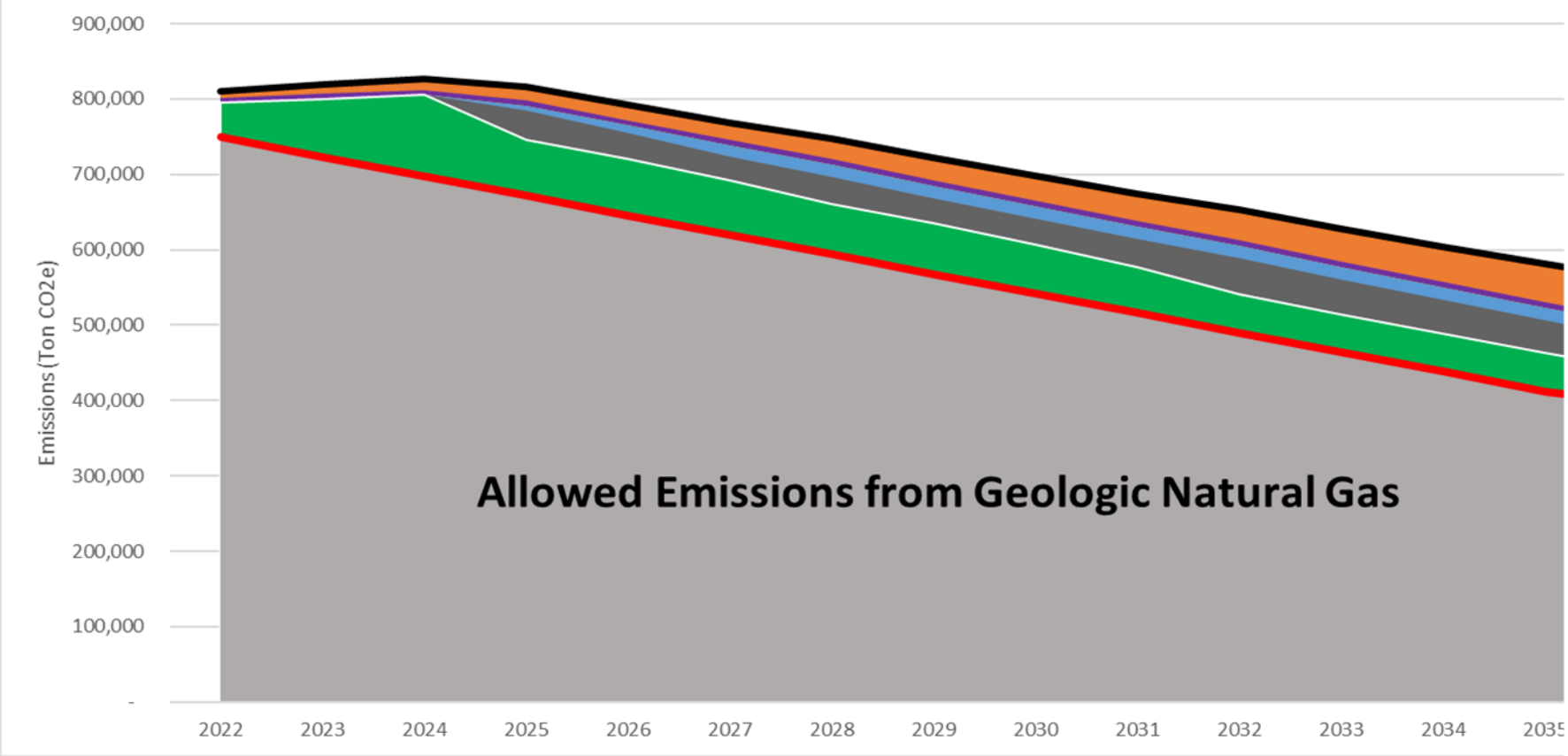
Excel File Name: ng_cons_sum_a_epg0_vc0_mmcf_a.xls
Available from Web Page: http://www.eia.gov/dnav/ng/ng_cons_sum_a_epg0_vc0_mmcf_a.htm
Source: Energy Information Administration
For Help, Contact: infoctr@eia.gov
(202) 586-8800

Latest Data for
2020

Sensitivity #6 - Delayed Innovation/Acce

Customer Growth?	
RNG Supply Availability	
45% Reduction Target Year	
80% Reduction Target Year	
EE Forecast Adjustment?	

Sensitivity #6 - Resource



Scenario #6 - Resource Need

	2022	2023	2024	2025	2026	2027

Expected EE	1,633,846	2,146,207	2,690,752	3,246,857	3,817,093	4,401,167
Expected RNG	1,344,500	1,344,500	1,344,500	1,344,500	1,344,500	1,344,500
Tier 1 Incremental EE	25,113	25,113	37,716	42,653	45,757	47,832
Tier 2 Incremental EE	-	0	-	-	-	-
Tier 3 Incremental EE	-	-	-	-	0	0
Tier 4 Incremental EE	(0)	-	-	-	-	-
Incremental Landfill RNG	-	-	-	811,892	1,275,831	1,667,753
Incremental Wastewater RNG	-	-	-	31,593	43,029	53,520
Incremental Solid Waste RNG	-	-	-	167,078	314,609	450,046
Incremental Dairy RNG	-	-	-	150,498	300,026	435,970
Incremental Hydrogen	-	-	-	7,292,430	6,485,463	6,109,447
CCIs Needed	45,471	77,049	107,801	74,966	74,506	72,224
	2032	**2033**	**2034**	**2035**	**2036**	**2037**
Expected EE	7,506,475	8,151,245	8,807,760	9,472,872	10,147,302	10,826,223
Expected RNG	1,344,500	1,344,500	1,344,500	1,344,500	1,344,500	1,344,500
Tier 1 Incremental EE	55,878	57,042	58,158	59,209	60,193	61,104
Tier 2 Incremental EE	-	-	(0)	-	-	-
Tier 3 Incremental EE	-	-	(0)	(0)	(0)	(0)
Tier 4 Incremental EE	-	-	-	-	(0)	(0)
Incremental Landfill RNG	1,970,981	1,970,981	1,970,981	1,970,981	1,970,981	1,970,981
Incremental Wastewater RNG	63,064	63,064	63,064	63,064	63,064	63,064
Incremental Solid Waste RNG	573,389	573,389	573,389	573,389	573,389	573,389
Incremental Dairy RNG	558,329	558,329	558,329	558,329	558,329	558,329
Incremental Hydrogen	9,027,416	8,699,406	8,374,290	8,049,819	7,739,390	7,399,618
CCIs Needed	50,983	50,113	50,825	51,534	44,681	35,842

Scenario #6 - Resource Impa

	2022	**2023**	**2024**	**2025**	**2026**	**2027**
Cascade Baseline Emissions	810,618	818,980	826,754	815,816	792,280	768,754
Expected Avoided Emissions - EE	8,669	11,388	14,277	17,228	20,253	23,353
Expected Avoided Emissions - RNG	7,134	7,134	7,134	7,134	7,134	7,134
Optimal Incremental EE	133	133	200	226	243	254
Optimal Incremental RNG	-	-	-	6,161	10,259	13,834
Optimal Incremental Hydrogen	-	-	-	38,694	34,412	32,417

CCIs Needed	45,471	77,049	107,801	74,966	74,506	72,224
Alternative Compliance Needed	-	-	-	-	-	-
Emissions Goal	749,210	723,276	697,341	671,407	645,473	619,539
	2032	**2033**	**2034**	**2035**	**2036**	**2037**
Cascade Baseline Emissions	652,808	627,690	604,232	580,821	558,422	533,906
Expected Avoided Emissions - EE	39,829	43,251	46,734	50,263	53,842	57,444
Expected Avoided Emissions - RNG	7,134	7,134	7,134	7,134	7,134	7,134
Optimal Incremental EE	296	303	309	314	319	324
Optimal Incremental RNG	16,798	16,798	16,798	16,798	16,798	16,798
Optimal Incremental Hydrogen	47,899	46,159	44,434	42,712	41,065	39,262
CCIs Needed	50,983	50,113	50,825	51,534	44,681	35,842
Alternative Compliance Needed	(0)	0	0	-	0	0
Emissions Goal	489,868	463,934	437,999	412,065	394,584	377,103

Scenario #6 - Key Cos

PV of 20-Year Compliance Costs	**$149,108,325**

Nominal Cost

	2022	2023	2024	2025	2026	2027
Optimal Incremental EE	$ 10,676	$ 11,748	$ 17,831	$ 19,718	$ 21,473	$ 23,062
Optimal Incremental RNG	$ -	$ -	$ -	$ 838,825	$ 1,464,186	$ 2,071,264
Optimal Incremental Hydrogen	$ -	$ -	$ -	$ 11,423,329	$ 9,141,895	$ 7,679,491
Alternative Compliance Needed	$ -	$ -	$ -	$ -	$ -	$ -
CCIs Needed	$ 3,741,735	$ 6,613,008	$ 9,664,227	$ 7,028,623	$ 7,400,729	$ 7,517,188
	2032	**2033**	**2034**	**2035**	**2036**	**2037**
Optimal Incremental EE	$ 30,901	$ 32,108	$ 33,676	$ 34,894	$ 36,201	$ 37,123
Optimal Incremental RNG	$ 2,629,735	$ 2,629,735	$ 2,629,735	$ 2,629,735	$ 2,629,735	$ 2,629,735
Optimal Incremental Hydrogen	$ 6,760,535	$ 6,154,718	$ 5,686,411	$ 5,191,060	$ 4,731,427	$ 4,348,115
Alternative Compliance Needed	$ -	$ -	$ -	$ -	$ -	$ -
CCIs Needed	$ 6,904,632	$ 7,124,786	$ 7,586,100	$ 8,159,646	$ 7,426,438	$ 6,253,408

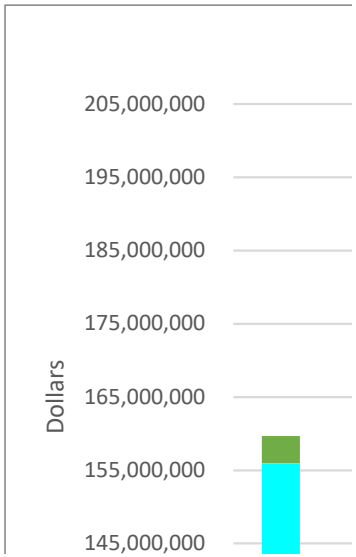
PV Cost

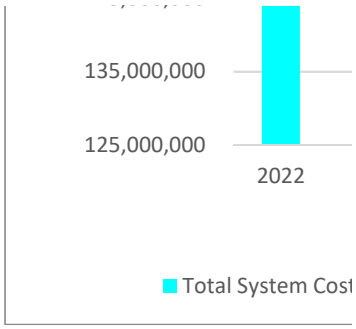
	2022	2023	2024	2025	2026	2027
Optimal Incremental EE	$ 10,676	$ 10,954	$ 15,502	$ 15,985	$ 16,231	$ 16,254
Optimal Incremental RNG	$ -	$ -	$ -	$ 680,000	$ 1,106,743	$ 1,459,818
Optimal Incremental Hydrogen	$ -	$ -	$ -	$ 9,260,419	$ 6,910,140	$ 5,412,472

Alternative Compliance Needed	$ -	$ -	$ -	$ -	$ -	$ -
CCIs Needed	$ 3,741,735	$ 6,166,116	$ 8,402,188	$ 5,697,813	$ 5,594,033	$ 5,298,082
	2032	**2033**	**2034**	**2035**	**2036**	**2037**
Optimal Incremental EE	$ 15,350	$ 14,871	$ 14,544	$ 14,051	$ 13,593	$ 12,997
Optimal Incremental RNG	$ 1,306,286	$ 1,218,011	$ 1,135,700	$ 1,058,952	$ 987,391	$ 920,665
Optimal Incremental Hydrogen	$ 3,358,208	$ 2,850,672	$ 2,455,783	$ 2,090,357	$ 1,776,516	$ 1,522,266
Alternative Compliance Needed	$ -	$ -	$ -	$ -	$ -	$ -
CCIs Needed	$ 3,429,786	$ 3,299,977	$ 3,276,199	$ 3,285,759	$ 2,788,416	$ 2,189,306

Data Item	2022	2023	2024	2025	2026	2027
Total System Cost	155,914,751	155,312,233	160,425,320	167,117,999	168,328,257	170,186,550
Optimal Incremental EE	$ 10,676	$ 10,954	$ 15,502	$ 15,985	$ 16,231	$ 16,254
Optimal Incremental RNG	$ -	$ -	$ -	$ 680,000	$ 1,106,743	$ 1,459,818
Optimal Incremental Hydrogen	$ -	$ -	$ -	$ 9,260,419	$ 6,910,140	$ 5,412,472
Alternative Compliance Needed	$ -	$ -	$ -	$ -	$ -	$ -
CCIs Needed	$ 3,741,735	$ 6,166,116	$ 8,402,188	$ 5,697,813	$ 5,594,033	$ 5,298,082

	Years			
Data Item	2022-2025	2026-2030	2031-2035	2036-2039
Total System Cost	638,770,304	856,212,411	900,511,713	751,056,344
Optimal Incremental EE	53,117	81,426	74,661	50,915
Optimal Incremental RNG	680,000	7,408,621	6,119,910	3,566,941
Optimal Incremental Hydrogen	9,260,419	23,847,921	13,755,489	5,634,394
Alternative Compliance Needed	-	-	-	-
CCIs Needed	24,007,853	24,989,222	17,393,933	7,852,709

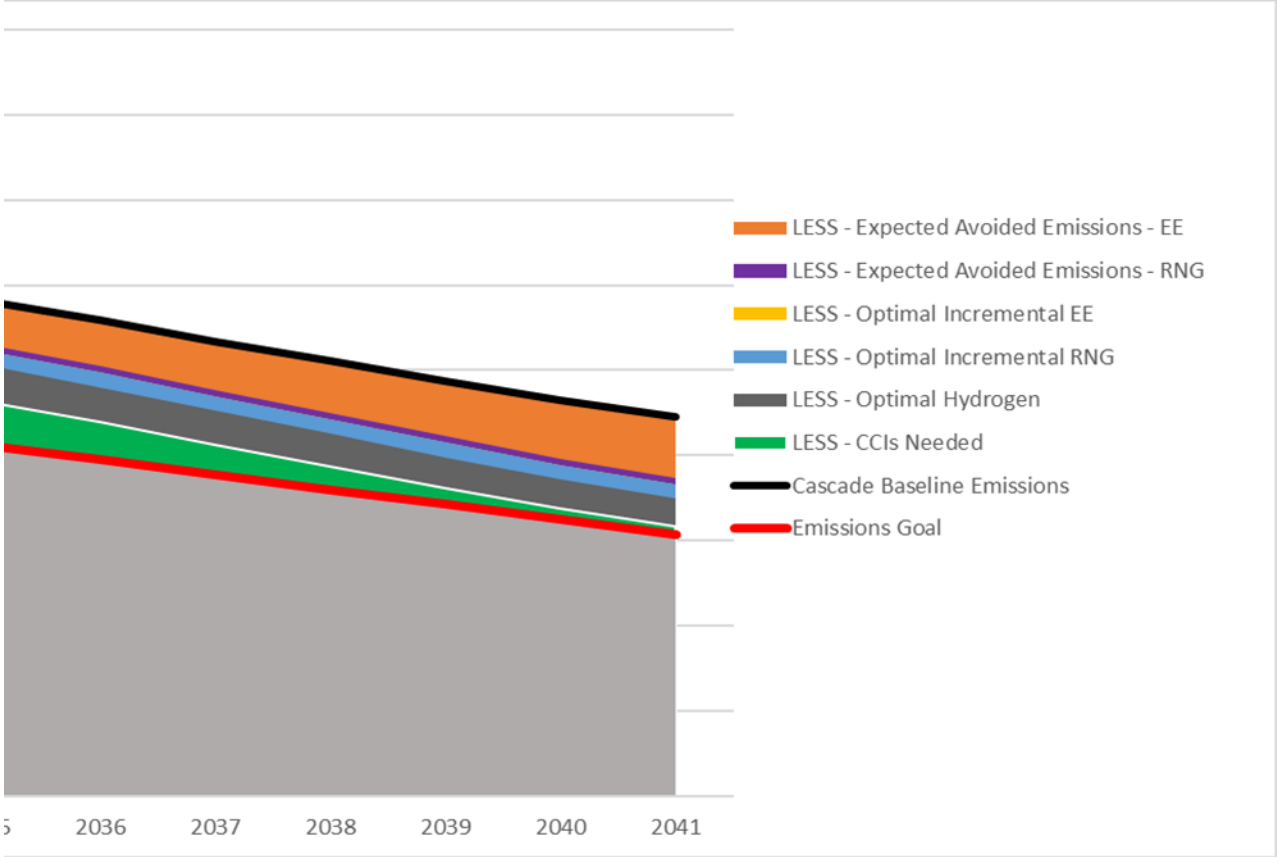



135,000,000
125,000,000
2022
Total System Cost

lerated Electrification

Subject to Accelerated Electrification
2019 AGF/ICF Study w/ Competition
2035
2050
Subject to Delayed Innovation

Stack



(Therms)

2028	2029	2030	2031

5,002,764	5,615,200	6,237,166	6,865,592
1,344,500	1,344,500	1,344,500	1,344,500
49,883	51,609	53,290	54,617
-	-	-	-
0	-	-	-
-	-	-	-
1,970,981	1,970,981	1,970,981	1,970,981
63,064	63,064	63,064	63,064
573,389	573,389	573,389	573,389
558,329	558,329	558,329	558,329
6,654,419	6,237,428	6,473,484	7,147,312
67,545	66,946	64,817	60,342
2038	**2039**	**2040**	**2041**
11,510,146	12,203,558	12,938,511	13,717,692
1,344,500	1,344,500	1,344,500	1,344,500
61,963	62,794	63,598	64,401
-	-	-	-
(0)	(0)	(0)	(0)
(0)	(0)	(0)	(0)
1,970,981	1,970,981	1,970,981	1,970,981
63,064	63,064	63,064	63,064
573,389	573,389	573,389	573,389
558,329	558,329	558,329	558,329
7,074,875	6,749,963	6,432,928	6,179,479
27,983	20,061	12,445	8,845

ct (CO2e)

2028	**2029**	**2030**	**2031**
747,200	721,713	698,211	674,718
26,545	29,794	33,094	36,429
7,134	7,134	7,134	7,134
265	274	283	290
16,798	16,798	16,798	16,798
35,308	33,096	34,348	37,924

67,545	66,946	64,817	60,342
-	-	-	-
593,605	567,671	541,737	515,802
2038	**2039**	**2040**	**2041**
510,475	487,032	464,157	445,869
61,073	64,752	68,652	72,786
7,134	7,134	7,134	7,134
329	333	337	342
16,798	16,798	16,798	16,798
37,539	35,815	34,133	32,788
27,983	20,061	12,445	8,845
(0)	0	-	0
359,620	342,139	324,658	307,176

sts

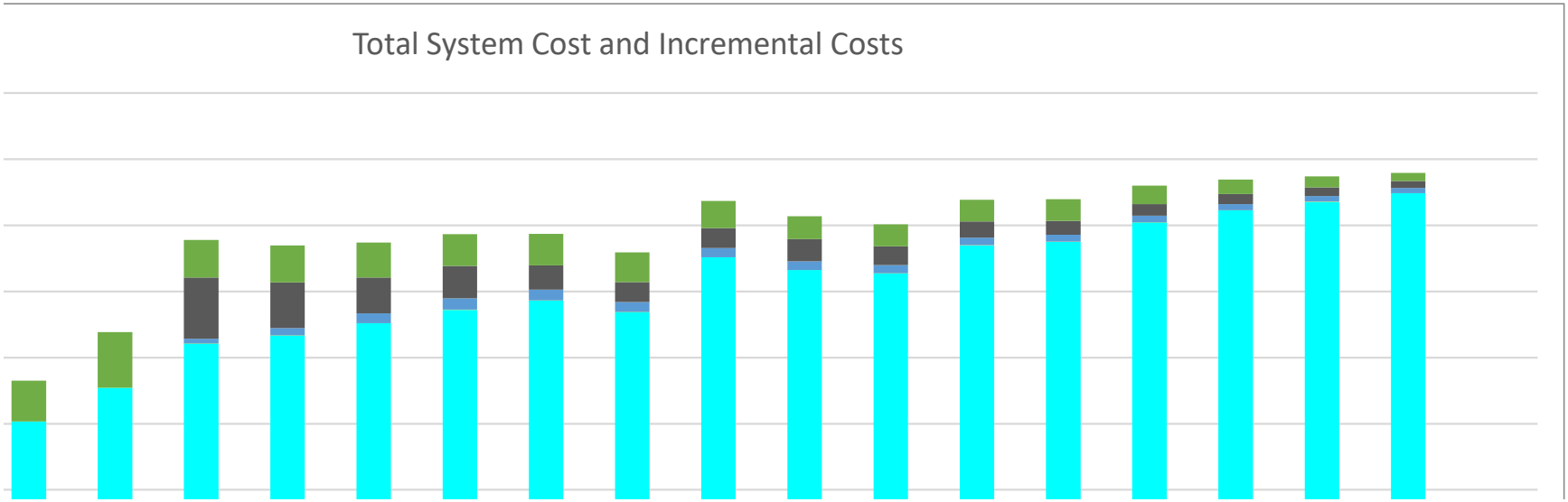
2028	2029	2030	2031
$ 25,183	$ 26,662	$ 28,100	$ 29,742
$ 2,629,735	$ 2,629,735	$ 2,629,735	$ 2,629,735
$ 7,406,317	$ 5,987,022	$ 5,232,408	$ 5,632,165
$ -	$ -	$ -	$ -
$ 7,371,943	$ 7,753,420	$ 7,878,803	$ 7,700,240
2038	**2039**	**2040**	**2041**
$ 38,107	$ 39,050	$ 40,278	$ 41,288
$ 2,629,735	$ 2,629,735	$ 2,629,735	$ 2,629,735
$ 3,909,866	$ 3,480,124	$ 3,135,762	$ 2,839,191
$ -	$ -	$ -	$ -
$ 5,175,969	$ 3,894,311	$ 2,535,506	$ 1,909,396

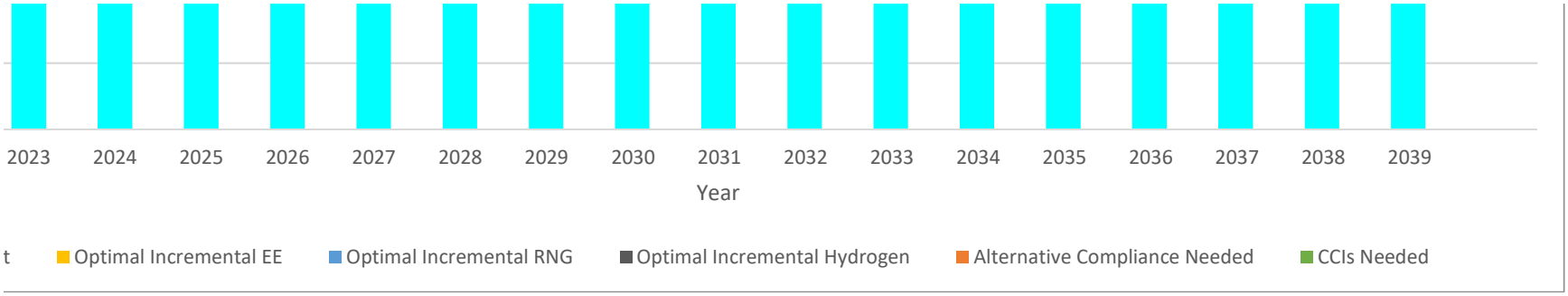
2028	2029	2030	2031
$ 16,549	$ 16,337	$ 16,055	$ 15,845
$ 1,728,176	$ 1,611,389	$ 1,502,495	$ 1,400,960
$ 4,867,188	$ 3,668,592	$ 2,989,529	$ 3,000,469

$ -	$ -	$ -	$ -
$ 4,844,599	$ 4,750,965	$ 4,501,543	$ 4,102,212
2038	**2039**	**2040**	**2041**
$ 12,440	$ 11,886	$ 11,431	$ 10,926
$ 858,449	$ 800,437	$ 746,345	$ 695,909
$ 1,276,334	$ 1,059,277	$ 889,960	$ 751,337
$ -	$ -	$ -	$ -
$ 1,689,639	$ 1,185,347	$ 719,602	$ 505,285

1.70

2028	2029	2030	2031		2032	2033	2034	2035	2036
172,204,557	173,620,834	171,872,214	180,126,404		178,221,481	#######	#######	#######	#######
$ 16,549	$ 16,337	$ 16,055	$ 15,845	$	15,350	$ 14,871	$ 14,544	$ 14,051	$ 13,593
$ 1,728,176	$ 1,611,389	$ 1,502,495	$ 1,400,960	$	1,306,286	#######	#######	#######	#######
$ 4,867,188	$ 3,668,592	$ 2,989,529	$ 3,000,469	$	3,358,208	#######	#######	#######	#######
$ -	$ -	$ -	$ -	$	-	$ -	$ -	$ -	$ -
$ 4,844,599	$ 4,750,965	$ 4,501,543	$ 4,102,212	$	3,429,786	#######	#######	#######	#######




2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
Year
t
Optimal Incremental EE
Optimal Incremental RNG
Optimal Incremental Hydrogen
Alternative Compliance Needed
CCIs Needed

2037	2038	2039
#######	#######	#######
$ 12,997	$ 12,440	$ 11,886
#######	#######	#######
#######	#######	#######
$ -	$ -	$ -
#######	#######	#######

Scenario	Renewable Supply Penetration (% of Deliveries)			Biofuel RNG Penetration (% of Current Deliveries)			Renewable Supply Portfolio Marginal Cost ($2022/Dth)			Total In CI (Milli
	2025	2030	2040	2025	2030	2040	2025	2030	2040	2025
Base Case	10%	26%	65%	10%	26%	57%	5.86	4.94	3.01	12
Declining Growth	10%	25%	54%	10%	25%	46%	5.86	4.91	2.75	12
RNG Availability	6%	17%	28%	6%	15%	27%	5.86	4.91	3.05	11
Aggressive Targets	17%	43%	83%	17%	37%	75%	5.86	4.78	2.97	20
No CCIs	16%	35%	65%	16%	27%	57%	5.86	4.59	2.91	16
Accelerated Innovation/Electrification/High Social Cost of Greenhouse Gas	11%	33%	45%	11%	33%	44%	5.86	4.81	2.39	13
Delayed Innovation/Accelerated Electrification	6%	8%	13%	2%	3%	5%	11.76	4.66	1.70	16

cremental Cost of PP Program on2022$/Year)		Community Climate Investments (% of Emissions)			Annual Residential Bill Impact (% Impact of CPP)			Annual Industrial Sales Bill Impact (% Impact of CPP)		
2030	2040	2025	2030	2040	2025	2030	2040	2025	2030	2040
25	33	6%	8%	0%	13%	27%	43%	16%	32%	50%
21	20	6%	6%	0%	13%	24%	31%	16%	29%	37%
27	32	10%	9%	10%	12%	28%	42%	15%	34%	49%
37	43	6%	6%	0%	20%	36%	49%	24%	42%	56%
26	33	0%	0%	0%	16%	28%	43%	20%	33%	49%
24	12	6%	0%	0%	11%	17%	9%	14%	21%	12%
9	2	9%	9%	3%	13%	8%	3%	16%	11%	4%