Final Analysis

CETA Section 12

Clallam County PUD

4/23/20

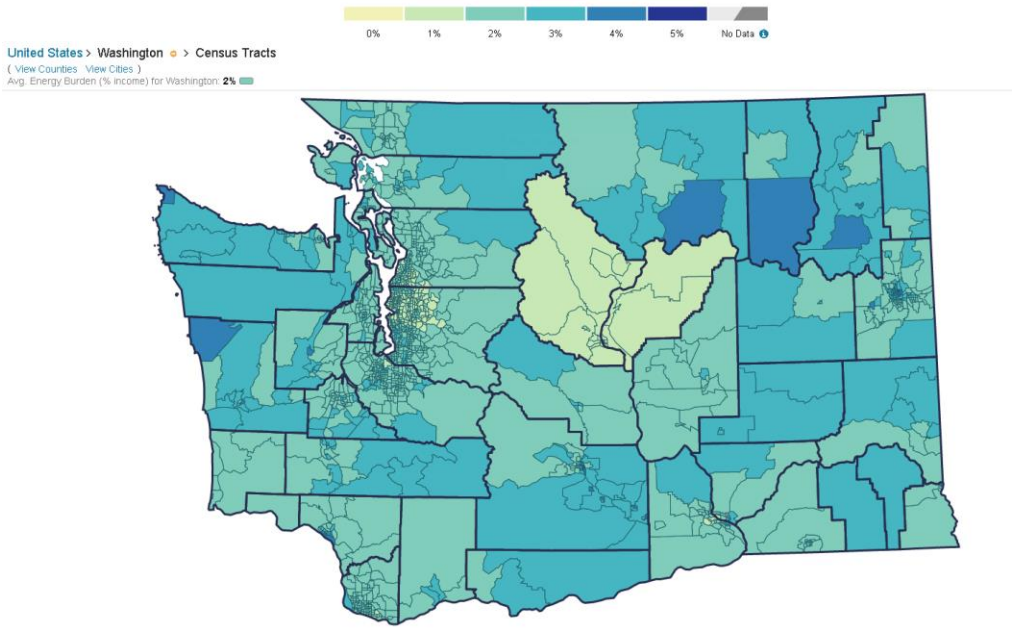
General Energy Use and Poverty Characteristics for Clallam PUD Area

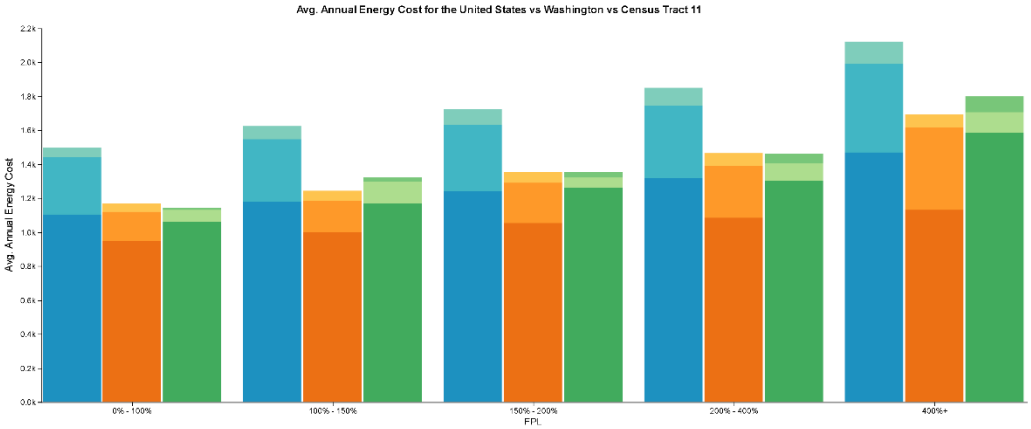
The US Department of Energy compiles extensive information at the census tract level, including:

- Household energy consumption and characteristics.
- Income and Poverty
- Energy Burden

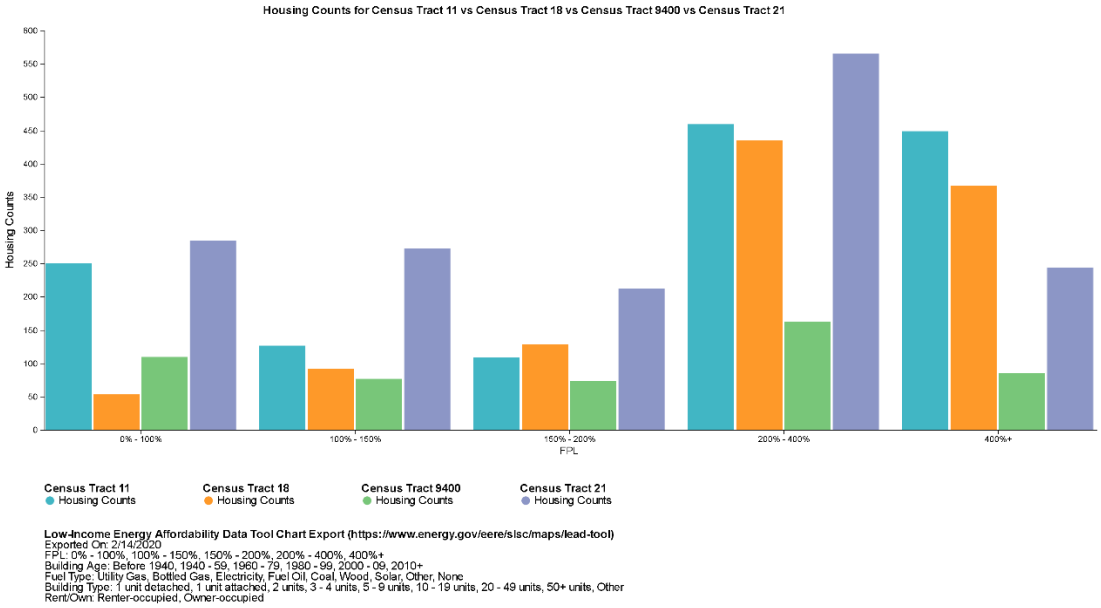
The Department also maintains a publicly available tool to retrieve, present and evaluate the compiled information. The WA Department of Commerce and numerous utilities to evaluate Section 1200 of the Clean Energy Transformation Act utilize the "Low-Income Energy Affordability Data" or LEAD tool.

Examples include:





Low-Income Energy Affordability Data Tool Chart Export (https://www.energy.gov/eere/slsc/maps/lead-tool)
Exported On: 2/14/2020
FPL: 0% - 100%, 100% - 150%, 150% - 200%, 200% - 400%, 400%+
Building Age: Before 1940, 1940 - 59, 1960 - 79, 1980 - 99, 2000 - 09, 2010+
Fuel Type: Utility Gas, Bottled Gas, Electricity, Fuel Oil, Coal, Wood, Solar, Other, None
Building Type: 1 unit detached, 1 unit attached, 2 units, 3 - 4 units, 5 - 9 units, 10 - 19 units, 20 - 49 units, 50+ units, Other
Rent/Own: Renter-occupied, Owner-occupied



The following information is available using the LEAD Tool (Exported 2/6/2020):

Name	Federal Poverty Level	Avg. Annual Energy Cost (Electricity)	Avg. Annual Energy Cost (Gas)	Avg. Annual Energy Cost (Other)	Avg. Annual Energy Cost (Total)	Housing Counts
Washington	0% - 100%	947	173	51	1171	280931
Washington	100% - 150%	1001	186	56	1243	202293
Washington	150% - 200%	1055	234	64	1353	209261
Washington	200% - 400%	1085	307	72	1464	773385
Washington	400%+	1132	486	76	1694	1230736
Clallam County	0% - 100%	1074	51	117	1242	3858
Clallam County	100% - 150%	1191	45	114	1350	3170
Clallam County	150% - 200%	1332	65	89	1486	3157
Clallam County	200% - 400%	1339	97	101	1537	10854
Clallam County	400%+	1460	154	110	1724	10397
Port Angeles	0% - 100%	1052	40	97	1189	1328
Port Angeles	100% - 150%	1068	38	113	1219	1015
Port Angeles	150% - 200%	1252	54	71	1377	887
Port Angeles	200% - 400%	1221	65	86	1372	2769
Port Angeles	400%+	1440	125	104	1669	2391

Information applicable for the Clallam PUD service territory is derived by taking Clallam County characteristics and subtracting Port Angeles characteristics. This data excludes about 200 Clallam PUD households in west Jefferson County, but it is assumed the 0.6% of Clallam PUD customers in Jefferson have similar traits to other PUD customers.

LEAD Tool information applicable to Clallam PUD:

Name	Federal Poverty Level	Avg. Annual Energy Cost (Electricity)	Avg. Annual Energy Cost (Gas)	Avg. Annual Energy Cost (Other)	Avg. Annual Energy Cost (Total)	Housing Counts	%Electric Energy Burden
Clallam PUD	0% - 100%	1086	57	127	1270	2530	85.49%
Clallam PUD	100% - 150%	1249	48	114	1412	2155	88.47%
Clallam PUD	150% - 200%	1363	69	96	1529	2270	89.18%
Clallam PUD	200% - 400%	1379	108	106	1594	8085	86.56%
Clallam PUD	400%+	1466	163	112	1740	8006	84.23%
Clallam PUD	All Customers	1363	112	110	1586	23046	85.99%

If energy assistance need (EAN) is established at 6% of all energy burden, it is assumed the electric energy assistance need is proportional to the electric energy burden. The need begins at a burden of 6% times the % Electric Energy Burden for each of the above poverty level ranges in the above table.

Based on housing counts and average annual energy cost the information in the LEAD Tool is dated and somewhat incomplete. Even so, the proportions derived from the Tool can be applied to a more current year of metering data, without introducing large errors.

Name	Federal Poverty Level	% of Median Electric Bill	% of Households
Clallam PUD	0% - 100%	79.62%	10.98%
Clallam PUD	100% - 150%	91.60%	9.35%
Clallam PUD	150% - 200%	99.99%	9.85%
Clallam PUD	200% - 400%	101.17%	35.08%
Clallam PUD	400%+	107.52%	34.74%

The LEAD Tool presents information in rather large increments based on the percentage of Federal Poverty Level (FPL). Unfortunately, the LEAD Tool raw database data is not formatted in a way conducive to additional granularity. To conduct a more useful and accurate analysis it is necessary to estimate a continuous probability density function(PDF) of the data that is mathematically consistent with information provided by the LEAD Tool under the following conditions:

- The integral of the PDF for households between 0-100% FPL must equal that of the LEAD Tool for households between 0-100%
- The integral of the PDF for households between 100-150% FPL must equal that of the LEAD Tool for households between 100-150%
- The integral of the PDF for households between 150-200% FPL must equal that of the LEAD Tool for households between 150-200%
- A fourth elective shaping parameter is used to set the PDF function to zero at 0% FPL.

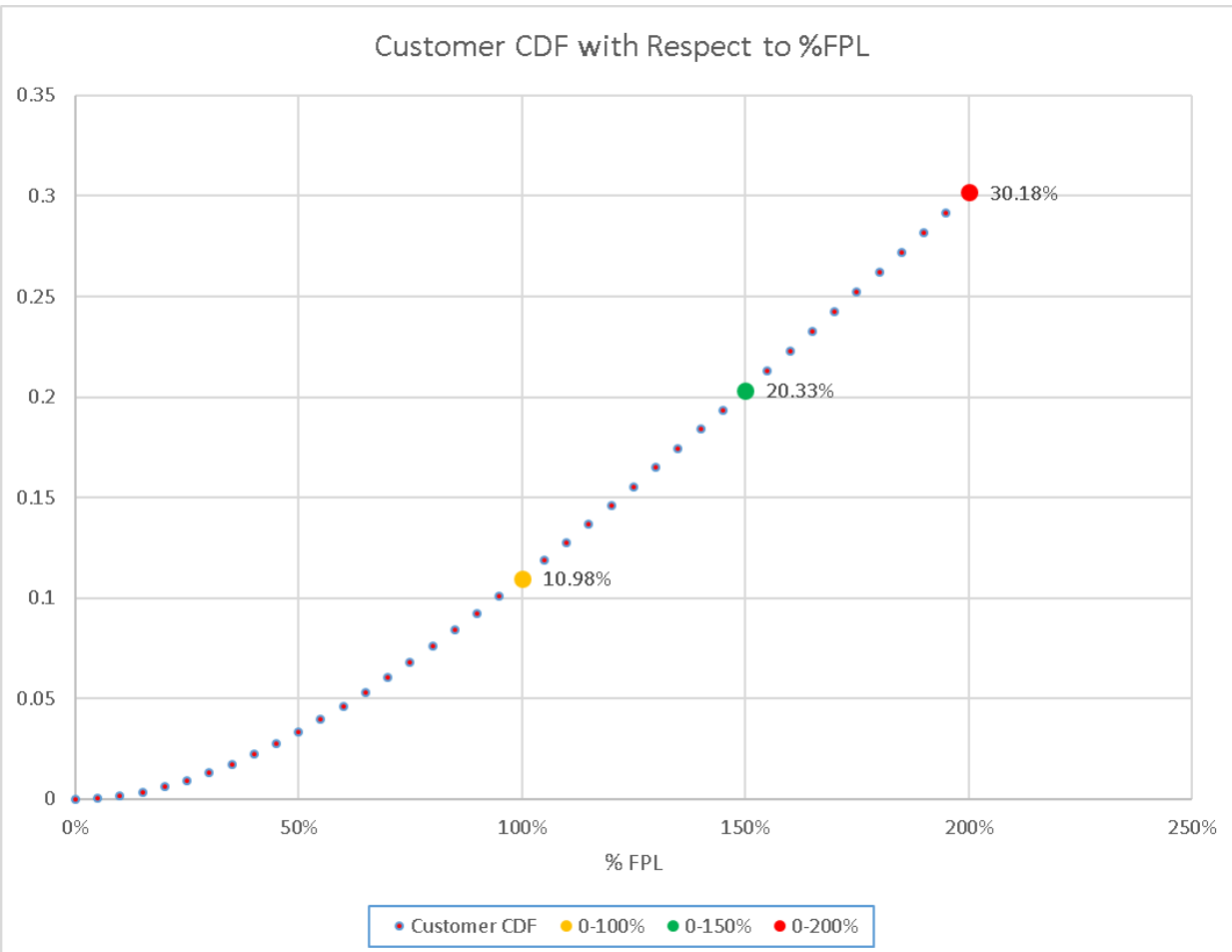
A fourth order polynomial that meets the above criteria in the form of:

- Cumulative Distribution Function, CDF(x) = $Ax^4+Bx^3+Cx^2+Dx+E$
- Probability Distribution Function, PDF(x) = $4Ax^3+3Bx^2+2Cx+D$
- A = 0.009051944
- B = -0.06148934
- C = 0.162217835
- D = E = 0

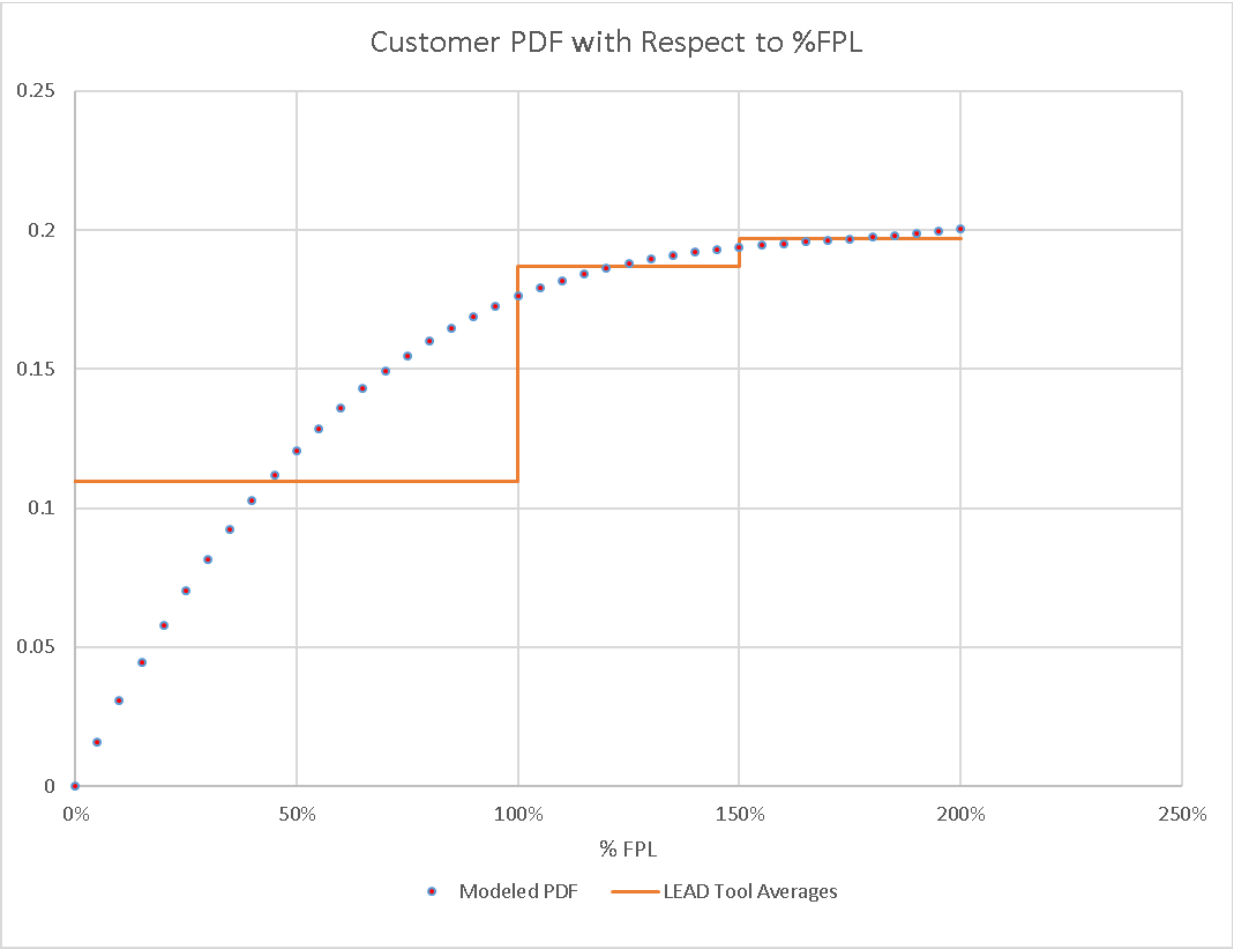
x %FPL	CDF(x)	Lead Tool	Error
0	0	0	0.000%
100%	0.10978044	0.10978044	0.000%
150%	0.20328907	0.20328907	0.000%
200%	0.30178773	0.30178773	0.000%

PDF(0) = D = 0

Cumulative Distribution Function (CDF):



The resulting Probability Density Function (PDF):



Similarly, it it desirable to develop a continuous function of utility bills as a % of the average bill with respect to % FPL, and weighted by the previously dervied PDF. The requirements are:

- The integral average of this function between 0 and 100% FPL must = 79.62% of the average electric bill of all customers to match LEAD data
- The integral average of this function between 100 and 150% FPL must = 91.60% of the average electric bill for all customers to match LEAD data
- The integral average of this function between 150 and 200% FPL must = 99.99% of the average electric bill for all customers to match LEADs data
- Two additional shaping parameters are required for the fourth order polynomial
    - The value of the function is selected to equal the geometric mean of average bill for 150% to 200% and 200% to 400% LEAD data $(0.999961868*1.01172241325958)^{1/2}$
    - The slope of the function at FPL%(0) = 0

A fourth order polynomial weighted with the previously modeled PDF for %FPL produces the desired result:

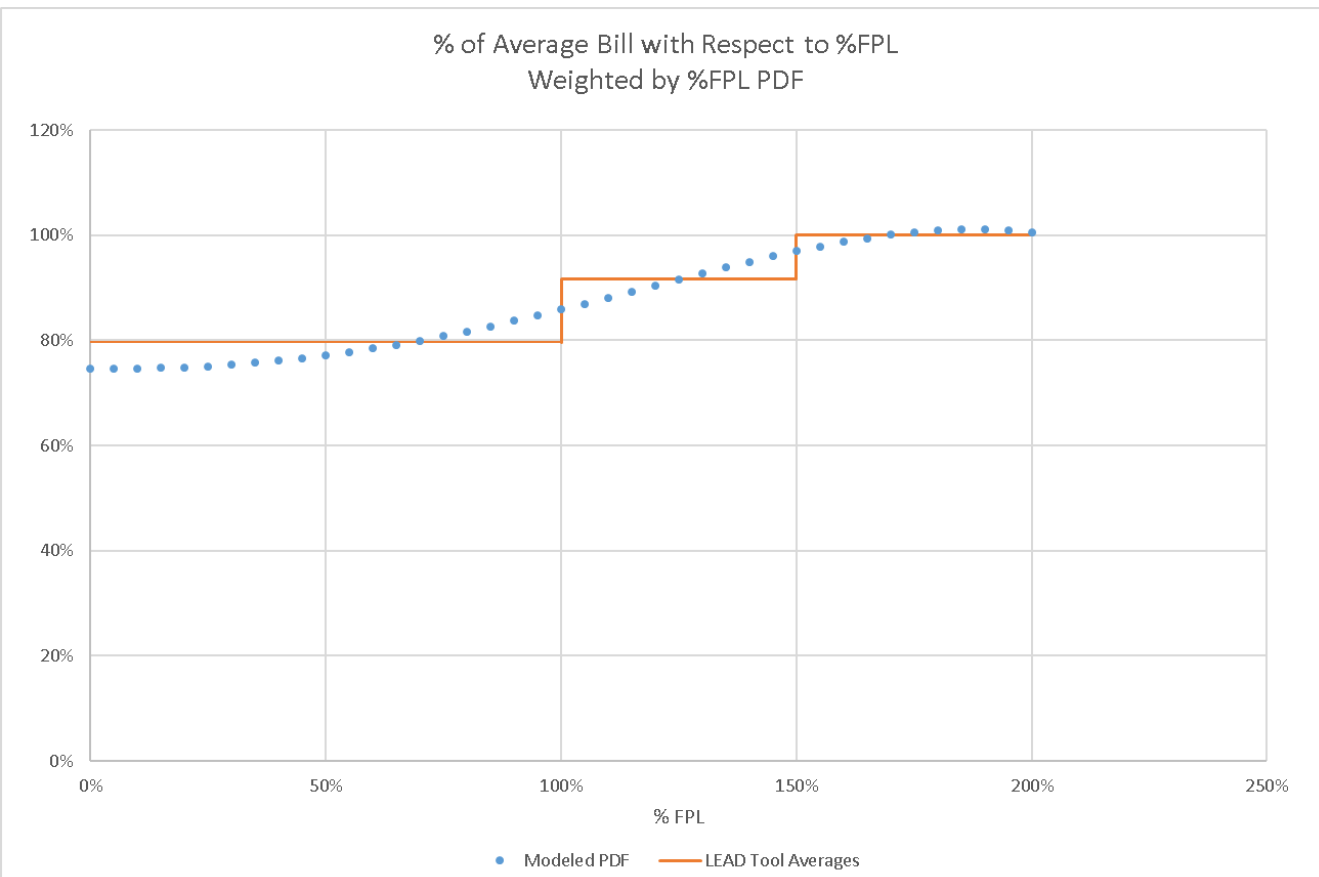
$\int (4Ax^3+3Bx^2+Cx+D) *(ax4+bx3+2cx2+dx+e)dx / \int (4Ax^3+3Bx^2+Cx+D)$

- Weighting Function F(x) = ax^4+bx^3+cx^2+dx+e
- a = -0.04235185
- b = 0.079110545
- c = 0.076287044
- d = 0
- e = 0.74537825

x %FPL	∫ PDF(x)*F(x)/ ∫ PDF(x)	Lead Tool	Error
100%	0.7961885	0.7961885	0.000%
150%	0.9160222	0.9160222	0.000%
200%	0.9998748	0.9998748	0.000%

dF(x) /dx = d = 0

$F(2) = (0.999961868*1.01172241325958)^{1/2}$

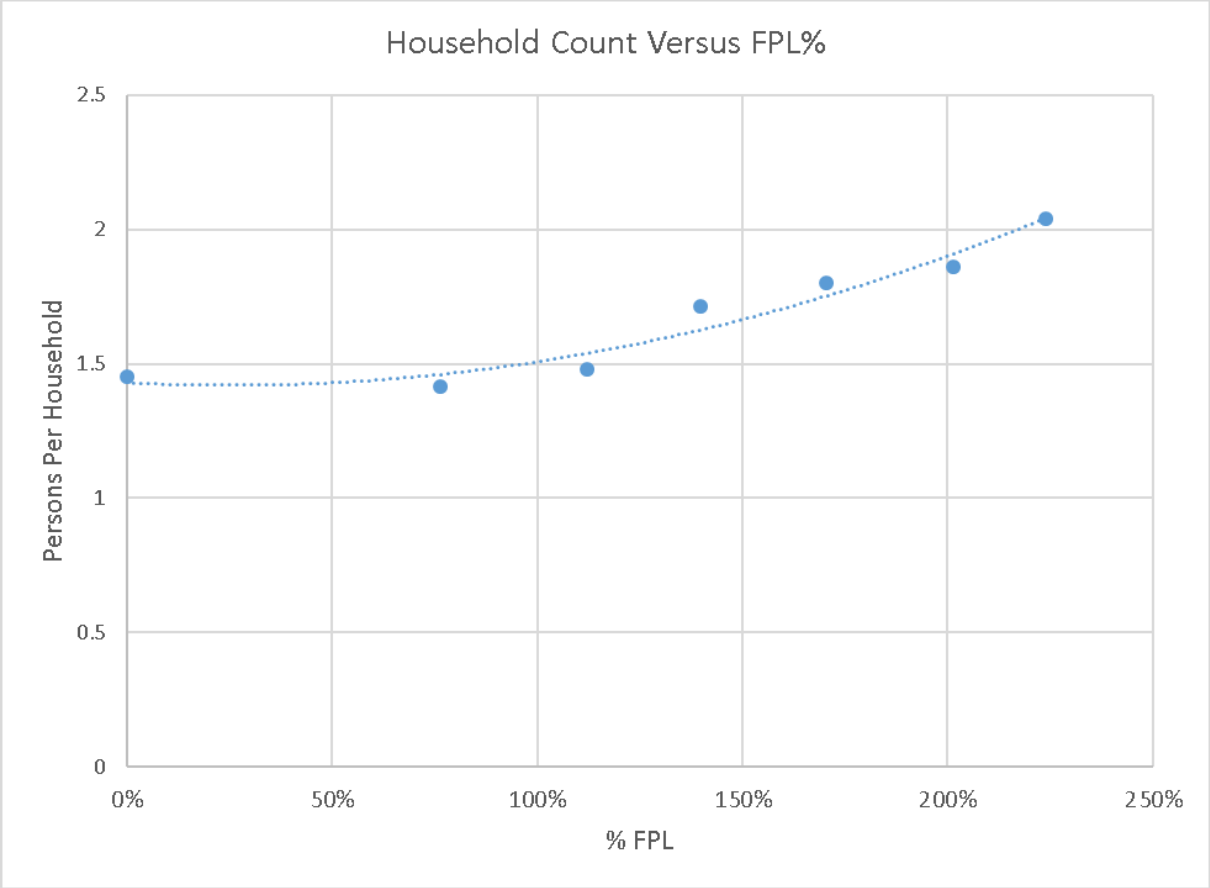


If weighted by the household PDF based on Federal Poverty Level (FPL), the assumed percentage of median customer bill meets all conditions, and one can presume is a considerable improvement over the stepped Lead Tool presentation of data.

The number of persons per household has a significant impact on the EAN calculation through the %FPL parameter. FCS Group obtained 2016 ACS survey responses for Clallam and Jefferson Counties that indicate lower household income ranges based on %FPL have substantially fewer persons per household than the County average:

Household Income			Average Household Size
$0	to	$9,999	1.45
$10,000	to	$14,999	1.38
$15,000	to	$19,999	1.58
$20,000	to	$24,999	1.85
$25,000	to	$29,999	1.75
$30,000	to	$34,999	1.97
$35,000	to	$39,999	2.11

If we assume a 3% annual wage growth rate and utilize 2019 FPL data, we can approximate a continuous function to model average household income for all percentage of poverty levels. For 2019, 100% FPL one-person household = $12,490, plus $4,420 for each additional person per household.

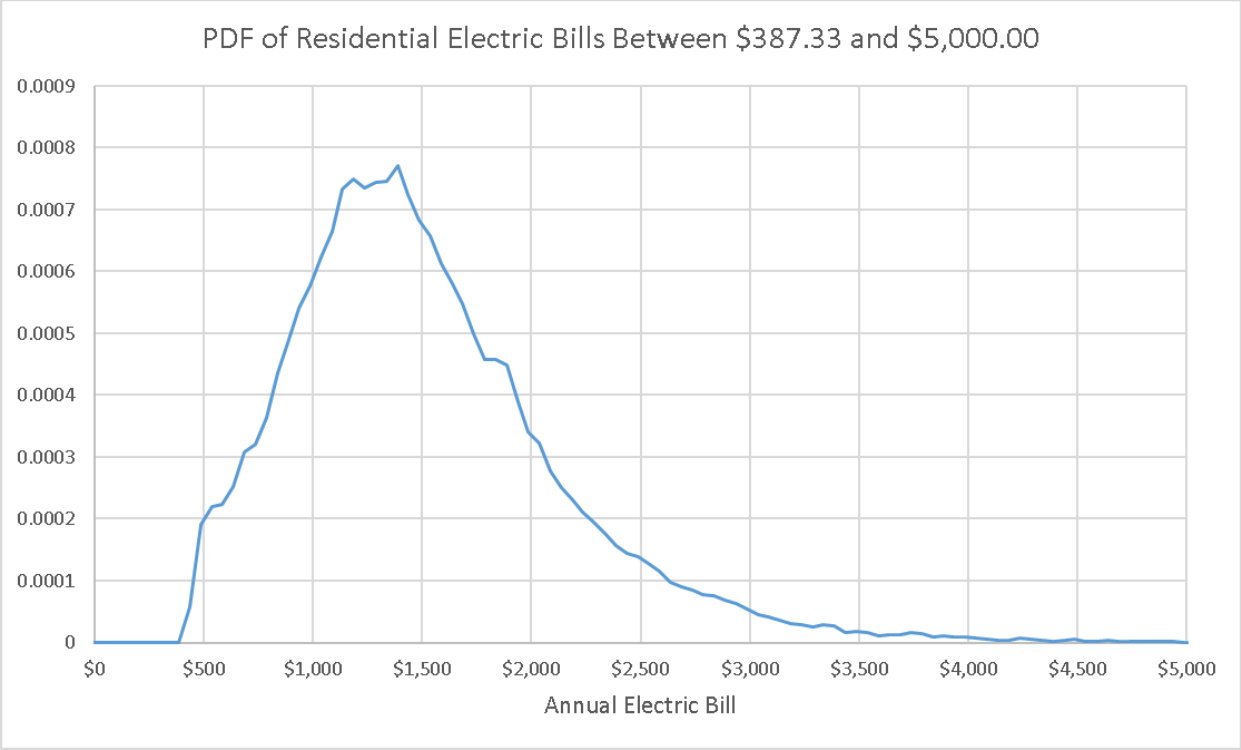


With an model approximation of persons per household in the form of = Ax^2+Bx+C

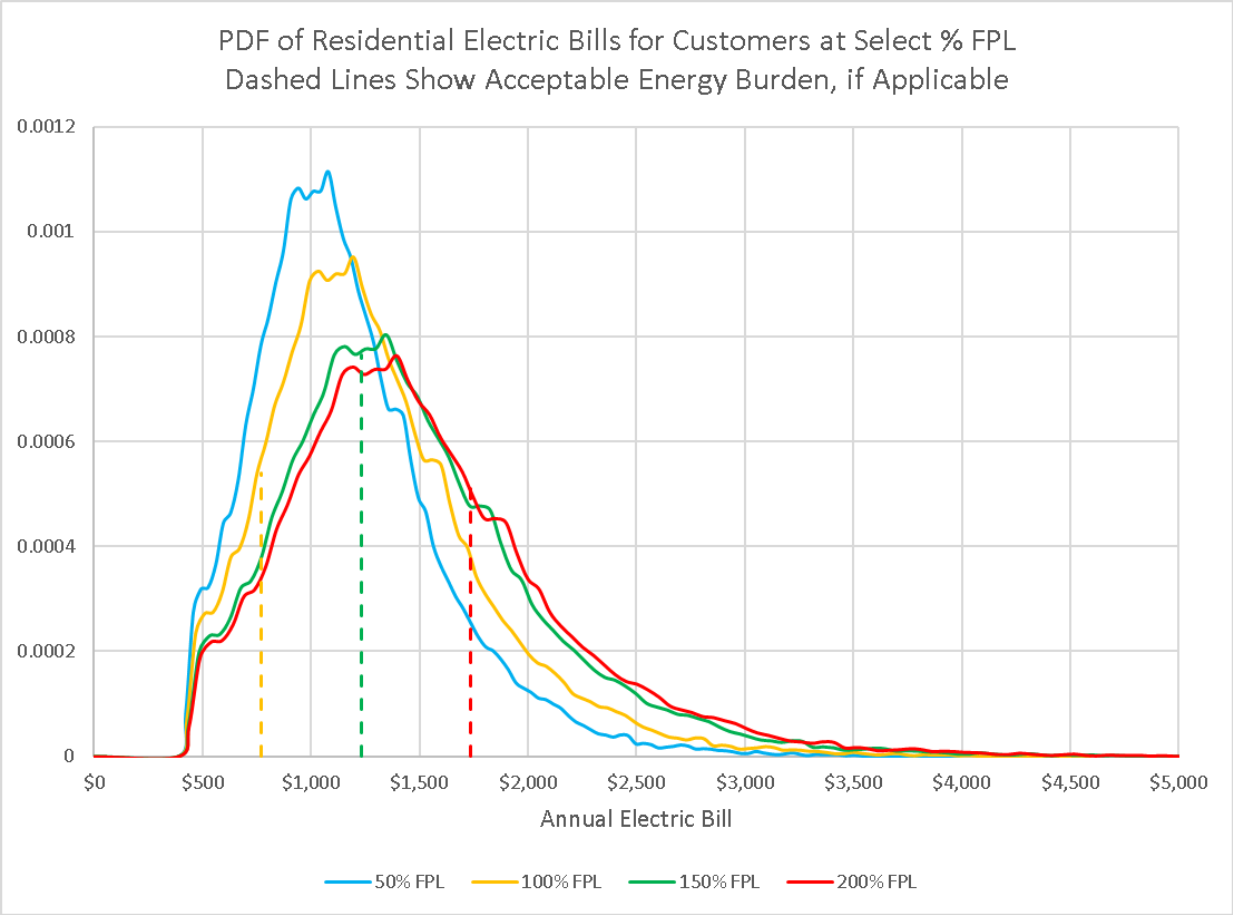
- A = 0.158321
- B = -0.080921
- C = 1.430230

It is important to note that the above assumption in household count will result in a simplification when computing EAN based on % FPL. Actual household count will be based on 1, 2, 3, or more persons, as opposed to an non-integer average household count. Therefore, there will be some households at some % of FPL that maybe evaluated as having an EAN, but do not, and a similar number of households evaluated as not having an EAN, but do. This will result in some errors with respect to total customer counts with EAN at a given % FPL range. These errors will generally cancel one another except for customers that fall between 0 and 50% of FPL. The combined effect of this simplification for total EAN dollar amounts and customer counts will be negligible for all % FPL and all % FPL ranges. Another mitigation to this simplification is that households with larger household counts generally utilize more energy and have greater energy burden than does a single person household.

The last full year of residential metering data available is for 2019. For inclusion, an account had to exist of the beginning of 2019 and remain in service for the entire year. There are 28,958 such residential accounts for Clallam PUD. Some of the accounts have extraordinarily high-energy consumption typical of data mining, indoor growing operations, farm operations and/or other commercial-like activities. For this reason, 53 accounts with that have electric bills in excess of $5,000 are not included. Similarly, 97 accounts that showed no KWH usage are excluded; leaving 28,808 accounts represented the following Probability Density Function (PDF):



Although this PDF represents a combination of all household incomes, we can shape the distribution to match the **Percentage of Median Electric Bills Versus FPL** distribution for individual data points corresponding to percentage of federal poverty level. This can be approximated by fixing the minimum annual electric bill and compressing or expanding values on the x-axis to represent a PDF with the mean corresponding to any % FPL based average annual electric bill. Any number of % FPL data points can be derived for further analysis as illustrated in the following graph:



Note that the mean of each of the above distribution will match the corresponding value of the function previously derived for average electric bill versus % FPL.

It should be noted that calendar year 2019 was slightly cooler than average year, which resulted in slightly more KWH usage than would an average year. For the base analysis, KWH charges are scaled downward by 1%.

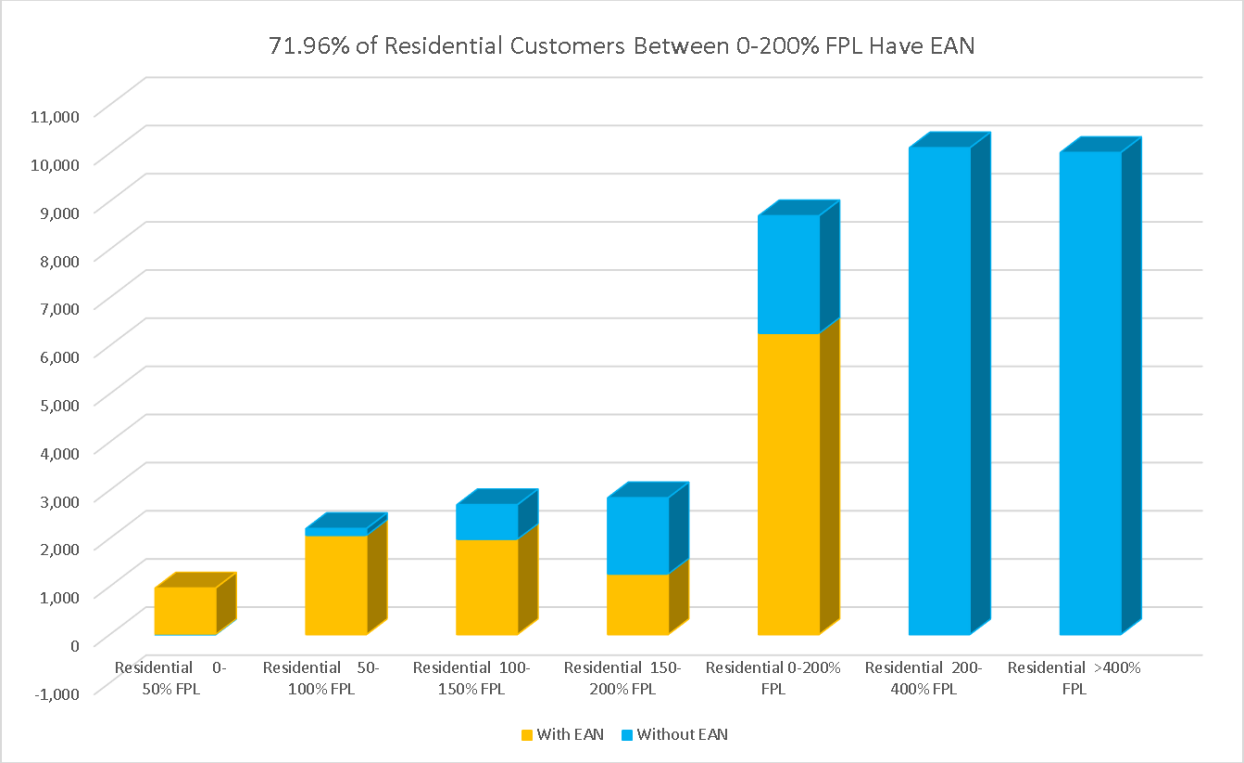
The following tables, charts and distributions illustrate the integration of the individual FPL based data points as well as the calculation of expected or median EAN for the FPL ranges, and the number of affected customers based on LEAD Tool data and previously outlined assumptions.

	All Residential Customers	Residential 0-50% FPL	Residential 50-100% FPL	Residential 100-150% FPL	Residential 150-200% FPL	Residential 0-200% FPL
Total Number of Customers	28,808	963	2,199	2,694	2,838	8,694
Number of Customers with EAN	6,256	963	2,059	1,978	1,256	6,256
Number of Customers without EAN	22,552	0	141	716	1,581	2,438
Average Annual Bill (0-200% FPL)	$1,488.42	$1,127.40	$1,210.31	$1,363.42	$1,494.58	$1,341.35
Average Annual EAN	$143.32	$887.99	$690.39	$584.35	$554.44	$659.99
Total EAN	$4,128,906	$855,359	$1,421,326	$1,155,605	$696,616	$4,128,906
Total Non-EAN	$38,749,377	$230,520	$1,240,609	$2,517,177	$3,544,327	$7,532,633
EAN as % of Bills	9.63%	78.77%	53.39%	31.46%	16.43%	35.41%
EAN as % of Customers	21.72%	100.01%	93.60%	73.41%	44.28%	71.96%

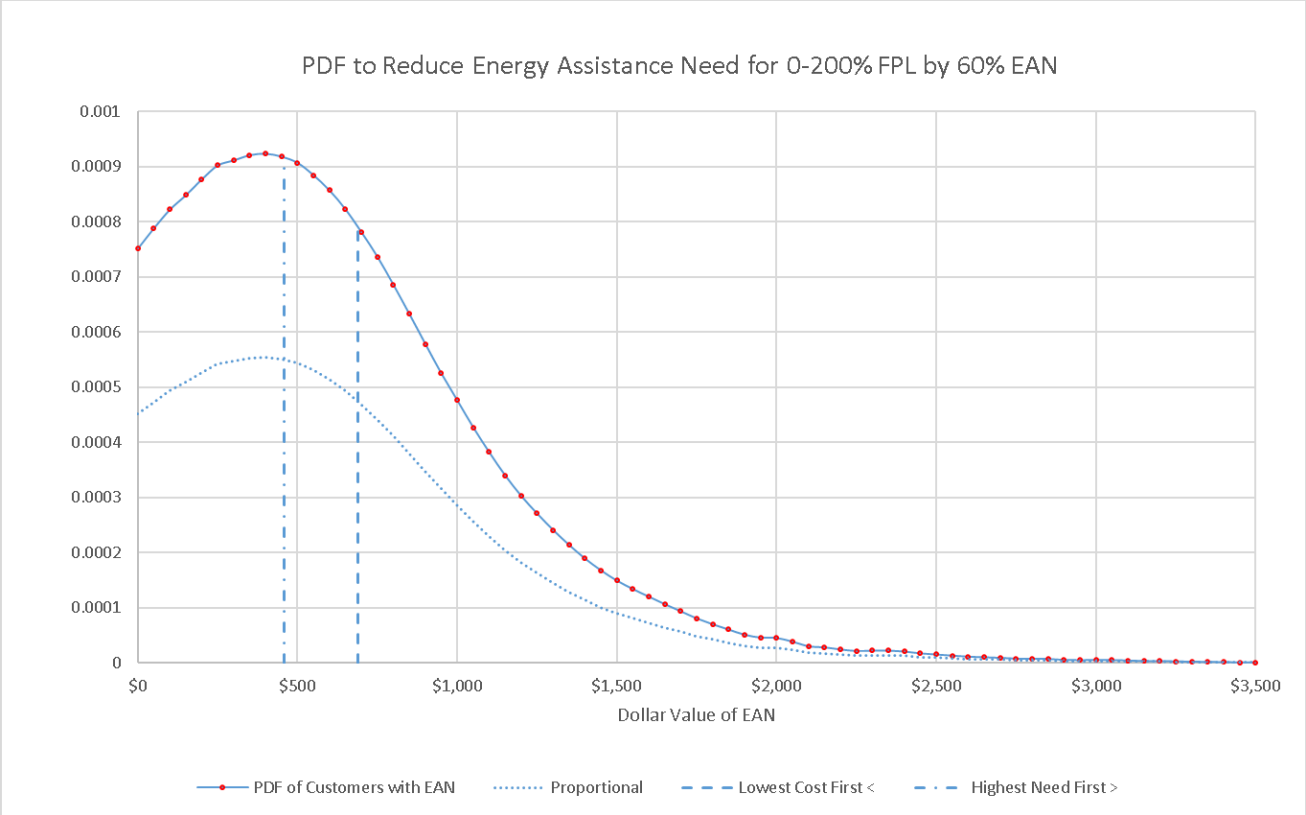
In summary:

- Total number of residential customers = 28,808
- 8,694 residential customers are below 200% FPL
- 6,256 residential customers below 200% FPL have an EAN,
- 71.96% of customers with household income between 0-200% have an EAN
- The average EAN is $659.99 per year
- The combined EAN without any aid is $4,128,906
- 21.72% of all residential customers have an EAN

Note in the table that all 963 households between 0-50 % FPL have an EAN because of the simplifying assumption that all households have the average household count. As previously mentioned, there may be a number of households with more than the average household count (2, 3 or more) such that the household has a higher income (and energy burden threshold) corresponding to the same % FPL as would a one household count customer. On the other hand, one would expect households with more than one household member would have a comparatively higher electric bill with respect to that distribution function.



Base on previously mentioned approximations and assumptions it is also possible to develop a PDF that represents all customers with an EAN and the amount of EAN.



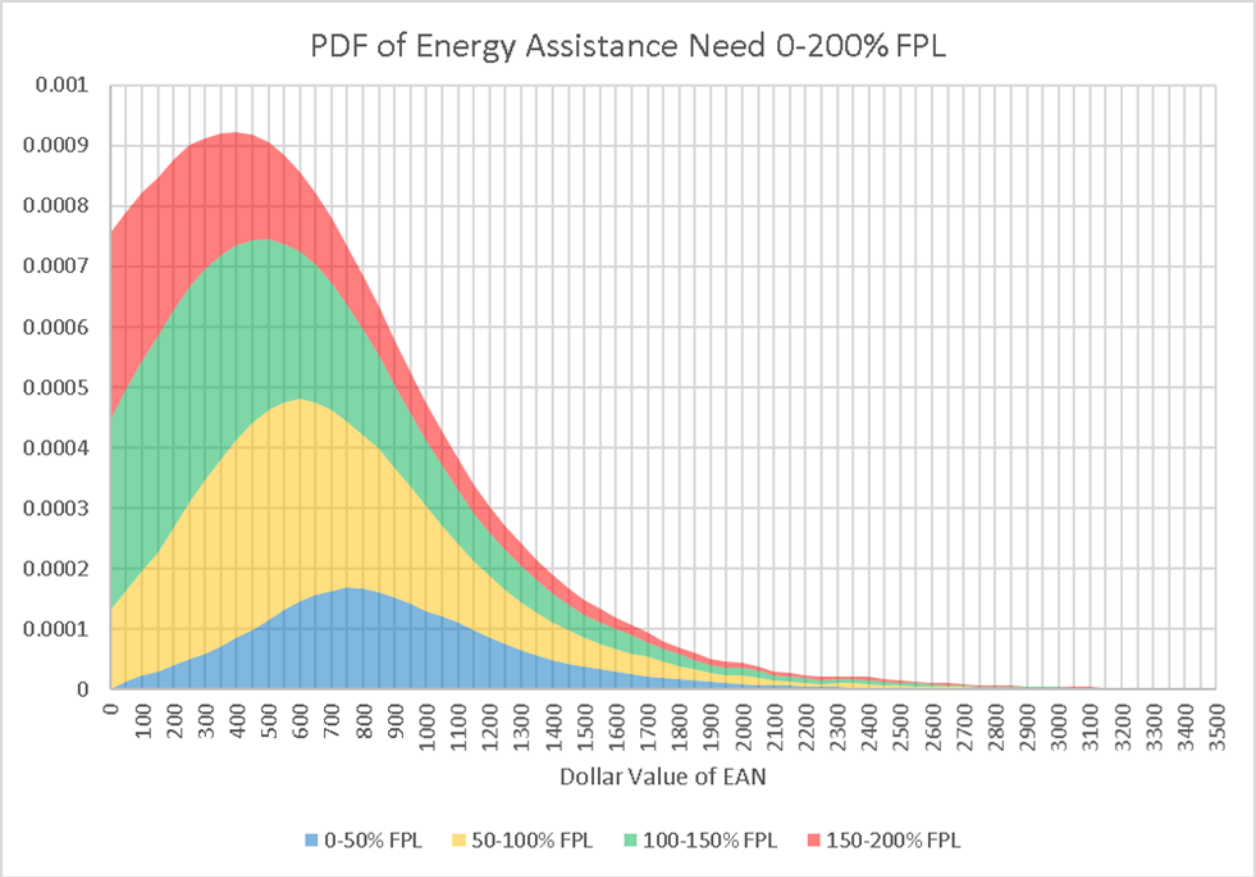
This function can be used to estimate the financial resources necessary to achieve a lower EAN through direct assistanc and potentially through comparable conservation methods. CETA Section 12 references funding needed to mitigate 60% EAN for residential customers between 0-200% FPL by 2030, and 90% of EAN for such customers by 2050, and that the State will prioritize housholds with higher EAN.

The above PDF graphically illustrate these cost in that all such EAN customers are represented by the area under the PDF curve. The different dashed lines show three different cases to achieve a reduction of 60% in EAN by customer count.

- The Proportional line assumes EAN mitigation without prioritization.
- The Lowest Cost First line eliminates EAN for customers at the lowest cost, basically aliveate EAN only for customers that have an EAN less than $690.
- The Highest Need First line eliminates EAN for customers with the highest EAN, in this case for customers with an EAN exceeding $459.

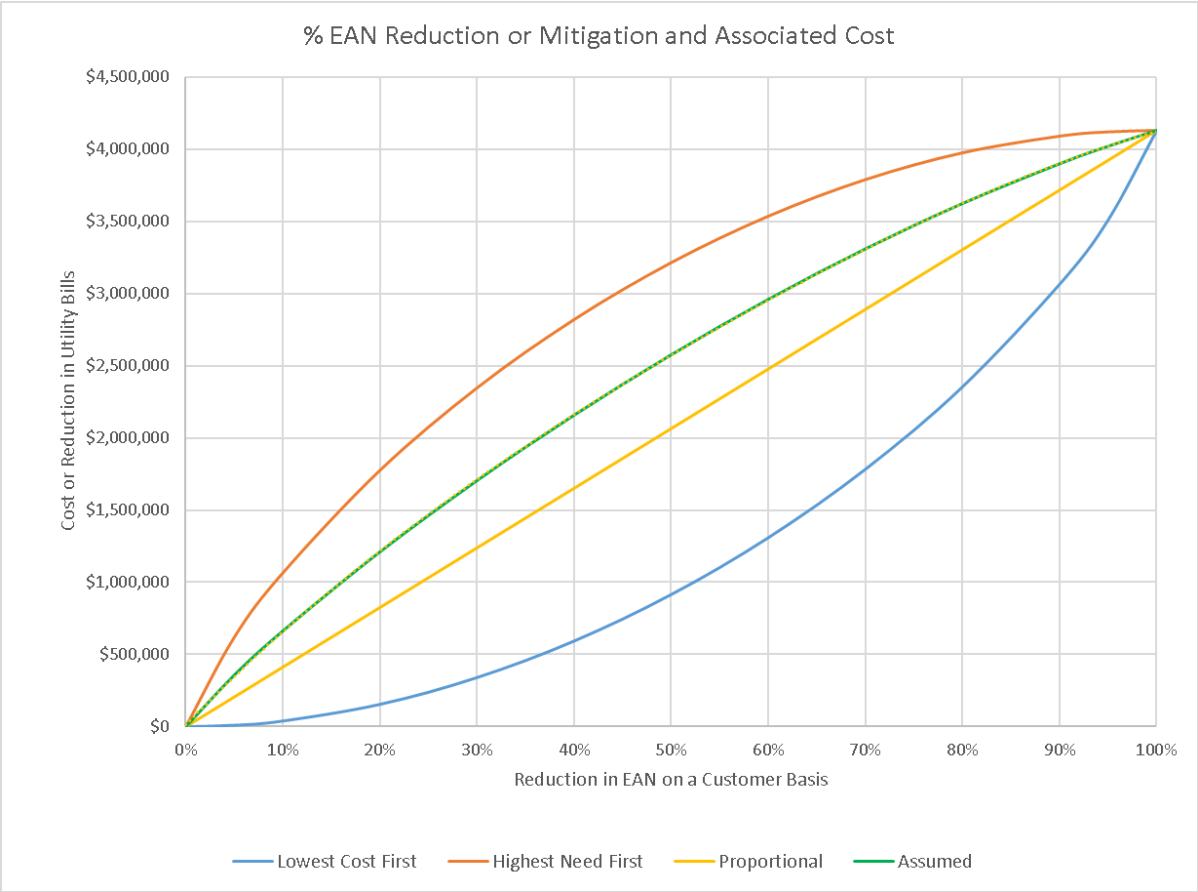
The above cases are idealized and the following analysis assumes EAN mitigation will be targeted towards higher EAN and effectively accomplished at roughly the geometric mean of Proportionately and the Highest Need First.

The following PDF graphically shows the contribution of FPL subset ranges with respect to the overall distribution.



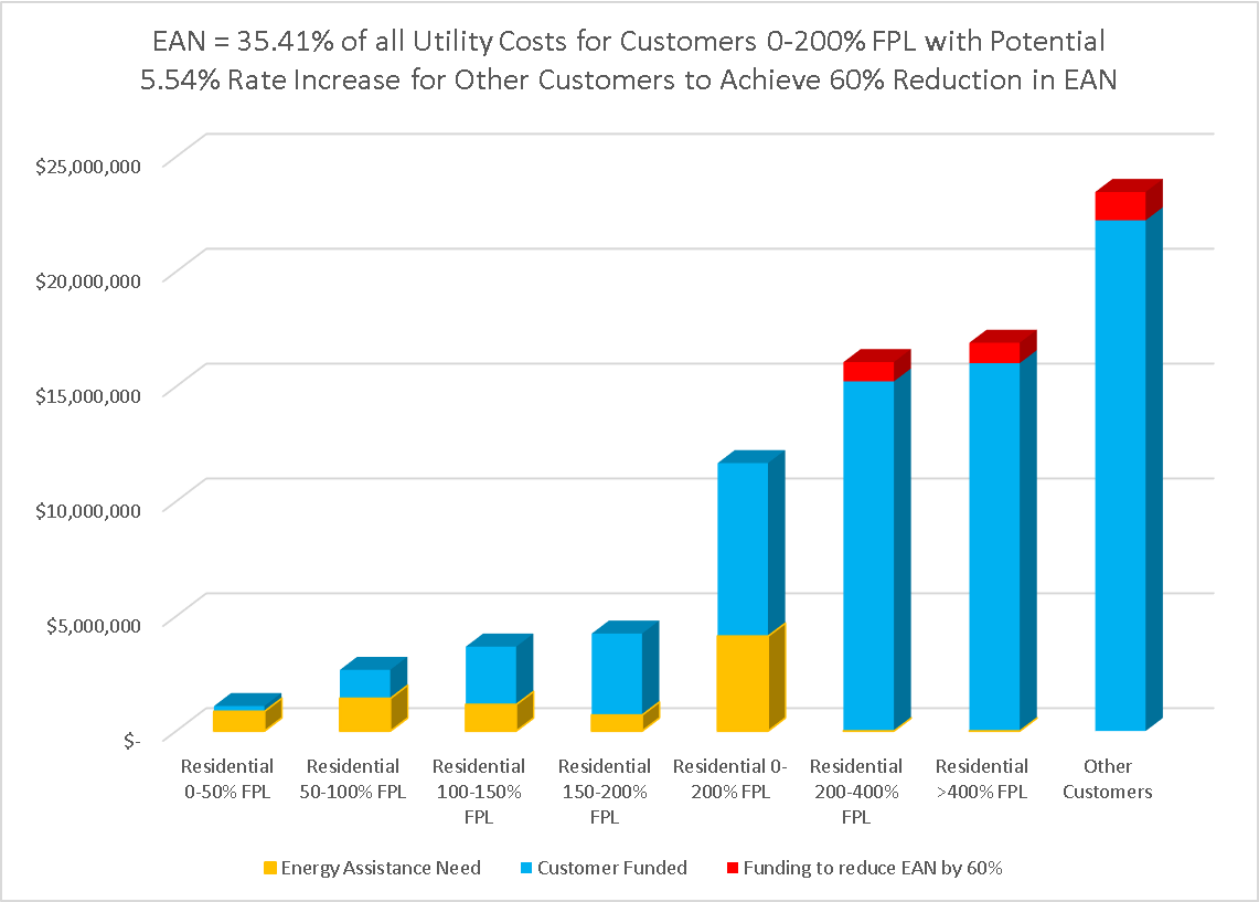
Analysis for reduction in EAN based on EAN customer count, as opposed to actual EAN dollars

This section outlines analysis results assuming a percentage reduction in EAN is based on household or customer counts, as opposed to a percentage reduction in EAN dollars



To achieve a 60% reduction in EAN based on customer count:

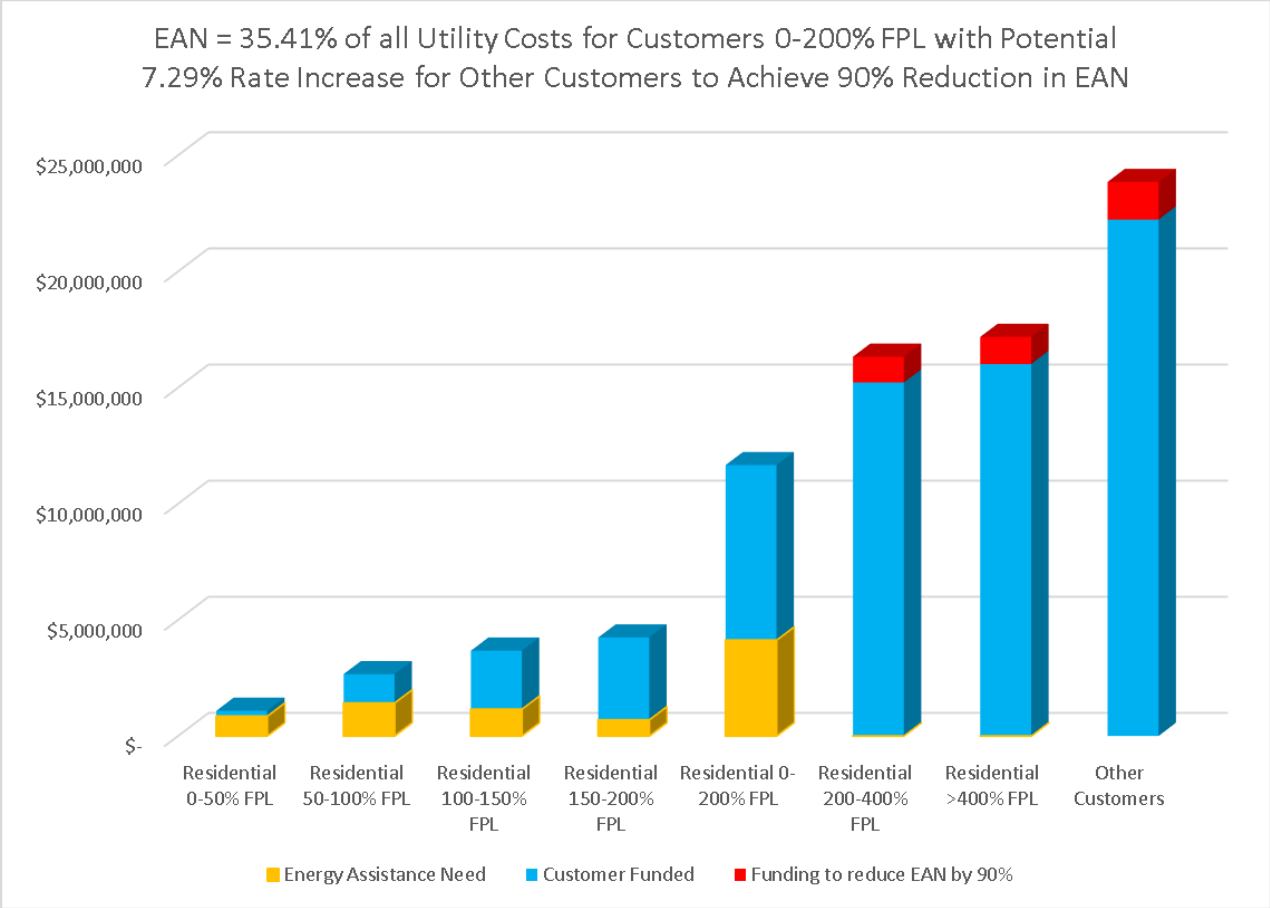
EAN as % of Customers	Residential 0-50% FPL	Residential 50-100% FPL	Residential 100-150% FPL	Residential 150-200% FPL	Residential 0-200% FPL
Funding to reduce EAN by 60%	$613,116	$1,018,797	$828,330	$499,330	$2,959,573
Customers alleviated of EAN	578	1235	1187	754	3754
Average Mitigation / Customer	$1,060.84	$824.78	$698.10	$662.36	$788.46



If funding is derived from non-EAN residential customers above 200% FPL and non-residential customers, the effective average rate increase will be 5.54% to achieve a 60% reduction in EAN.

To achieve a 90% reduction in EAN based on customer count:

EAN as % of Customers	Residential 0-50% FPL	Residential 50-100% FPL	Residential 100-150% FPL	Residential 150-200% FPL	Residential 0-200% FPL
Funding to reduce EAN by 90%	$807,577	$1,341,927	$1,091,050	$657,701	$3,898,256
Customers alleviated of EAN	867	1853	1780	1131	5630
Average Mitigation / Customer	$931.54	$724.25	$613.01	$581.63	$692.36



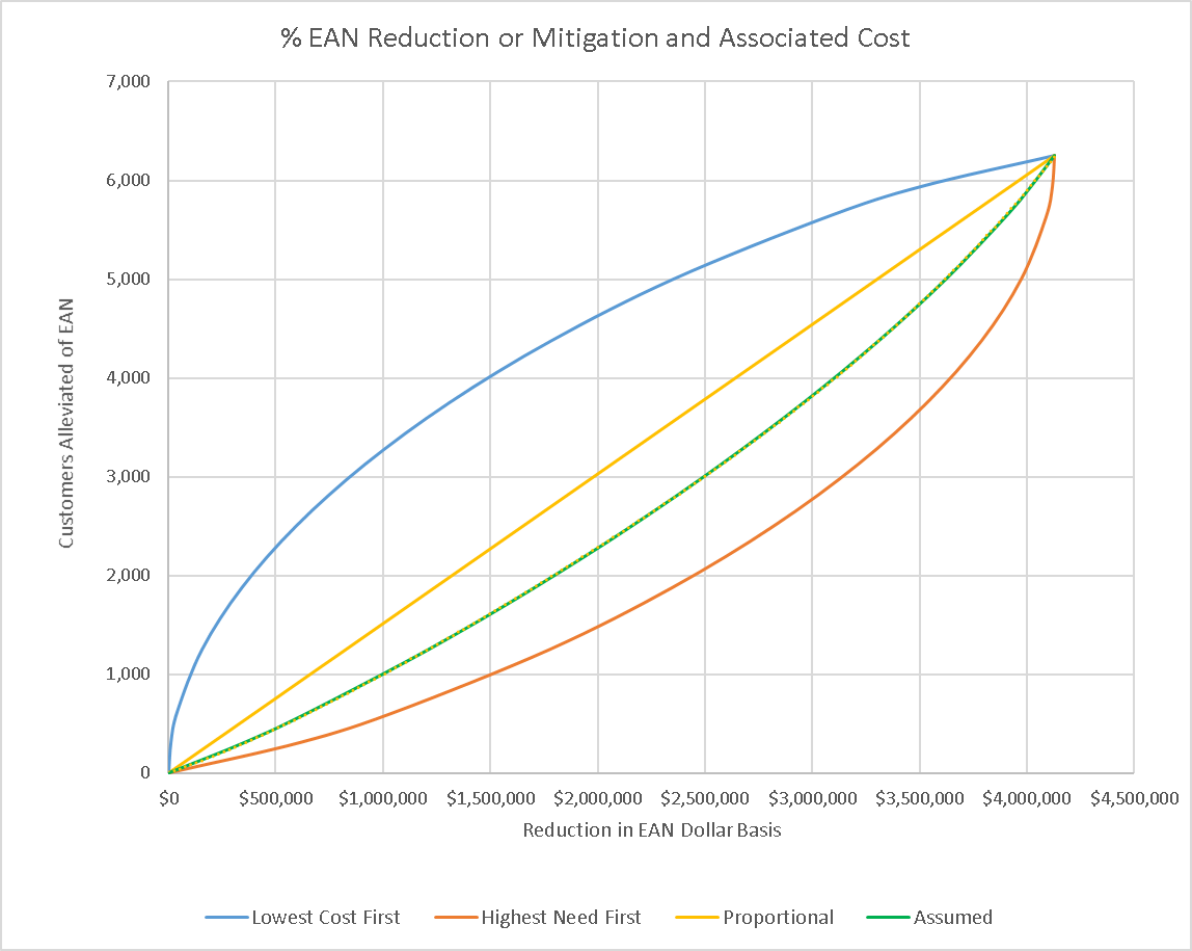
If funding is derived from non-EAN residential customers above 200% FPL and non-residential customers, the effective average rate increase will be 7.29% to achieve a 90% reduction in EAN.

Analysis for reduction in EAN based on actual EAN dollars, as opposed to actual EAN customer count

An analysis based a percentage of EAN is relatively simple, and can be summarized and illustrated in the following table and graph:

EAN % Alleviated	EAN $ Aleviated	Lowest Cost First	Highest Need First	Proportional	Assumed	Rate Impact
0%	$0	0	0	0	0	0.00%
10%	$412,891	2,039	191	626	366	0.77%
20%	$825,781	2,983	449	1,251	805	1.54%
30%	$1,238,672	3,672	765	1,877	1,284	2.32%
40%	$1,651,563	4,204	1,132	2,502	1,811	3.09%
50%	$2,064,453	4,671	1,585	3,128	2,369	3.86%
60%	$2,477,344	5,124	2,052	3,754	2,972	4.63%
70%	$2,890,234	5,491	2,583	4,379	3,636	5.41%
80%	$3,303,125	5,807	3,273	5,005	4,372	6.18%
90%	$3,716,016	6,065	4,217	5,630	5,208	6.95%
100%	$4,128,906	6,256	6,256	6,256	6,256	7.72%

*Rate impact assumes funding through non-low income and non-residential ratepayers



Current Low-Income Funding

In 2019 Clallam PUD, provided direct assistance to 1007 customers in the amount of $330,245 and the District believes as many as 1,800 customers receive as much as $440,021 through OlyCap, and all other Federal, State and Tribal assistance organizations for application to electric bills. There is some overlap such that customers may receive multiple assistance funding streams so the actual number of assisted customers may be as low as 2,000.

Current assistance does not specifically address energy burden and much of the aid simply reduces EAN as opposed to eliminating EAN for a customer. If current assistance incorporated a specific requirement to eliminate EAN at 100% effectiveness, the reduction in District EAN on a customer basis would be about 11.9% at 2019 funding. Increasing funding by 15% will increase the EAN reduction by 2% or 13.9%. On simply a dollar basis, current EAN funding is 18.6% and a 15% increase would 21,4%.

Policy Considerations

- The CETA EAN targets are not mandatory per legislation – see attached General Counsel Analysis.
    - However, the subjective term "demonstrate progress" could ultimately be utilized as a mechanism to meet Energy Assistance Need targets of 60% by 2030 and 90% by 2050.
    - Mandatory reports to the Legislature that show targets will not be met could lead to additional legislative action to meet targets.
- Clallam PUD has two characteristics that makes it particularly vulnerable to adverse consequences associated with CETA Section 12:
    - A relatively high poverty level and proportion of customers with household income below 200% of the FPL
    - An electric utility customer base in which Residential customers contribute more 73% of all electric revenue.
- The State does not identify the funding mechanism needed to meet objectives but at high confidence, it will require $2.96 million dollars in annual assistance for Clallam PUD to actually meet the 2030 target based on customer count, and $3.90 million/year to meet the 2050 objective, assuming direct financial assistance to offset electric bill costs. Note $2.96 million annual assistance would substantially exceed the 2% of annual revenue cost cap for the legislation even if only half was used in the form of conservation.
    - Mitigating EAN based on customer count only through resources within the Districts authority will have an eventual 5.54% rate impact for most customers to achieve a 60% reduction EAN by 2030, and a 7.29% rate impact to achieve a 90% reduction in EAN by 2050.
    - Mitigating EAN based on EAN dollars results would result in rate impact of 4.63% to achieve a 60% reduction and 6.95% to achieve a 100% reduction.
    - As a matter of fairness, PUD staff believes State and/or Federal funding is needed to effectively mitigate EAN and other income equality issues.
    - While many Washington electric utilities will have an EAN of 60% to 70% for customers falling with 0-200% FPL, there will be substation disparity in the proportion of customers who are above and below 200% FPL.
        - For Clallam an EAN for 21.72% of all residential customers below 200% FPL may receive funding derived from 70% of residential customers above 200% FPL, and a relatively small number of non-residential accounts.
        - For a utility with half the Clallam poverty rate, a higher proportion of customers, including more numerous commercial customers, could fund a much smaller percentage of customers with EAN.
- Legislation indicates that the State will prioritize mitigation of EAN to those with the highest energy burdens, and if so, the EAN will be considerably higher than the average EAN of $660 per customer.
- Present low-income assistance does not consider CETA Energy Assistance Need and is in the form of financial assistance for low-income customers in amount no more than the fixed monthly charge on utility bill.
    - To provide additional monetary assistance to KWh used undermines conservation.

    - The current fixed monthly charge for residential customer in 2020 will be $426.48, considerably less than the average EAN.
    - Any future low-income assistance program should incorporate EAN as a condition of assistance
- Low-income assistance can take the form of either direct assistance to offset utility bills or activities to promote conservation, including weatherization programs.
    - Mitigation of EAN that is higher than fixed monthly charges should be given consideration for weatherization or some other form of conservation.
    - Mitigation of EAN that is in the form of conservation or other weatherization would be included in the general CETA cost cap of 2% of retail sales.
- Direct financial assistance is usually cheapest means of compliance and undermines any incentive to assist in conservation/weatherization programs. This will ultimately cost the utility more in the end and could migrate away from the intent of the legislation.
- CETA approves working with CAP agencies in the legislation by way of a partnership. A utility will be spending money on administrative burden to cover the overheads at the CAP agency to administer the utility low-income program. If handled at the state level this could be done at a much lower per unit cost based on economies of scale, and paid for through the public utility tax or privilege tax.
- Consideration should be given to how taxes are handled. Tribal members on tribal land are exempt from public utility tax and privilege tax. These taxes are 6% of the electrical charges and should not be counted toward energy burden.
- Electric vehicle fuel switching should not be included in household energy burden. A mechanism to ensure that transportation electrification does not hinder utilities from showing progress toward the 60% and 90% EAN reduction goals.
- To ensure vulnerable and low income persons do not see a higher energy burden and energy assistance need, all additional cost incurred by CETA compliance will be assessed by separate bill line item from which the low income and vulnerable customers are exempt. This will avoid compounding the 2% of revenue sales cost cap, as would otherwise be the case if CETA compliance cost were rolled into general rate schedules.