ENERGY STAR[®] Performance Ratings Technical Methodology for Retail Store

This document presents specific details on the EPA's analytical result and rating methodology for Retail Store. For background on the technical approach to development of the energy performance ratings, refer to *Energy Performance Ratings – Technical Methodology* (http://www.energystar.gov/ia/business/evaluate_performance/General_Overview_tech_methodo logy.pdf).

Model Release Date

October 2007

Portfolio Manager Retail Store Definition

Retail Store applies to stores of at least 5,000 square feet in gross floor area used to conduct the retail sale of consumer products goods, with the exception of Electronics Stores, Convenience Stores, and Supermarkets. The total gross floor area should include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, etc. Stores must be free standing or located in strip centers. Stores located in enclosed malls are not eligible, with the exception of mall anchors. Retail segments typically eligible for benchmarking include: Department Stores, Discount Stores, Supercenters, Warehouse Clubs, Drug Stores, Dollar Stores, Home Center/Hardware Stores, and Apparel/Hard Line Specialty Stores (i.e. books, clothing, office products, toys, home goods). Electronics stores and convenience stores are not eligible at this time. Note that supermarkets are rated according to a different model; please refer to the Technical Methodology for Supermarket.

Reference Data

The Retail Store regression model is based on data from the Department of Energy, Energy Information Administration's 2003 Commercial Building Energy Consumption Survey (CBECS). Detailed information on this survey, including complete data files, is publicly available at: <u>http://www.eia.doe.gov/emeu/cbecs/contents.html</u>.

Data Filters

Four types of filters are applied to define the peer group for comparison and to overcome any technical limitations in the data: Building Type Filters, EPA Program Filters, Data Limitation Filters, and Analytical Limitation Filters. A complete description of each of these categories is provided in Section V of the general technical description document: *Energy Performance Ratings – Technical Methodology*. **Table 1** presents a summary of each filter applied in the development of the Retail Store model, the rationale behind the filter, and the resulting number of observations after the filter is applied. After all filters are applied, the remaining data set has 182 observations.

The reasons for applying filters on the use and quantity of propane are worthy of additional discussion. In CBECS, major fuel use is reported in exact quantities of consumption. However, if a building uses propane, the amount of propane is reported according to the variable PRAMT8, which uses ranges rather than exact quantities (e.g. less than 100 gallons, 100 to 500 gallons, etc.) Therefore, the quantity must be estimated within the range. To limit error associated with this estimation, EPA applies two limits to the propane quantity.

- 1. The quantity of propane expressed by PRAMT8 must be 1000 gallons or smaller.
- 2. The value of propane cannot account for more than 10% of the total source energy use. Because the exact quantity of propane is not reported, this cap ensures that the quantity of propane entered will not introduce undue error into the calculation of total energy consumption. In order to apply this 10% limitation, the value at the high end of the propane category is employed (e.g. for the category of less than 100, a value of 99 is used). If the 10% cap is not exceeded, then EPA will use the value at the middle of the range to calculate total energy use (e.g. for the category of less than 100, a value of 50 is used).

Table 1				
Condition for Including an Rationale Observation in the Analysis Rationale				
PBAPLUS8=42	Building Filter – CBECS defines building types according to the variable "PBAPLUS8." Retail Stores are coded as PBAPLUS8=42.	291		
Must operate for at least 30 hours per week	EPA Program Filter – Baseline condition for being a full time Retail Store.	282		
Must operate for at least 10 months per year	EPA Program Filter – Baseline condition for being a full time Retail Store.	267		
Retail activity must characterize more than 50% of the floor space ¹	EPA Program Filter – In order to be considered part of the Retail peer group, more than 50% of the building must be defined by retail activity.	259		
Must have square foot <=1,000,000	Data Limitation Filter – CBECS masks actual values above 1,000,000, using regional averages.	259		
If propane is used, the amount category (PRAMTC8) must equal 1, 2, or 3	Data Limitation Filter – Cannot estimate propane use if the quantity is "greater than 1000" or unknown.	250		
If propane is used, the maximum estimated propane amount must be 10% or less of the total source energy	Data Limitation Filter – Because propane values are estimated from a range, propane is restricted to 10% of the total source energy.	243		
Must not use chilled water	Data Limitation Filter – CBECS does not collect quantities of chilled water.	241		
Must have square foot $\geq 5,000$	Analytical Limitation – Analysis could not model behavior for buildings smaller than 5,000ft ² .	182		

¹ If the variable ONEACT8=1, this indicates that one activity occupies 75% or more of the building. If the variable ONEACT8=2, then the building can specify up to 3 activities (ACT18, ACT28, ACT38). One of these activities must be retail (PBAX8=15), and must account for more than 50% of the floor area.

Dependent Variable

The dependent variable in the Retail analysis is source energy use intensity (source EUI). This is equal to the total source energy use of the facility divided by the gross floor area. By setting source EUI as the dependent variable, the regressions analyze the key drivers of source EUI – those factors that explain the variation in source energy per square foot in a Retail Store.

Independent Variables

General Overview:

The CBECS data contain numerous building operation questions that EPA identified as potentially important for Retail Stores. Based on a review of the available variables in the CBECS data, in accordance with the EPA criteria for inclusion², EPA analyzed the following variables³:

- SQFT8 Square footage
- RGSTRN8 Number of cash registers
- WKHRS8 Weekly hours of operation
- NWKER8 Number of employees during the main shift
- PCNUM8 Number of personal computers
- SRVNUM8 Number of servers
- PRNTRN8 Number of printers
- RFGWIN8 Number of walk-in refrigeration units
- RFGOPN8 Number of open refrigerated cases
- RFGRSN8 Number of residential refrigerators
- RFGCLN8 Number of closed refrigerated cases
- RFGVNN8 Number of refrigerated vending machines
- FDRM8 Commercial food preparation area
- SNACK8 Snack bar
- FASTFD8 Fast food or small restaurant
- CAF8 Cafeteria or large restaurant
- NFLOOR8 Number of floors
- HDD658 Heating degree days
- CDD658 Cooling degree days
- HEATP8 Percent heated
- COOLP8 Percent cooled

EPA performed extensive review on all of these operational characteristics. In addition to reviewing each characteristic individually, characteristics were reviewed in combination with each other (e.g., Heating Degree Days * Percent Heated). As part of the analysis, some variables were reformatted to reflect the physical relationships of building components. For example, the number of workers on the main shift is typically evaluated in a density format. The number of

² For a complete explanation of these criteria, refer to *Energy Performance Ratings – Technical Methodology* (http://www.energystar.gov/ia/business/evaluate_performance/General_Overview_tech_methodology.pdf).

³ Note that the 8 at the end of all variables indicates that the 2003 CBECS survey is the eighth survey conducted by the Energy Information Administration.

workers *per square foot* (not the gross number of workers) is expected to be correlated with the energy use per square foot. In addition, based on analytical results and residual plots, variables were examined using different transformations (such as the natural logarithm). The analysis consisted of multiple regression formulations. These analyses were structured to find the combination of statistically significant operating characteristics that explained the greatest amount of variance in the dependent variable: source EUI.

Based on the Retail Store regression analysis, the following nine characteristics were identified as key explanatory variables that can be used to estimate the expected average source EUI $(kBtu/ft^2)$ in a Retail Store:

- Natural log of gross square foot
- Weekly operating hours
- Number of workers per 1,000 square feet
- Number of personal computers (PCs) per 1,000 square feet
- Number of cash registers per 1,000 square feet
- Number of walk in refrigeration units per 1,000 square feet
- Number of open and closed refrigeration cases per 1,000 square feet
- Heating degree days times Percent of the building that is heated
- Cooling degree days times Percent of the building that is cooled

In addition to the variables listed above, EPA requested and funded the collection of an additional variable "STORE8", which places each observation into one of five categories: Discount Store, Drugstore, Home Center/Hardware Store, Department Store, and Other type of Store. EPA performed extensive analysis of these categories, including using these categories to create interactive regression terms with the other variables in the analysis. Based on these analyses, the category of Store was *not* determined to be statistically significant. The CBECS data lists supermarkets and convenience stores separately from Retail Stores. Therefore, neither of these types of buildings is eligible to rate as a Retail Store according to the model discussed herein. A separate model and technical description are available for Supermarket.

Model Testing:

In addition to the analysis of CBECS data, EPA performed subsequent testing on supplemental data for approximately 600 stores shared with EPA by 10 retail organizations. The results of testing and analysis of this dataset showed that the performance distribution of the test stores was similar to that of the CBECS 2003 observations. This analysis also confirmed that the CBECS categories under "Store8" are not significant. This supplemental data helped EPA verify that the Retail Store regression model provides a valid assessment of energy performance across a variety of Retail Stores. The rating model can be applied to most retail stores including: Department Stores, Discount Stores, Supercenters, Warehouse clubs, Drug Stores, Dollar Stores, Home Centers/Hardware Stores, and Apparel/Hard Line Specialty Stores. However, the analysis showed that the Retail Store model cannot be used to evaluate the energy performance of Electronics Stores. The plug load requirement of these facilities makes it impossible to perform a peer comparison with other retailers.

Finally, the supplemental data included a variety of stand alone retail stores, retail stores in strip malls, and anchor establishments at enclosed malls. Several of the organizations who shared data with EPA had facilities in more than one of these categories. Analysis across all three types of stores did not identify a bias, and therefore confirmed that the Retail Store model is appropriate for rating free standing retail stores, retail stores located within strip mall facilities, and anchor establishments located at enclosed malls.

It is important to reiterate that the final regression model is based on the nationally representative CBECS data, not the supplemental data collected by EPA. The supplemental data served to verify that the CBECS-based regression model provides a valid assessment of energy performance in Retail Stores.

Regression Modeling Results

The final regression is a weighted ordinary least squares regression across the filtered data set of 182 observations. The dependent variable is source EUI. Each independent variable is centered relative to the mean value, presented in **Table 2**. The final model is presented in **Table 3**. All model variables are significant at the 90% confidence level or better, as shown by the significance levels (a p-level of less than 0.10 indicates 90% confidence). The model has an R^2 value of 0.71, indicating that this model explains 71% of the variance in source EUI for Retail Store buildings. Because the final model is structured with energy per square foot as the dependent variable, the explanatory power of square foot is not included in the R^2 value. Thus, this value appears artificially low. Re-computing the R^2 value in units of source energy⁴, demonstrates that the model actually explains 94.4% of the variation of source energy of Retail Stores. This is an excellent result for a statistically based energy model.

Detailed information on the ordinary least squares regression approach, the methodology for performing weather adjustments, and the independent variable centering technique is available in the technical document: *Energy Performance Ratings – Technical Methodology*.

⁴ The R² value in Source Energy is calculated as: 1 - (Residual Variation of Y) / (Total Variation of Y). The residual variation is sum of (Actual Source Energy_i – Predicted Source Energy_i)² across all observations. The Total variation of Y is the sum of (Actual Source Energy_i – Mean Source Energy)² across all observations.

Table 2				
Descriptive Statistics for Variables in Final Regression Model				
Variable	Full Name	Mean	Minimum	Maximum
SrcEUI	Source Energy per Square Foot	153.1	6.660	1009
LNSqFt	Natural Log of Square Foot9.3718.			13.02
WkHrs	Weekly Operating Hours63.7430.00			168.0
WkrDen	Number of Workers per 1000 ft ²	0.6279	0.2500	4.000
PCDen	Number of Computers per 1000 ft ²	0.3149	0.0000	2.000
RgstrDen	Number of Cash Registers per 1000 ft ²	0.1905	0.0000	1.400
WalkinDen	Number of Walk-in Refrigerators per 1000 ft ²	0.0038	0.0000	0.1110
RfgCommDen	Number of Open and Closed Refrigerators per 1000 ft ²	0.0450	0.0000	1.000
HDDxPH	Heating Degree Days x Percent Heated	3811	0.0000	9625
CDDxPC	CDDxPCCooling Degree Days x Percent Cooled972.10.0000		0.0000	5206
Note: - Statistics are computed over the filtered data set (n=182 observations)				

- Values are weighted by the CBECS variable ADJWT8

The mean values are used to center variables for the regression _

Table 3 Final Regression Modeling Results					
Dependent Variable		Source Energy Intensity (kBtu/ft ²)			
Analysis	182				
	0.710				
	46.74				
1)		0.0000			
Unstandardized Coefficients	Standard Error	T value	Significance (p-level)		
153.1	5.685	26.93	0.0000		
20.19	9.315	2.167	0.0316		
1.373	0.4209	3.263	0.0013		
61.76	15.54	3.975	0.0001		
70.60	20.80	3.394	0.0009		
249.1	33.79	7.372	0.0000		
720.2	379.6	1.897	0.0595		
81.90	44.34	1.847	0.0665		
0.0113	0.0036	4.274	0.0000		
0.0125	0.0073	1.725	0.0863		
	Unstandardized Coefficients 1) Unstandardized Coefficients 153.1 20.19 1.373 61.76 70.60 249.1 720.2 81.90 0.0113 0.0125	Table 3 Final Regression Woteling Results Source 1 Analysis Source 1 Analysis Standard Unstandardized Coefficients Standard 1) Error 153.1 5.685 20.19 9.315 1.373 0.4209 61.76 15.54 70.60 20.80 249.1 33.79 720.2 379.6 81.90 44.34 0.0113 0.0036 0.0125 0.0073	Table 3Final Regression Modeling ResultsSource Energy IntensAnalysis182Analysis182Analysis0.710Unstandardized CoefficientsStandard ErrorT value153.15.68526.9320.199.3152.1671.3730.42093.26361.7615.543.97570.6020.803.394249.133.797.372720.2379.61.89781.9044.341.8470.01130.00364.2740.01250.00731.725		

- The regression is a weighted ordinary least squares regression, weighted by the CBECS variable "ADJWT8".

The prefix C_{on} each variable indicates that it is centered. The centered variable is equal to difference between the actual value and the observed mean. The observed mean values are presented in **Table 2**. Full variable names and definitions are presented in Table 2.

Retail Store Lookup Table

The final regression model (presented in **Table 3**) yields a prediction of source EUI based on a building's operating constraints. Some buildings in the CBECS data sample use more energy than predicted by the regression equation, while others use less. The *actual* source EUI of each CBECS observation is divided by its *predicted* source EUI to calculate an energy efficiency ratio:

Energy Efficiency Ratio = Actual Source EUI / Predicted Source EUI

A lower efficiency ratio indicates that a building uses less energy than predicted, and consequently is more efficient. A higher efficiency ratio indicates the opposite.

The efficiency ratios are sorted from smallest to largest and the cumulative percent of the population at each ratio is computed using the individual observation weights from the CBECS dataset. **Figure 1** presents a plot of this cumulative distribution. A smooth curve (shown in red) is fitted to the data using a two parameter gamma distribution. The fit is performed in order to minimize the sum of squared differences between each building's actual percent rank in the population and each building's percent rank with the gamma solution. The final fit for the gamma curve yielded a shape parameter (alpha) of 4.2595 and a scale parameter (beta) of 0.2397. For this fit, the sum of squared error is 0.074.



The final gamma shape and scale parameters are then used to calculate the efficiency ratio at each percentile (1 to 100) along the curve. For example, the ratio on the gamma curve at 1% corresponds to a rating of 99; only 1% of the population has a ratio this small or smaller. The ratio on the gamma curve at the value of 25% is 0.6707. The ratio on the gamma curve at the value of 25% will correspond to the ratio for a rating of 75; only 25% of the population has ratios this small or smaller. The complete lookup table is presented at the end of the document. In order to read this lookup table, note that if the ratio is less than 0.2243 the rating for the building

should be 100. If the ratio is greater than or equal to 0.2243 and less than 2.5066 the rating for the building should be 99, etc.

Example Calculation

As detailed in the document *Energy Performance Ratings – Technical Methodology*, there are five steps to compute a rating. The following is a specific example with the Retail Store model:

<u>Step 1 – User enters building data into Portfolio Manager</u> For the purposes of this example, sample data is provided

- Energy data
 - Total annual electricity = 400,000 kWh
 - \circ Total annual natural gas = 180 therms
 - Note that this data is actually entered in monthly meter entries
- Operational data
 - Gross floor area $(ft^2) = 50,000$
 - Weekly operating hours = 70
 - Workers on main shift⁵ = 8
 - Number of personal computers = 3
 - \circ Percent heated = 100%
 - \circ Percent cooled = 100%
 - Number of cash registers = 6
 - Number of walk-in refrigeration/freezer units = 0
 - \circ Number of open and closed refrigeration/freezer cases = 7
 - HDD (provided by Portfolio Manager, based on zip code) = 3850
 - \circ CDD (provided by Portfolio Manager, based on zip code) = 2300

Step 2 – Portfolio Manager computes the Actual Source Energy Use Intensity

In order to compute actual source EUI, Portfolio Manager must convert each fuel from the specified units (e.g. kWh) into Site kBtu, and must convert from Site kBtu to source kBtu.

- Convert the meter data entries into site kBtu
 - o Electricity: (400,000kWh)*(3.412kBtu/kWh) = 1,364,800 kBtu Site
 - Natural gas: (180 therms)*(100kBtu/therm) = 18,000 kBtu Site
- Apply the source-site ratios to compute the source energy
 - o Electricity:
 - 1,364,800 Site kBtu*(3.34 Source kBtu/Site kBtu) = 4,558,432 kBtu Source
 - o Natural Gas:
 - 18,000 Site kBtu *(1.047 Source kBtu/Site kBtu) = 18,846 kBtu Source
- Combine source kBtu across all fuels
 - o 4,558,432 kBtu + 18,846 kBtu = 4,577,278 kBtu
- Divide total source energy by gross floor area
 - Source $EUI = 4,577,278 \text{ kBtu}/50,000 \text{ft}^2 = 91.5 \text{ kBtu}/\text{ft}^2$

⁵ This represents typical peak staffing level during the main shift. For example, in a retail store if there are two daily 8 hour shifts of 15 workers each, the Workers on Main Shift value is 15.

<u>Step 3 – Portfolio Manager computes the Predicted Source Energy Intensity</u>

Portfolio Manager uses the building data entered under Step 1 to compute centered values for each operating parameter. These centered values are entered into the Retail Store regression equation to obtain a predicted source EUI.

- Calculate centered variables
 - Use the operating characteristic values to compute each variable in the model. (e.g. LN(Square Foot) = LN(50,000) = 10.82).
 - Subtract the reference centering value from calculated variable (e.g. LN(Square Foot) 9.371 = 10.82 9.371 = 1.449).
 - These calculations are summarized in **Table 4**
- Compute predicted source energy use intensity
 - Multiply each centered variable by the corresponding coefficient in the model (e.g. Coefficient*CenteredLN(Square Foot) = 20.19*1.449=29.26)
 - Take the sum of these products (i.e. coefficient*CenteredVariable) and add to the constant (this yields a predicted source EUI of 148.6 kBtu/ft²)
 - This calculation is summarized in Table 5

<u>Step 4 – Portfolio Manager computes the energy efficiency ratio</u> The energy efficiency ratio is equal to: Actual Source EUI/ Predicted Source EUI

• Ratio = 91.5/148.6 = 0.6157

Step 5 – Portfolio Manager looks up the efficiency ratio in the lookup table

Starting at 100 and working down, Portfolio Manager searches the lookup table for the first ratio value that is larger than the computed ratio for the building.

- A ratio of 0.6157 is less than 0.6237 (requirement for 79) but greater than 0.6116 (requirement for 80)
- The rating is 79

Table 4						
Ex	Example Calculation – Computing Building Centered Variables					
Operating Characteristic	Formula to Compute Variable	Building Variable Value	Reference Centering Value	Building Centered Variable (Variable Value - Center Value)		
LN(SqFt)	LN(Square Foot)	10.82	9.371	1.449		
WkHrs	Weekly Operating Hours	70.00	63.74	6.260		
WkrDen	(#Workers/ft ² *1000)	0.1600	0.6279	-0.4679		
PCDen	(#Computers/ft ² *1000)	0.0600	0.3149	-0.2549		
RgstrDen	(#Registers/ft ² *1000)	0.1200	0.1905	-0.0705		
WalkinDen	(Walk-in/ft ² *1000)	0.0000	0.0038	-0.0038		
RfgCommDen	(#Open&Closed/ft ² *1000)	0.1400	0.0450	0.0950		
HDDxPH	(HDD*Percent Heated)	3850	3811	39.00		
CDDxPC	(CDD*Percent Cooled)	2300	972.1	1328		
Note						

- Densities are always expressed as the number per 1,000 square feet

- The center reference values are the weighted mean values from the CBECS population, show in Table 2

Table 5				
Example Calculation – Computing predicted Source EUI				
Operating	Centered Variable	Coefficient	Coefficient * Centered	
Characteristic			Variable	
Constant (intercept)	NA	153.1	153.1	
LN(SqFt)	1.449	20.19	29.26	
WkHrs	6.260	1.373	8.595	
WkrDen	-0.4679	61.76	-28.90	
PCDen	-0.2549	70.60	-18.00	
RgstrDen	-0.0705	249.1	-17.56	
WalkinDen	-0.0038	720.2	-2.737	
RfgCommDen	0.0950	81.90	7.781	
HDDxPH	39.00	0.0113	0.4407	
CDDxPC	1328	0.0125	16.60	
	148.6			

Attachment

Table 6 lists the energy efficiency ratio cut-off point for each rating, from 1 to 100.

RatioCumulative PercentRatio1000%<0.22433991% 0.274272 982%0.309965964%0.364015973%0.33985964%0.364015946%0.366155955%0.386355946%0.466745445%0.425649919%0.4461659010%0.4761659010%0.4761659010%0.4761658812%0.5062938812%0.5062938813%0.5344878515%0.5344878614%0.5612223866%1.1057418119%0.5992983169%1.105741337%0.6236657921%0.6236657921%0.6236657921%0.6236657327%0.6361027426%0.6821927524%0.740937426%0.6821927524%0.740937426%0.741527524%0.740937426%0.6361027525%0.740977426%0.740937524%0.740937426%0.741527533%0.7408537624%0.7586837723%	Table 6 Lookup Table for Retail Rating					
IntegCommunication1000% -0.224377 991% 0.274272 982% 0.309965 973% 0.338985 973% 0.338985 964% 0.36015 955% 0.386355 94 6% 0.406745 937% 0.425649 94 6% 0.440745 95 8% 0.443381 92 8% 0.443381 91 9% 0.460165 90 10% 0.476165 44 56% 1.00009 92 8% 0.443381 42 58% 1.067074 90 10% 0.476165 44 1.00009 91 0.476165 45 5.5% 1.107074 87 13% 0.520598 87 13% 0.520598 88 11% 0.590293 86 144% 0.548013 85 15% 0.548013 85 15% 0.548034 82 18% 0.536610 79 21% 0.635610 77 23% 0.670697 78 22% 0.635610 79 21% 0.670697 71 29% 0.716241 72 28% 0.72139 66 34% 0.78256 77 23% 0.72139 66 34% 0.78268 79 4.19775 66 34% 0.78258 <t< th=""><th>Rating</th><th>Cumulative Percent</th><th>Ratio</th><th>Rating</th><th>Cumulative Percent</th><th>Ratio</th></t<>	Rating	Cumulative Percent	Ratio	Rating	Cumulative Percent	Ratio
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33 0.40 0.425649 44 $30%$ 1.028072 92 $8%$ 0.425649 43 $57%$ 1.040909 92 $8%$ 0.443381 42 $58%$ 1.053899 91 $9%$ 0.460165 41 $59%$ 1.067074 90 $10%$ 0.476165 41 $59%$ 1.067074 89 $11%$ 0.491508 39 $61%$ 1.094028 88 $12%$ 0.506293 38 $62%$ 1.107833 87 $13%$ 0.520598 37 $63%$ 1.121876 86 $14%$ 0.554813 35 $65%$ 1.150742 84 $16%$ 0.561222 34 $66%$ 1.165601 83 $17%$ 0.574152 33 $67%$ 1.180770 82 $18%$ 0.592928 31 $69%$ 1.122127 80 $20%$ 0.635610 27 $73%$ 1.245014 78 $22%$ 0.635610 27 $73%$ 1.226105 77 $23%$ 0.670697 23 $77%$ 1.325659 72 $28%$ 0.704954 20 $80%$ 1.49775 79 $31%$ 0.732683 18 $82%$ 1.4662511 70 $30%$ 0.7274814 20 $80%$ 1.492756 72 $28%$ 0.76954 21 $79%$ 1.32653 72 $28%$ 0.738563 117 $83%$ 1.445273 66 <t< td=""><td>95</td><td>5%</td><td>0.380333</td><td>43</td><td>5604</td><td>1.013437</td></t<>	95	5%	0.380333	43	5604	1.013437
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919760.00010341 3796 1.0007049010%0.47616560%1.08404468911%0.4915083961%1.0940288812%0.5062933862%1.1078338713%0.5205983763%1.1218768614%0.5344873566%1.165018317%0.5741523566%1.165018317%0.5741523367%1.1807708218%0.5868343268%1.962718020%0.6115673070%1.2283657921%0.6236652971%1.2450147624%0.6591012674%1.2796727624%0.669712575%1.3164007426%0.6821922476%1.3356537327%0.7049532278%1.3766127129%0.7162412080%1.4199757633%0.7610031684%1.5202407129%0.7882681486%1.5791106634%0.793981486%1.5791106139%0.8278691090%1.7252386644%0.880379991%1.770745842%0.8616037993%1.8215685743%0.884329694%1.366	92	8% 00/	0.445581	42	500/	1.055899
9010%0.4/915084060%1.0804468911%0.4915083961%1.0940288812%0.50629338 62% 1.1078338713%0.52059837 63% 1.1218768614%0.548013 35 66% 1.1367138515%0.548013 35 66% 1.1656018317%0.574152 34 66% 1.1662718416%0.561222 34 66% 1.1807708020%0.611567 30 70% 1.2121278020%0.61567 30 70% 1.2283657921%0.623665 29 71% 1.2621057723%0.647420 27 73% 1.2621057525%0.670697 23 77% 1.3555697228%0.704953 22 78% 1.364007426%0.682192 24 76% 1.3356537723%0.749854 12 77% 1.3555597228%0.749854 12 77% 1.3555697228%0.749854 12 77% 1.3555696634%0.772139 16 84% 1.5202406535%0.783268 14 86% 1.5971106634%0.820537 13 87% 1.6115126733%0.872938 14 86% 1.597110 <tr<< td=""><td>91</td><td>9%</td><td>0.460165</td><td>41</td><td>59%</td><td>1.06/0/4</td></tr<<>	91	9%	0.460165	41	59%	1.06/0/4
89 $11%$ 0.49108 39 $61%$ 1.094028 88 $12%$ 0.506293 37 $63%$ 1.107833 87 $13%$ 0.520598 37 $63%$ 1.121876 86 $14%$ 0.5346813 36 $64%$ 1.136173 85 $15%$ 0.548013 35 $65%$ 1.150742 84 $16%$ 0.566384 36 $64%$ 1.136773 81 $19%$ 0.579298 31 $66%$ 1.165601 81 $19%$ 0.592928 31 $66%$ 1.180770 80 $20%$ 0.611567 30 $70%$ 1.223365 79 $21%$ 0.623665 29 $71%$ 1.228365 77 $23%$ 0.647420 27 $73%$ 1.26114 77 $23%$ 0.647420 27 $73%$ 1.279672 76 $24%$ 0.6635111 26 $74%$ 1.235569 72 $28%$ 0.74953 22 $78%$ 1.335563 71 $29%$ 0.716241 20 $80%$ 1.397564 70 $30%$ 0.727481 20 $80%$ 1.449273 66 $34%$ 0.783268 14 $86%$ 1.579110 61 $39%$ 0.82737869 15 $85%$ 1.548780 64 $36%$ 0.78328 7 $93%$ 1.879461 61 $39%$ 0.87238 7 $93%$ 1.879461 65 <td< td=""><td>90</td><td>10%</td><td>0.4/6165</td><td>40</td><td>60%</td><td>1.080446</td></td<>	90	10%	0.4/6165	40	60%	1.080446
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86 $14%$ 0.534487 36 $64%$ 1.136173 85 $15%$ 0.548013 35 $65%$ 1.150742 84 $16%$ 0.561222 34 $66%$ 1.165601 83 $17%$ 0.574152 33 $67%$ 1.180770 82 $18%$ 0.586834 32 $68%$ 1.196271 81 $19%$ 0.592928 31 $69%$ 1.21217 80 $20%$ 0.611567 30 $70%$ 1.228365 79 $21%$ 0.623665 29 $71%$ 1.262105 77 $23%$ 0.647420 27 $73%$ 1.279672 76 $24%$ 0.659111 26 $74%$ 1.297756 74 $26%$ 0.682192 24 $76%$ 1.335653 73 $27%$ 0.693607 22 $78%$ 1.376212 71 $29%$ 0.716241 21 $79%$ 1.397654 70 $30%$ 0.727481 20 $80%$ 1.419975 69 $31%$ 0.738083 18 $82%$ 1.467659 66 $34%$ 0.772139 16 $84%$ 1.520240 65 $35%$ 0.782769 11 $89%$ 1.684051 61 $39%$ 0.827869 11 $89%$ 1.646341 64 $36%$ 0.87793 7 $93%$ 1.821568 57 $43%$ 0.887293 7 $93%$ 1.821568 57	87	13%	0.520598	37	63%	1.1218/6
85 $15%$ 0.548013 35 $65%$ 1.150742 84 $16%$ 0.561222 34 $66%$ 1.165601 83 $17%$ 0.574152 33 $67%$ 1.180770 82 $18%$ 0.590298 31 $69%$ 1.212127 80 $20%$ 0.611567 30 $70%$ 1.228365 79 $21%$ 0.623665 29 $71%$ 1.245014 78 $22%$ 0.635610 28 $72%$ 1.262105 77 $23%$ 0.647420 27 $73%$ 1.279672 76 $24%$ 0.659111 26 $74%$ 1.227756 75 $25%$ 0.670697 25 $75%$ 1.316400 74 $26%$ 0.682192 24 $76%$ 1.335559 72 $28%$ 0.704953 22 $78%$ 1.376212 71 $29%$ 0.716241 21 $79%$ 1.337654 70 $30%$ 0.727481 20 $80%$ 1.449753 66 $34%$ 0.7738683 15 $85%$ 1.548780 66 $34%$ 0.794398 14 $86%$ 1.579110 63 $37%$ 0.827869 11 $89%$ 1.684051 60 $40%$ 0.839075 9 $91%$ 1.770704 56 $44%$ 0.884329 6 $94%$ 1.94694 55 $45%$ 0.897349 5 $95%$ 2.202087 52 <td< td=""><td>86</td><td>14%</td><td>0.534487</td><td>36</td><td>64%</td><td>1.136173</td></td<>	86	14%	0.534487	36	64%	1.136173
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79 21% 0.623665 78 22% 0.635610 28 72% 1.245014 78 22% 0.635610 28 72% 1.262105 77 23% 0.647420 27 73% 1.279672 76 24% 0.659111 26 74% 1.297756 75 25% 0.670697 25 75% 1.316400 74 26% 0.693607 23 77% 1.335553 73 27% 0.693607 23 77% 1.335559 72 28% 0.704953 22 78% 1.376212 71 29% 0.716241 21 79% 1.397654 70 30% 0.727481 20 80% 1.449273 68 32% 0.749854 18 82% 1.467659 67 33% 0.761003 17 83% 1.493262 66 34% 0.772139 16 84% 1.520240 65 35% 0.783268 14 86% 1.579110 63 37% 0.805537 13 87% 1.611512 62 38% 0.827869 10 90% 1.725238 59 41% 0.850317 9 91% 1.770704 58 42% 0.881603 8 92% 1.821568 57 43% 0.872938 7 93% 1.879461 55 45% 0.98784 5 95% 2.028047 <	80	20%	0.611567	30	70%	1.228365
78 $22%$ 0.635610 28 $72%$ 1.262105 77 $23%$ 0.647420 27 $73%$ 1.279672 76 $24%$ 0.659111 26 $74%$ 1.297756 75 $25%$ 0.670697 25 $75%$ 1.316400 74 $26%$ 0.682192 24 $76%$ 1.335553 73 $27%$ 0.693607 23 $77%$ 1.355569 72 $28%$ 0.704953 22 $78%$ 1.376212 71 $29%$ 0.716241 21 $79%$ 1.397654 70 $30%$ 0.727481 20 $80%$ 1.419975 69 $31%$ 0.738683 19 $81%$ 1.443273 68 $32%$ 0.761003 17 $83%$ 1.443262 66 $34%$ 0.772139 16 $84%$ 1.520240 65 $35%$ 0.783268 15 $85%$ 1.548780 64 $36%$ 0.794398 14 $86%$ 1.579110 63 $37%$ 0.805537 13 $87%$ 1.611512 62 $38%$ 0.816692 11 $89%$ 1.646341 61 $39%$ 0.827869 10 $90%$ 1.725238 59 $41%$ 0.884329 55 $95%$ 1.821568 57 $43%$ 0.872398 7 $93%$ 1.879461 56 $44%$ 0.884329 55 $95%$ 2.028047 51 <	79	21%	0.623665	29	71%	1.245014
77 $23%$ 0.647420 76 $24%$ 0.659111 75 $25%$ 0.670697 74 $26%$ 0.682192 73 $27%$ 0.693607 72 $28%$ 0.704953 71 $29%$ 0.716241 70 $30%$ 0.727481 70 $30%$ 0.727481 70 $30%$ 0.7740853 68 $32%$ 0.74953 66 $34%$ 0.772139 66 $34%$ 0.772139 66 $34%$ 0.772139 63 $37%$ 0.805537 62 $38%$ 0.805537 60 $40%$ 0.827869 60 $40%$ 0.827869 60 $40%$ 0.872938 59 $41%$ 0.861603 57 $43%$ 0.872938 55 $44%$ 0.872938 55 $44%$ 0.872938 55 $44%$ 0.895784 55 $45%$ 0.993600 53 $47%$ 0.918912 52 $48%$ 0.930600 53 $47%$ 0.918912 52 $48%$ 0.930600 53 $47%$ 0.918912 51 $40%$ 0.942370 51 $40%$ 0.942370	78	22%	0.635610	28	72%	1.262105
76 $24%$ 0.659111 26 $74%$ 1.297756 75 $25%$ 0.670697 25 $75%$ 1.316400 74 $26%$ 0.682192 24 $76%$ 1.335553 73 $27%$ 0.693607 23 $77%$ 1.355569 72 $28%$ 0.704953 22 $78%$ 1.376212 71 $29%$ 0.716241 21 $79%$ 1.397654 70 $30%$ 0.727481 20 $80%$ 1.419975 69 $31%$ 0.738683 19 $81%$ 1.443273 68 $32%$ 0.761003 17 $83%$ 1.493262 66 $34%$ 0.772139 16 $84%$ 1.520240 65 $35%$ 0.783268 14 $86%$ 1.579110 63 $37%$ 0.805537 13 $87%$ 1.611512 62 $38%$ 0.816692 11 $89%$ 1.646341 61 $39%$ 0.827869 11 $89%$ 1.684051 60 $40%$ 0.839075 9 $91%$ 1.770704 58 $42%$ 0.884329 6 $94%$ 1.946894 55 $45%$ 0.895784 5 $95%$ 2.028047 54 $46%$ 0.907309 4 $96%$ 2.130689 53 $47%$ 0.918912 3 $97%$ 2.272085 52 $48%$ 0.933060 1 $00%$ 0.250654	77	23%	0.647420	27	73%	1.279672
75 $25%$ 0.670697 74 $26%$ 0.682192 73 $27%$ 0.693607 72 $28%$ 0.704953 71 $29%$ 0.716241 70 $30%$ 0.727481 70 $30%$ 0.727481 69 $31%$ 0.738683 68 $32%$ 0.749854 67 $33%$ 0.761003 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 61 $39%$ 0.8055377 60 $40%$ 0.839075 60 $40%$ 0.839075 50 $41%$ 0.884329 55 $45%$ 0.895784 55 $45%$ 0.895784 55 $45%$ 0.907309 53 $47%$ 0.918912 52 $48%$ 0.907309 53 $47%$ 0.918912 51 $40%$ 0.907309 51 $40%$ 0.907309 51 $40%$ 0.907309 51 $40%$ 0.907309 52 $48%$ 0.903270 63 $97%$ 2.2506554 60 $94%$ 1.946894 52 $0.90%$ 2.2506554	76	24%	0.659111	26	74%	1.297756
74 $26%$ 0.682192 73 $27%$ 0.693607 72 $28%$ 0.704953 71 $29%$ 0.716241 70 $30%$ 0.727481 70 $30%$ 0.727481 69 $31%$ 0.738683 68 $32%$ 0.749854 67 $33%$ 0.761003 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 61 $39%$ 0.805537 60 $40%$ 0.805537 60 $40%$ 0.803075 60 $40%$ 0.827869 60 $40%$ 0.827369 59 $41%$ 0.850317 56 $44%$ 0.872938 57 $43%$ 0.872938 55 $45%$ 0.997309 53 $47%$ 0.918912 52 $48%$ 0.907309 51 $40%$ 0.94270 51 $40%$ 0.94270	75	25%	0.670697	25	75%	1.316400
73 $27%$ 0.693607 72 $28%$ 0.704953 71 $29%$ 0.716241 70 $30%$ 0.727481 70 $30%$ 0.727481 69 $31%$ 0.738683 68 $32%$ 0.749854 67 $33%$ 0.761003 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 61 $39%$ 0.827869 60 $40%$ 0.839075 60 $40%$ 0.8305317 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.84329 55 $45%$ 0.897384 55 $45%$ 0.997309 53 $47%$ 0.918912 52 $48%$ 0.907309 51 $40%$ 0.907309 51 $40%$ 0.907309 51 $40%$ 0.907309 51 $40%$ 0.907309 51 $40%$ 0.907309 52 $48%$ 0.904370 51 $40%$ 0.904370	74	26%	0.682192	24	76%	1.335653
72 $28%$ 0.704953 71 $29%$ 0.716241 70 $30%$ 0.727481 69 $31%$ 0.738683 68 $32%$ 0.749854 67 $33%$ 0.761003 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 61 $39%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 61 $39%$ 0.827869 55 $45%$ 0.895784 55 $45%$ 0.995784 55 $45%$ 0.9907309 53 $47%$ 0.918912 52 $48%$ 0.930600 52 $48%$ 0.930600 51 $49%$ 0.900602 52 $48%$ 0.930600 6 $94%$ 1.946894 52 $95%$ 2.272085 <t< td=""><td>73</td><td>27%</td><td>0.693607</td><td>23</td><td>77%</td><td>1.355569</td></t<>	73	27%	0.693607	23	77%	1.355569
71 $29%$ 0.716241 70 $30%$ 0.727481 69 $31%$ 0.738683 68 $32%$ 0.749854 67 $33%$ 0.761003 66 $34%$ 0.772139 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 61 $39%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 60 $40%$ 0.839075 59 $41%$ 0.850317 56 $44%$ 0.884329 55 $45%$ 0.895784 55 $45%$ 0.907309 53 $47%$ 0.918912 52 $48%$ 0.930600 51 $49%$ 0.932600	72	28%	0.704953	22	78%	1.376212
70 $30%$ 0.727481 69 $31%$ 0.738683 68 $32%$ 0.749854 67 $33%$ 0.761003 66 $34%$ 0.772139 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.805537 62 $38%$ 0.816692 60 $40%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.861603 57 $43%$ 0.872938 57 $43%$ 0.872938 55 $45%$ 0.895784 55 $45%$ 0.9907309 53 $47%$ 0.918912 52 $48%$ 0.930600 51 $40%$ 0.930600 11 $90%$ 2.2720854	71	29%	0.716241	21	79%	1.397654
69 $31%$ 0.738683 68 $32%$ 0.749854 67 $33%$ 0.761003 66 $34%$ 0.772139 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.794398 64 $36%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.850317 56 $44%$ 0.872938 57 $43%$ 0.872938 55 $45%$ 0.895784 55 $45%$ 0.907309 53 $47%$ 0.918912 52 $48%$ 0.9027300 51 $49%$ 0.942370	70	30%	0.727481	20	80%	1.419975
68 $32%$ 0.749854 67 $33%$ 0.761003 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 63 $37%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.850317 58 $42%$ 0.861603 57 $43%$ 0.872938 55 $45%$ 0.895784 55 $45%$ 0.895784 52 $48%$ 0.907309 53 $47%$ 0.918912 52 $48%$ 0.930600 51 $40%$ 0.930600 51 $40%$ 0.930600 51 $40%$ 0.94270 51 $40%$ 0.94270	69	31%	0.738683	19	81%	1.443273
67 $33%$ 0.761003 66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 64 $36%$ 0.794398 63 $37%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.850317 58 $42%$ 0.861603 57 $43%$ 0.872938 56 $44%$ 0.884329 55 $45%$ 0.995784 54 $46%$ 0.907309 52 $48%$ 0.930600 51 $49%$ 2.272085 52 $48%$ 0.930600	68	32%	0.749854	18	82%	1.467659
66 $34%$ 0.772139 65 $35%$ 0.783268 64 $36%$ 0.794398 63 $37%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.850317 58 $42%$ 0.861603 57 $43%$ 0.872938 56 $44%$ 0.884329 55 $45%$ 0.907309 53 $47%$ 0.918912 52 $48%$ 0.92370 51 $40%$ 0.92370	67	33%	0.761003	17	83%	1.493262
65 $35%$ 0.783268 64 $36%$ 0.794398 63 $37%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.850317 58 $42%$ 0.861603 57 $43%$ 0.872938 56 $44%$ 0.884329 55 $45%$ 0.997309 53 $47%$ 0.918912 52 $48%$ 0.930600 51 $40%$ 0.93270	66	34%	0.772139	16	84%	1.520240
64 $36%$ 0.794398 63 $37%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.861603 57 $43%$ 0.872938 56 $44%$ 0.884329 55 $45%$ 0.895784 54 $46%$ 0.907309 52 $48%$ 0.930600 51 $40%$ 0.93270	65	35%	0.783268	15	85%	1.548780
63 $37%$ 0.805537 62 $38%$ 0.816692 61 $39%$ 0.827869 60 $40%$ 0.839075 59 $41%$ 0.850317 58 $42%$ 0.861603 57 $43%$ 0.872938 56 $44%$ 0.884329 55 $45%$ 0.997309 53 $47%$ 0.918912 52 $48%$ 0.930600 51 $40%$ 0.93270	64	36%	0.794398	14	86%	1.579110
62 $38%$ 0.816692 12 $88%$ 1.646341 61 $39%$ 0.827869 11 $89%$ 1.646341 60 $40%$ 0.839075 10 $90%$ 1.725238 59 $41%$ 0.850317 9 $91%$ 1.770704 58 $42%$ 0.861603 8 $92%$ 1.821568 57 $43%$ 0.872938 7 $93%$ 1.879461 56 $44%$ 0.884329 6 $94%$ 1.946894 55 $45%$ 0.907309 4 $96%$ 2.130689 52 $48%$ 0.930600 2 $98%$ 2.506554 51 $40%$ 0.942370 1 $90%$ 2.506554	63	37%	0.805537	13	87%	1.611512
61 $39%$ 0.827869 11 $89%$ 1.684051 60 $40%$ 0.839075 10 $90%$ 1.725238 59 $41%$ 0.850317 9 $91%$ 1.770704 58 $42%$ 0.861603 8 $92%$ 1.821568 57 $43%$ 0.872938 7 $93%$ 1.879461 56 $44%$ 0.884329 6 $94%$ 1.946894 55 $45%$ 0.907309 4 $96%$ 2.130689 53 $47%$ 0.918912 3 $97%$ 2.272085 51 $49%$ 0.942370 1 $90%$ 2.506554	62	38%	0.816692	12	88%	1.646341
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	61	39%	0.827869	11	89%	1.684051
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	60	40%	0.839075	10	90%	1 725238
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	50	41%	0.850317	Q	91%	1 770704
57 43% 0.872938 7 93% 1.879461 56 44% 0.884329 6 94% 1.946894 55 45% 0.895784 5 95% 2.028047 54 46% 0.907309 4 96% 2.130689 52 48% 0.930600 2 98% 2.506554 51 40% 0.942370 1 90% 2.506554	58	42%	0.861603	8	92%	1 821568
57 45% 0.07250 7 55% 1.079401 56 44% 0.884329 6 94% 1.946894 55 45% 0.895784 5 95% 2.028047 54 46% 0.907309 4 96% 2.130689 52 48% 0.930600 2 98% 2.506554 51 40% 0.942370 1 00% 2.506554	57	42%	0.872938	7	93%	1 879461
55 45% 0.895784 5 95% 2.028047 54 46% 0.907309 4 96% 2.130689 53 47% 0.918912 3 97% 2.272085 51 40% 0.942370 1 90% 2.506554	56	1/10/	0.88/1320	6	Q/1%	1 0/680/
55 4570 0.055704 54 46% 0.907309 53 47% 0.918912 52 48% 0.930600 2 98% 2.028047 2.130689 3 97% 2.272085 51 40%	55	4504	0.805784	5	Q504	2 028047
54 4070 0.907309 4 90% 2.130689 53 47% 0.918912 3 97% 2.272085 52 48% 0.930600 2 98% 2.506554 51 40% 0.942370 1 0.0% 2.506554	51	4,5%	0.073/04	<u> </u>	7J70 0604	2.020047
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	52	40%	0.907309	4	90%	2.130089
J2 46% 0.950000 2 98% 2.300554 51 40% 0.042270 1 00% 2.500554	50	++ / %0 / Q0/	0.020400	2	7 / %0 080/	2.272003
	51	40%	0.930000	<u> </u>	70% 000/	2.300334