
CANADIAN
Building Energy End-Use
DATA AND ANALYSIS CENTRE
commercial • residential • institutional

# Commercial and Institutional Building Energy Use Survey Review

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## Executive Summary

- The Commercial and Institutional Building Energy Use Survey (CIBEUS) is intended to provide government, utility providers, building managers and academic researchers with pertinent information on energy use characteristics to aid them in decision-making and consideration of policy issues.

- The survey is similar in scope and focus to that of its US Commercial Buildings Energy Consumption Survey (CBECS) counterpart. The main differences between the two surveys are:

  (1) CIBEUS coverage is limited to buildings in larger metropolitan areas (and therefore has very limited coverage of buildings in some parts of the country);

  (2) CBECS supplements the survey data with location-specific information on cooling and heating degree days (as opposed to a uniform assumption across all buildings in all locations);

  (3) CBECS surveys the same buildings over time, providing a longitudinal sample that is very useful for 'micro' analysis of energy use by commercial and institutional buildings.

- In both the CBECS and CIBEUS data, there are many instances in which data have to be imputed. While this imputation is necessary, and in fact useful, for any use of the data set involving aggregation to national totals, the imputed values need to be flagged for those using the data for micro-level analysis.

- Statistical analysis of the data indicates that there are differences across locations in energy use. This implies that better national totals might be achieved should buildings in under-represented geographical and climatic regions be included in further surveys.

- The current CIBEUS data set provides an important starting point for an understanding of energy use patterns for buildings in the commercial and institutional sectors of the Canadian economy. It provides high-quality detailed information on an important subset of these buildings. As further data are gathered over time, and as more is learned about buildings in other regions of the country, the usefulness of the data for government agencies, utilities, building owners/managers and academic researchers will increase.

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## Section 1: Background Information

### *Initial Goals of the Survey*

The Commercial and Institutional Building Energy Use Survey (CIBEUS) was implemented with an aim to serve the purposes of a wide variety of stakeholders. Among the stakeholders considered in the design and implementation of the survey were various levels of government, utility providers, building managers, and academic researchers.

It was originally envisioned that the survey data might, among other things, provide information that would enable survey users to:

(1) Understand energy consumption and energy efficiency characteristics of commercial and institutional buildings in Canada;

(2) Identify ways of decreasing energy consumption and costs in commercial and institutional buildings;

(3) Assess the fulfillment of greenhouse gas emission commitments by providing baseline information regarding fuel use in commercial and institutional buildings.

For purposes (1) and (3), the survey data are generally used to aggregate up from individual buildings to nationwide totals. For the second envisaged purpose of the survey, however, the goal is to use the data pertaining to the characteristics and energy-use patterns of sampled buildings for making inferences about particular (out-of-sample)

buildings. A data set that is designed primarily for uses (1) and (3) may or may not be useful when looking at the types of questions likely to be asked in (2).

***Survey coverage***

In order to qualify for inclusion in the first CIBEUS survey, a commercial or institutional building must have been located in a Census Metropolitan Area or Census Area (CMA/CA) with a population of greater than 175,000, with the exception of the Atlantic region where buildings in CMA/CAs with populations greater than 50,000 were surveyed. No buildings in northern Canada were surveyed.

Sampling was conducted in such a way as to ensure the inclusion of buildings of a variety of sizes, age classes, and types. Each of the 24 CMA/CAs included in the coverage was broken down by enumeration area (EAs). All EAs were classified into one of three categories, based on the total number of buildings and the number of buildings constructed within the past 2 years in that EA. Wherever possible, at least two EAs from each category were selected from each CMA/CA, with buildings sampled from 370 (out of a total of 20,322) EAs.

A total of 4750 buildings were selected for the survey, with an aim of providing reliable national estimates by type, age and size of building. Only those buildings with at least 1000 sq feet of floor space, of which at least one-half was devoted to commercial or institutional activities, and with 6 or more employees were included in the survey.

In order to ensure adequate coverage of certain classes of important specialized atypical buildings, the inclusion of hospitals, colleges, universities and shopping centres was not left to chance via random sampling within the EAs. Instead, lists provided by appropriate authorities were used as a basis for selecting buildings belonging to these institutional categories.

***Data Collected***

In order to satisfy as many end-uses of the data as possible, while taking into consideration survey costs, the following information was requested of all survey participants.

A *basic info* (type of structure, ownership)

B *general physical characteristics* (age, size, parking, walls)

C *occupancy characteristics* (activities, # of occupants, hours, seasonal use)

D *energy efficiency characteristics* (renovations, reasons for renovations, payback required on renovations, windows, lighting, heating/cooling, window:wall ratio, R-value and type of walls, R-value and type of roof)

E *energy consumption* (fuel sources: electricity needs; heating, % of building heated, heating equipment; hot water; cooling, % of building cooled, equipment; shared facilities/services with other buildings)

F *energy quantities and costs* (electricity, natural gas, fuel/heating oil, district steam, district hot water) *

* Although mentioned in the questionnaire, energy cost data are not included in the CIBEUS data set.

## 2. Comparison to the US Commercial Buildings Energy Consumption Survey (CBECS)

### *Survey Design*

The CIBEUS survey was modeled after its US CBECS counterpart. The US Department of Energy has been gathering information on energy use in commercial buildings since 1979, with their most recent surveys being conducted in 1995 and 1999. Sample sizes for the CBECS and CIBEUS data sets are comparable, with the Canadian data set sampling a larger proportion of total buildings, but restricting its sample to larger urban areas.

### *Sampling Strategy*

For the most part, sampling strategies are similar, with the CBECS sampling strategy being a little more complex than that of CIBEUS and not being restricted to larger

metropolitan areas. The CBECS survey, unlike CIBEUS, does have a time dimension to it. The CBECS survey is currently a longitudinal (panel) survey, with the same buildings being examined at approximately 5-year intervals. The existing panel is supplemented each time with a survey of new buildings. A recent innovation in the CBECS survey is a move towards telephone interviews, preceded by mail-outs providing information about the questions that will be asked over the course of the telephone interview.

***National Aggregations***

Methods used to obtain national estimates based on the surveyed buildings are methodologically very similar across the two surveys. The buildings surveyed are taken to be representative of buildings in their age/size/type stratum, and values from surveyed buildings are weighted up to generate local, provincial/regional or national totals. The uncertainty inherent in these totals is gauged through the estimation of standard errors for the estimates.

The fact that the coverage in the Canadian data set is limited to buildings in larger metropolitan areas may have implications for the relative quality of the Canadian national estimates. It is implicitly assumed that the energy-use characteristics in non-sampled areas are similar to those in the sampled areas of the country.

There are also differences in the quality of the data used for calculating seasonal energy expenditures. While the CIBEUS data set assumes a fixed number of days in each of the summer and winter seasons, the CBECS survey questionnaire data are supplemented with

information on location-specific heating and cooling degree-days. Average daily temperature information allows for the construction of degree-day totals that correspond more closely to the buildings in the sample than the use of a uniform assumption across all buildings in all locations.

### *Variables Included in the Data Sets*

The sets of variables in the CBECS and CIBEUS data sets are quite similar. The CBECS data set includes information on some factors not included in the CIBEUS data set. The CBECS surveys include some limited information on space usage (commercial food preparation, computer rooms (1995 survey only)), as well as a limited equipment inventory (heating and cooling, refrigeration, water heating, lighted floor space, lighting equipment, office equipment.) Also included in the CBECS data set are information on the source of purchase for energy, and information on whether or not the building had been participating in any sort of demand-side management projects sponsored by their energy supplier(s). As mentioned previously, the CBECS data set is also supplemented with location-specific weather data.

### *Missing Values and Imputed Data*

In both surveys, aside from complete non-response for some buildings originally targeted in the survey, there are a significant number of observations with incomplete information. This can range from missing data on one or two building characteristics, to missing data on energy consumption. In both the CBECS and CIBEUS data sets, missing data are imputed based on the characteristics of other similar buildings in the data set.

While imputing these data can be useful in terms of eventual aggregation to regional or national totals, the fact that these data are imputed is very important information for any user who wishes to use these data sets for generating microeconomic inferences regarding energy use patterns in commercial and institutional buildings. The presence of measurement error due to imputation in some or all of the variables in any particular observation is important information for researchers when making decisions regarding which observations and which estimation methods to use. It is therefore important that imputed data be flagged, as is the case for the publicly available CBECS data sets.

**3. CIBEUS National Estimates Extrapolation to Buildings in Smaller Centres**

The current CIBEUS survey targets only commercial and institutional buildings located within larger urban centres. As a result, there is no coverage of buildings in the northern regions of the country and limited coverage of certain regions such as the prairies. The climactic conditions in the areas omitted from the survey will, in many cases, be more severe than those in the areas included in the survey.

Given that the mix of buildings, operating hours, and energy requirements and availability options are likely to be different from those in the 24 urban centres that were covered in the survey, it is quite possible that the extrapolation of energy intensity and other energy use data to buildings in other parts of the country might not be very reliable.

One way to check the reliability of the (implicit) extrapolations used in the national aggregations would be to actually survey a selection of buildings in non-covered regions and then compare the actual energy use data to that predicted from similar buildings already included in the survey. This is, however, a fairly expensive option and is complicated by the fact that the dates of observation for the buildings will differ. Given that energy prices have changed in the interim, adjustments would need to be made to account for these differences.

It is possible to say something about whether or not extrapolation might be a reasonable option by examining within-sample buildings in the current CIBEUS data set. The CMA/CAs covered in the survey do present a fairly broad range of geographic locations and climactic conditions. In order to examine similarities of energy use and energy intensity characteristics across various regions in the country, we consider a simple model wherein energy use (or intensity) is regressed on a variety of factors, including the geographical location of the building. These models are estimated for overall energy usage and intensity, electricity usage and intensity, and natural gas usage and intensity.

The set of controls selected from the CIBEUS data set are the building's age (measured via B1 in the CIBEUS data set, the year of construction), the size of the building (measured via B2 in the CIBEUS data set, area in square feet), dummy variables indicating single or multiple retrofits since 1995 (retany and retmany), dummy variables indicating the presence of lighting or heating conservation features (conslight and consheat), the type of district in which the building is located (measured by EA type

dummies), and the hours of operation of the building (C3H). Although not comprehensive, these control for a variety of factors that would be expected to affect energy use.

In addition to these factors, dummy variables for location (Atlantic, Quebec, Prairie, and BC) are included in the models. These locations present differing general climactic conditions, with buildings in BC facing generally temperate conditions, and those in the prairies facing harsher conditions than elsewhere.

Preliminary testing showed that the regression coefficients were not constant across building size, so separate regressions are reported for four size groupings of building: 1000 – 5000 sq ft; 5000-10000 sq ft; 10000-50000 sq ft; and those buildings 50000 sq ft or larger. The results for overall energy use and intensity are presented in Tables 1 through 8, for 24. The main coefficients of interest in these regressions are those corresponding to the location dummies.

Significant regional effects are highlighted (in yellow). When it comes to overall energy usage and intensity there are significant differences across regions for 3 out of 4 of the size categories. The same is true for natural gas. There are fewer differences across regions as far as electricity usage and intensity are concerned, but differences do exist.

These differences may be due to different building characteristics not controlled for in the regressions, different climates, different relative prices of energy sources across location

and differences in availability of some energy sources. This suggests that inferences regarding energy use characteristics for out-of-sample centres where climactic conditions, relative prices and fuel availability might not be as accurate as might be hoped if based on information from other regions of the country.

## 4. Recommendations for Next CIBEUS Survey

- When collecting cross-sectional survey data over time, there are distinct advantages to the use of longitudinal or panel data rather than the collection of a series of unrelated random samples over time. With longitudinal data, the same buildings are surveyed in each subsequent survey year. This allows researchers to better track energy use across time, holding several of the building's characteristics constant over time. Since staying exclusively with the buildings in previous sample would lead to the exclusion of any newly constructed buildings, the sample would need to be supplemented with data through the use of an additional new construction sample. (In the CBECS survey, only buildings with a minimum floor space of 10,000 sq feet are included in the new construction sample.)

- For the CIBEUS data sets to be of use for many research purposes, data on the actual cost of energy purchases are required. Although these can be roughly estimated from the quantity data if the researcher has corresponding price data, the uncertainty of the estimates will result in less reliable statistical outcomes.

(Confidentiality requirements may prevent these data from being publicly available.)

- Data on the costs of retrofits would also be useful to researchers interested in exploring the economic factors associated with energy efficiency initiatives.

- Although detailed equipment inventories for all buildings would not be feasible, it would be useful to undertake (partial) equipment inventories for certain specialized buildings such as hospitals.

- Since the main building of a college (or hospital) may be atypical in terms of energy use, more extensive surveying of these specialized buildings would be beneficial.

- Given that climactic conditions can differ substantially across the urban areas covered in the survey, weather data specific to the location of the sampled buildings should be used in the determination of heating and cooling days.

- Coverage of buildings in smaller centres, especially those in currently unrepresented northern regions where energy consumption patterns are likely to be different, could improve the reliability of national estimates based on the CIBEUS survey data.

- Given the move to deregulation in many energy markets, more detailed information on the source of supply of energy could be included. Information on the purchase of 'green' energy and information regarding participation in demand-management programs could also be gathered.

- Provision of the data to the public in standard ASCII format (including imputed data flags for appropriate observations) would make the data more readily accessible to researchers.

## 5. Conclusions

The current CIBEUS data set provides an important starting point for an understanding of energy use patterns for buildings in the commercial and institutional sectors of the Canadian economy. It provides high-quality detailed information on an important subset of these buildings. As further data are gathered over time, and as more is learned about buildings in other regions of the country, the usefulness of the data for government agencies, utilities, building owners/managers and academic researchers will increase.

***Table 1***: Energy Usage: *Size Group 1: 1000-5000 Sq ft.*

Model: MODEL1
Dependent Variable: ENERGY_TOTAL_USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 59352542 | 4565580 | 12.53 | <.0001 |
| Error | 670 | 244128647 | 364371 | | |
| Corrected Total | 683 | 303481189 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 603.63160 | R-Square | 0.1956 |
| Dependent Mean | 552.82451 | Adj R-Sq | 0.1800 |
| Coeff Var | 109.19046 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -1907.01815 | 1329.67245 | -1.43 | 0.1520 |
| B1 | 0.89569 | 0.67707 | 1.32 | 0.1863 |
| B2 | 0.15828 | 0.02213 | 7.15 | <.0001 |
| atlantic | -140.19620 | 81.87460 | -1.71 | 0.0873 |
| quebec | -114.56731 | 60.72082 | -1.89 | 0.0596 |
| prairie | 119.63136 | 75.87945 | 1.58 | 0.1154 |
| bc | -28.30270 | 88.42801 | -0.32 | 0.7490 |
| retany | 128.90633 | 67.26352 | 1.92 | 0.0557 |
| retmany | -28.34748 | 87.88889 | -0.32 | 0.7471 |
| conslight | 66.66277 | 49.02124 | 1.36 | 0.1743 |
| consheat | 11.31287 | 58.19761 | 0.19 | 0.8459 |
| type1 | -197.67604 | 87.87114 | -2.25 | 0.0248 |
| type2 | -204.08487 | 95.03006 | -2.15 | 0.0321 |
| C3H | 6.11426 | 0.67027 | 9.12 | <.0001 |

***Table 2***: Energy Intensity: *Size Group 1: 1000-5000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_ENERGY

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 5.64600 | 0.43431 | 11.28 | <.0001 |
| Error | 670 | 25.80195 | 0.03851 | | |
| Corrected Total | 683 | 31.44794 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.19624 | R-Square | 0.1795 |
| Dependent Mean | 0.19914 | Adj R-Sq | 0.1636 |
| Coeff Var | 98.54442 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -0.32528 | 0.43228 | -0.75 | 0.4520 |
| B1 | 0.00025699 | 0.00022012 | 1.17 | 0.2434 |
| B2 | -0.00001543 | 0.00000719 | -2.14 | 0.0324 |
| atlantic | -0.03997 | 0.02662 | -1.50 | 0.1337 |
| quebec | -0.02855 | 0.01974 | -1.45 | 0.1486 |
| prairie | 0.02927 | 0.02467 | 1.19 | 0.2359 |
| bc | -0.01059 | 0.02875 | -0.37 | 0.7128 |
| retany | 0.02542 | 0.02187 | 1.16 | 0.2455 |
| retmany | -0.00859 | 0.02857 | -0.30 | 0.7637 |
| conslight | 0.02009 | 0.01594 | 1.26 | 0.2079 |
| consheat | 0.01678 | 0.01892 | 0.89 | 0.3755 |
| type1 | -0.10393 | 0.02857 | -3.64 | 0.0003 |
| type2 | -0.10452 | 0.03089 | -3.38 | 0.0008 |
| C3H | 0.00218 | 0.00021790 | 10.02 | <.0001 |

***Table 3***: Energy Usage: *Size Group 2: 5000-10000 Sq ft.*

Model: MODEL1
Dependent Variable: ENERGY_TOTAL_USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 77808060 | 5985235 | 5.63 | <.0001 |
| Error | 486 | 517015525 | 1063818 | | |
| Corrected Total | 499 | 594823585 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 1031.41551 | R-Square | 0.1308 |
| Dependent Mean | 1010.97561 | Adj R-Sq | 0.1076 |
| Coeff Var | 102.02180 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -1047.72009 | 2293.68773 | -0.46 | 0.6480 |
| B1 | 0.36927 | 1.15709 | 0.32 | 0.7498 |
| B2 | 0.11082 | 0.03342 | 3.32 | 0.0010 |
| atlantic | -506.69347 | 173.47084 | -2.92 | 0.0037 |
| quebec | -280.76852 | 130.64706 | -2.15 | 0.0321 |
| prairie | 53.48760 | 157.36890 | 0.34 | 0.7341 |
| bc | 68.52196 | 147.28401 | 0.47 | 0.6420 |
| retany | 2.66398 | 137.22016 | 0.02 | 0.9845 |
| retmany | 160.95556 | 170.91805 | 0.94 | 0.3468 |
| conslight | 127.68849 | 98.14847 | 1.30 | 0.1939 |
| consheat | -70.95382 | 132.59702 | -0.54 | 0.5928 |
| type1 | 18.70055 | 159.29698 | 0.12 | 0.9066 |
| type2 | 182.44736 | 178.07575 | 1.02 | 0.3061 |
| C3H | 8.94130 | 1.44603 | 6.18 | <.0001 |

***Table 4***: Energy Intensity: *Size Group 2: 5000-10000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_ENERGY

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 1.65923 | 0.12763 | 5.50 | <.0001 |
| Error | 486 | 11.27116 | 0.02319 | | |
| Corrected Total | 499 | 12.93039 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.15229 | R-Square | 0.1283 |
| Dependent Mean | 0.14748 | Adj R-Sq | 0.1050 |
| Coeff Var | 103.26054 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -0.11404 | 0.33866 | -0.34 | 0.7365 |
| B1 | 0.00010454 | 0.00017084 | 0.61 | 0.5409 |
| B2 | -0.00000477 | 0.00000494 | -0.97 | 0.3344 |
| atlantic | -0.08114 | 0.02561 | -3.17 | 0.0016 |
| quebec | -0.04491 | 0.01929 | -2.33 | 0.0203 |
| prairie | -0.00018260 | 0.02324 | -0.01 | 0.9937 |
| bc | 0.01056 | 0.02175 | 0.49 | 0.6273 |
| retany | 0.00523 | 0.02026 | 0.26 | 0.7962 |
| retmany | 0.02136 | 0.02524 | 0.85 | 0.3978 |
| conslight | 0.01737 | 0.01449 | 1.20 | 0.2313 |
| consheat | -0.00716 | 0.01958 | -0.37 | 0.7148 |
| type1 | -0.00000989 | 0.02352 | -0.00 | 0.9997 |
| type2 | 0.02492 | 0.02629 | 0.95 | 0.3437 |
| C3H | 0.00143 | 0.00021351 | 6.72 | <.0001 |

***Table 5***: Energy Usage: *Size Group 3: 10000-50000 Sq ft.*

Model: MODEL1
Dependent Variable: ENERGY_TOTAL_USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 2735448131 | 210419087 | 18.00 | <.0001 |
| Error | 858 | 10029758663 | 11689695 | | |
| Corrected Total | 871 | 12765206794 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 3419.01966 | R-Square | 0.2143 |
| Dependent Mean | 2728.35355 | Adj R-Sq | 0.2024 |
| Coeff Var | 125.31439 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | 6462.52435 | 8532.80765 | 0.76 | 0.4490 |
| B1 | -4.06310 | 4.29893 | -0.95 | 0.3449 |
| B2 | 0.13491 | 0.01148 | 11.75 | <.0001 |
| atlantic | -1192.16844 | 433.29451 | -2.75 | 0.0061 |
| quebec | -1043.22914 | 339.68981 | -3.07 | 0.0022 |
| prairie | 81.22031 | 353.25508 | 0.23 | 0.8182 |
| bc | -593.65087 | 386.26598 | -1.54 | 0.1247 |
| retany | 786.03363 | 339.67606 | 2.31 | 0.0209 |
| retmany | -883.79177 | 412.34081 | -2.14 | 0.0324 |
| conslight | 363.68474 | 237.29495 | 1.53 | 0.1257 |
| consheat | 572.88259 | 378.68087 | 1.51 | 0.1307 |
| type1 | -391.85207 | 427.19404 | -0.92 | 0.3593 |
| type2 | -62.76361 | 453.31209 | -0.14 | 0.8899 |
| C3H | 17.26227 | 3.55958 | 4.85 | <.0001 |

***Table 6***: Energy Intensity: *Size Group 3: 10000-50000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_ENERGY

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 1.19960 | 0.09228 | 6.54 | <.0001 |
| Error | 858 | 12.10558 | 0.01411 | | |
| Corrected Total | 871 | 13.30518 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.11878 | R-Square | 0.0902 |
| Dependent Mean | 0.12280 | Adj R-Sq | 0.0764 |
| Coeff Var | 96.72670 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | 0.46306 | 0.29644 | 1.56 | 0.1186 |
| B1 | -0.00020719 | 0.00014935 | -1.39 | 0.1657 |
| B2 | 1.943679E-7 | 3.988162E-7 | 0.49 | 0.6261 |
| atlantic | -0.05550 | 0.01505 | -3.69 | 0.0002 |
| quebec | -0.04028 | 0.01180 | -3.41 | 0.0007 |
| prairie | 0.00422 | 0.01227 | 0.34 | 0.7313 |
| bc | -0.02841 | 0.01342 | -2.12 | 0.0346 |
| retany | 0.02891 | 0.01180 | 2.45 | 0.0145 |
| retmany | -0.03247 | 0.01433 | -2.27 | 0.0237 |
| conslight | 0.01384 | 0.00824 | 1.68 | 0.0934 |
| consheat | 0.02842 | 0.01316 | 2.16 | 0.0310 |
| type1 | -0.00667 | 0.01484 | -0.45 | 0.6534 |
| type2 | 0.00167 | 0.01575 | 0.11 | 0.9154 |
| C3H | 0.00069463 | 0.00012366 | 5.62 | <.0001 |

***Table 7***: Energy Usage: *Size Group 4: > 50000 Sq ft.*

Model: MODEL1
Dependent Variable: ENERGY_TOTAL_USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 4.021773E11 | 30936714137 | 65.22 | <.0001 |
| Error | 306 | 1.451486E11 | 474341748 | | |
| Corrected Total | 319 | 5.473259E11 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 21779 | R-Square | 0.7348 |
| Dependent Mean | 24561 | Adj R-Sq | 0.7235 |
| Coeff Var | 88.67385 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | 108304 | 96619 | 1.12 | 0.2632 |
| B1 | -59.37671 | 48.59207 | -1.22 | 0.2227 |
| B2 | 0.18743 | 0.00692 | 27.10 | <.0001 |
| atlantic | 890.39108 | 5060.70922 | 0.18 | 0.8605 |
| quebec | 5295.12557 | 3419.60158 | 1.55 | 0.1225 |
| prairie | 5278.86781 | 3331.51411 | 1.58 | 0.1141 |
| bc | 1834.46775 | 4617.99581 | 0.40 | 0.6915 |
| retany | -4208.72728 | 3417.03603 | -1.23 | 0.2190 |
| retmany | 8697.87147 | 3759.16342 | 2.31 | 0.0213 |
| conslight | 1565.19534 | 2709.88205 | 0.58 | 0.5640 |
| consheat | -3301.95538 | 6372.48983 | -0.52 | 0.6047 |
| type1 | -2599.54756 | 5709.82379 | -0.46 | 0.6492 |
| type2 | 1426.16313 | 5526.14275 | 0.26 | 0.7965 |
| C3H | 37.29107 | 32.29762 | 1.15 | 0.2492 |

***Table 8***: Energy Intensity: *Size Group 4: > 50000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_ENERGY

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 0.38887 | 0.02991 | 2.91 | 0.0005 |
| Error | 306 | 3.14890 | 0.01029 | | |
| Corrected Total | 319 | 3.53778 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.10144 | R-Square | 0.1099 |
| Dependent Mean | 0.13711 | Adj R-Sq | 0.0721 |
| Coeff Var | 73.98608 | | |

Parameter Estimates

| Variable | | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|---|
| Intercept | | 1.31264 | 0.45002 | 2.92 | 0.0038 |
| B1 | | -0.00062341 | 0.00022633 | -2.75 | 0.0062 |
| B2 | | 7.954025E-8 | 3.221758E-8 | 2.47 | 0.0141 |
| atlantic | | -0.00353 | 0.02357 | -0.15 | 0.8812 |
| quebec | | 0.01932 | 0.01593 | 1.21 | 0.2260 |
| prairie | | 0.02594 | 0.01552 | 1.67 | 0.0956 |
| bc | | 0.02209 | 0.02151 | 1.03 | 0.3053 |
| retany | | -0.02700 | 0.01592 | -1.70 | 0.0908 |
| retmany | | 0.03740 | 0.01751 | 2.14 | 0.0335 |
| conslight | | 0.00122 | 0.01262 | 0.10 | 0.9233 |
| consheat | | 0.00429 | 0.02968 | 0.14 | 0.8851 |
| type1 | | -0.02158 | 0.02659 | -0.81 | 0.4179 |
| type2 | | 0.01164 | 0.02574 | 0.45 | 0.6514 |
| C3H | 1 | 0.00031706 | 0.00015043 | 2.11 | 0.0359 |

***Table 9***: Electricity Usage: *Size Group 1: 1000-5000 Sq ft.*

Model: MODEL1
Dependent Variable: ELECTRICITY_TOTAL_USAGE TOTAL USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 22026744 | 1694365 | 19.19 | <.0001 |
| Error | 768 | 67795778 | 88276 | | |
| Corrected Total | 781 | 89822522 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 297.11236 | R-Square | 0.2452 |
| Dependent Mean | 252.55093 | Adj R-Sq | 0.2324 |
| Coeff Var | 117.64453 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -1795.40813 | 652.41904 | -2.75 | 0.0061 |
| B1 | 0.81732 | 0.33229 | 2.46 | 0.0141 |
| B2 | 0.07231 | 0.01021 | 7.08 | <.0001 |
| atlantic | 41.91539 | 35.14002 | 1.19 | 0.2333 |
| quebec | -35.84686 | 28.05628 | -1.28 | 0.2017 |
| prairie | 4.87466 | 34.93555 | 0.14 | 0.8891 |
| bc | 31.61337 | 39.99179 | 0.79 | 0.4295 |
| retany | 31.17264 | 33.23208 | 0.94 | 0.3485 |
| retmany | -8.11556 | 43.12821 | -0.19 | 0.8508 |
| conslight | 58.97463 | 22.41549 | 2.63 | 0.0087 |
| consheat | 18.95864 | 26.32899 | 0.72 | 0.4717 |
| type1 | -52.42178 | 44.26659 | -1.18 | 0.2367 |
| type2 | -67.68350 | 48.25754 | -1.40 | 0.1612 |
| C3H | 3.71210 | 0.29926 | 12.40 | <.0001 |

***Table 10***: Electricity Intensity: *Size Group 1: 1000-5000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_ELECTRICITY

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 2.65497 | 0.20423 | 19.03 | <.0001 |
| Error | 768 | 8.24404 | 0.01073 | | |
| Corrected Total | 781 | 10.89901 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.10361 | R-Square | 0.2436 |
| Dependent Mean | 0.09207 | Adj R-Sq | 0.2308 |
| Coeff Var | 112.53542 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -0.64843 | 0.22751 | -2.85 | 0.0045 |
| B1 | 0.00034571 | 0.00011587 | 2.98 | 0.0029 |
| B2 | -0.00000805 | 0.00000356 | -2.26 | 0.0241 |
| atlantic | 0.01533 | 0.01225 | 1.25 | 0.2114 |
| quebec | -0.00869 | 0.00978 | -0.89 | 0.3745 |
| prairie | -0.00327 | 0.01218 | -0.27 | 0.7888 |
| bc | 0.01073 | 0.01395 | 0.77 | 0.4417 |
| retany | 0.00756 | 0.01159 | 0.65 | 0.5146 |
| retmany | -0.00627 | 0.01504 | -0.42 | 0.6768 |
| conslight | 0.01844 | 0.00782 | 2.36 | 0.0186 |
| consheat | 0.01391 | 0.00918 | 1.52 | 0.1300 |
| type1 | -0.02883 | 0.01544 | -1.87 | 0.0622 |
| type2 | -0.02914 | 0.01683 | -1.73 | 0.0837 |
| C3H | 0.00139 | 0.00010436 | 13.35 | <.0001 |

***Table 11***: Electricity Usage: *Size Group 2: 5000-10000 Sq ft.*

Model: MODEL1
Dependent Variable: ELECTRICITY_TOTAL_USAGE TOTAL USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 17076705 | 1313593 | 4.41 | <.0001 |
| Error | 521 | 155039893 | 297581 | | |
| Corrected Total | 534 | 172116599 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 545.51019 | R-Square | 0.0992 |
| Dependent Mean | 425.92035 | Adj R-Sq | 0.0767 |
| Coeff Var | 128.07798 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -2707.67348 | 1247.80360 | -2.17 | 0.0305 |
| B1 | 1.31814 | 0.63301 | 2.08 | 0.0378 |
| B2 | 0.03825 | 0.01694 | 2.26 | 0.0244 |
| atlantic | -126.24422 | 79.64823 | -1.59 | 0.1136 |
| quebec | -157.75787 | 68.27664 | -2.31 | 0.0212 |
| prairie | -182.43737 | 81.01367 | -2.25 | 0.0247 |
| bc | 60.40981 | 76.22856 | 0.79 | 0.4284 |
| retany | -55.12431 | 72.12156 | -0.76 | 0.4450 |
| retmany | 38.62010 | 91.84168 | 0.42 | 0.6743 |
| conslight | 46.91994 | 49.41705 | 0.95 | 0.3428 |
| consheat | -59.50588 | 68.67312 | -0.87 | 0.3866 |
| type1 | 90.72254 | 90.09302 | 1.01 | 0.3144 |
| type2 | 237.53567 | 99.04546 | 2.40 | 0.0168 |
| C3H | 3.94818 | 0.72274 | 5.46 | <.0001 |

***Table 12***: Electricity Intensity: *Size Group 2: 5000-10000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_ELECTRICITY

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 0.38468 | 0.02959 | 4.64 | <.0001 |
| Error | 521 | 3.32181 | 0.00638 | | |
| Corrected Total | 534 | 3.70649 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.07985 | R-Square | 0.1038 |
| Dependent Mean | 0.06263 | Adj R-Sq | 0.0814 |
| Coeff Var | 127.48788 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -0.32770 | 0.18265 | -1.79 | 0.0734 |
| B1 | 0.00018693 | 0.00009266 | 2.02 | 0.0442 |
| B2 | -0.00000315 | 0.00000248 | -1.27 | 0.2049 |
| atlantic | -0.01706 | 0.01166 | -1.46 | 0.1440 |
| quebec | -0.02228 | 0.00999 | -2.23 | 0.0262 |
| prairie | -0.02633 | 0.01186 | -2.22 | 0.0268 |
| bc | 0.01078 | 0.01116 | 0.97 | 0.3346 |
| retany | -0.00737 | 0.01056 | -0.70 | 0.4851 |
| retmany | 0.00739 | 0.01344 | 0.55 | 0.5826 |
| conslight | 0.00731 | 0.00723 | 1.01 | 0.3128 |
| consheat | -0.00784 | 0.01005 | -0.78 | 0.4358 |
| type1 | 0.01192 | 0.01319 | 0.90 | 0.3664 |
| type2 | 0.03254 | 0.01450 | 2.24 | 0.0252 |
| C3H | 0.00062823 | 0.00010579 | 5.94 | <.0001 |

***Table 13***: Electricity Usage: *Size Group 3: 10000-50000 Sq ft.*

Model: MODEL1
Dependent Variable: ELECTRICITY_TOTAL_USAGE TOTAL USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 726590953 | 55891612 | 11.16 | <.0001 |
| Error | 853 | 4271729484 | 5007889 | | |
| Corrected Total | 866 | 4998320437 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 2237.83136 | R-Square | 0.1454 |
| Dependent Mean | 1295.76589 | Adj R-Sq | 0.1323 |
| Coeff Var | 172.70337 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -4908.85890 | 5626.45817 | -0.87 | 0.3832 |
| B1 | 2.10975 | 2.82771 | 0.75 | 0.4558 |
| B2 | 0.07071 | 0.00732 | 9.66 | <.0001 |
| atlantic | 52.55222 | 256.19121 | 0.21 | 0.8375 |
| quebec | -182.21304 | 230.64810 | -0.79 | 0.4297 |
| prairie | -227.80802 | 236.77428 | -0.96 | 0.3363 |
| bc | -70.95012 | 255.07691 | -0.28 | 0.7810 |
| retany | 510.35542 | 227.60987 | 2.24 | 0.0252 |
| retmany | -795.72131 | 275.43868 | -2.89 | 0.0040 |
| conslight | 90.11883 | 157.71548 | 0.57 | 0.5679 |
| consheat | 199.69264 | 242.57757 | 0.82 | 0.4106 |
| type1 | -337.75208 | 326.28390 | -1.04 | 0.3009 |
| type2 | -268.55138 | 337.97348 | -0.79 | 0.4271 |
| C3H | 8.98973 | 2.26588 | 3.97 | <.0001 |

***Table 14***: Electricity Intensity: *Size Group 3: 10000-50000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_ELECTRICITY

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 0.21315 | 0.01640 | 2.97 | 0.0003 |
| Error | 853 | 4.70997 | 0.00552 | | |
| Corrected Total | 866 | 4.92312 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.07431 | R-Square | 0.0433 |
| Dependent Mean | 0.05647 | Adj R-Sq | 0.0287 |
| Coeff Var | 131.58243 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -0.03696 | 0.18683 | -0.20 | 0.8432 |
| B1 | 0.00003371 | 0.00009389 | 0.36 | 0.7197 |
| B2 | 3.248188E-7 | 2.429737E-7 | 1.34 | 0.1816 |
| atlantic | -0.00598 | 0.00851 | -0.70 | 0.4824 |
| quebec | -0.00554 | 0.00766 | -0.72 | 0.4694 |
| prairie | -0.00869 | 0.00786 | -1.11 | 0.2694 |
| bc | -0.00375 | 0.00847 | -0.44 | 0.6578 |
| retany | 0.01940 | 0.00756 | 2.57 | 0.0104 |
| retmany | -0.02775 | 0.00915 | -3.03 | 0.0025 |
| conslight | 0.00366 | 0.00524 | 0.70 | 0.4854 |
| consheat | 0.00128 | 0.00805 | 0.16 | 0.8734 |
| type1 | -0.00519 | 0.01083 | -0.48 | 0.6319 |
| type2 | -0.00389 | 0.01122 | -0.35 | 0.7289 |
| C3H | 0.00034922 | 0.00007524 | 4.64 | <.0001 |

***Table 15***: Electricity Usage: *Size Group 4: > 50000 Sq ft.*

Model: MODEL1
Dependent Variable: ELECTRICITY_TOTAL_USAGE TOTAL USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 72886277471 | 5606636729 | 54.44 | <.0001 |
| Error | 344 | 35425307300 | 102980544 | | |
| Corrected Total | 357 | 1.083116E11 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 10148 | R-Square | 0.6729 |
| Dependent Mean | 11005 | Adj R-Sq | 0.6606 |
| Coeff Var | 92.21230 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -15379 | 48687 | -0.32 | 0.7523 |
| B1 | 6.55146 | 24.45669 | 0.27 | 0.7890 |
| B2 | 0.08424 | 0.00350 | 24.07 | <.0001 |
| atlantic | -1306.97057 | 1761.10854 | -0.74 | 0.4585 |
| quebec | 1137.96687 | 1542.88741 | 0.74 | 0.4613 |
| prairie | -856.51768 | 1534.35021 | -0.56 | 0.5771 |
| bc | 1723.89204 | 2043.21693 | 0.84 | 0.3994 |
| retany | -1301.45616 | 1559.98519 | -0.83 | 0.4047 |
| retmany | 4283.51952 | 1699.98132 | 2.52 | 0.0122 |
| conslight | 707.62860 | 1228.26387 | 0.58 | 0.5649 |
| consheat | -2397.78307 | 3330.12067 | -0.72 | 0.4720 |
| type1 | 923.80856 | 2706.75060 | 0.34 | 0.7331 |
| type2 | 1590.77079 | 2663.47035 | 0.60 | 0.5507 |
| C3H | 11.50235 | 13.82648 | 0.83 | 0.4060 |

***Table 16***: Electricity Intensity: *Size Group 4: > 50000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_ELECTRICITY

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 13 | 0.06227 | 0.00479 | 2.06 | 0.0158 |
| Error | 344 | 0.79850 | 0.00232 | | |
| Corrected Total | 357 | 0.86077 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.04818 | R-Square | 0.0723 |
| Dependent Mean | 0.06715 | Adj R-Sq | 0.0373 |
| Coeff Var | 71.74422 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -0.07219 | 0.23115 | -0.31 | 0.7550 |
| B1 | 0.00006264 | 0.00011611 | 0.54 | 0.5899 |
| B2 | 1.766043E-8 | 1.661312E-8 | 1.06 | 0.2885 |
| atlantic | -0.02338 | 0.00836 | -2.80 | 0.0055 |
| quebec | -0.00387 | 0.00733 | -0.53 | 0.5977 |
| prairie | -0.01581 | 0.00728 | -2.17 | 0.0306 |
| bc | 0.00334 | 0.00970 | 0.34 | 0.7310 |
| retany | 0.00179 | 0.00741 | 0.24 | 0.8091 |
| retmany | 0.00934 | 0.00807 | 1.16 | 0.2480 |
| conslight | 0.00328 | 0.00583 | 0.56 | 0.5741 |
| consheat | -0.01350 | 0.01581 | -0.85 | 0.3938 |
| type1 | 0.01323 | 0.01285 | 1.03 | 0.3041 |
| type2 | 0.02783 | 0.01265 | 2.20 | 0.0284 |
| C3H | 0.00008890 | 0.00006564 | 1.35 | 0.1765 |

***Table 17***: Natural Gas Usage: *Size Group 1: 1000-5000 Sq ft.*

Model: MODEL1
Dependent Variable: NATURALGAS_TOTAL_USAGE TOTAL USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 12 | 18753288 | 1562774 | 8.49 | <.0001 |
| Error | 424 | 78082261 | 184156 | | |
| Corrected Total | 436 | 96835549 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 429.13433 | R-Square | 0.1937 |
| Dependent Mean | 395.72535 | Adj R-Sq | 0.1708 |
| Coeff Var | 108.44247 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -721.64513 | 1307.41241 | -0.55 | 0.5813 |
| B1 | 0.26819 | 0.66058 | 0.41 | 0.6849 |
| B2 | 0.13285 | 0.01957 | 6.79 | <.0001 |
| quebec | 24.41420 | 56.80852 | 0.43 | 0.6676 |
| prairie | 157.70445 | 56.27474 | 2.80 | 0.0053 |
| bc | -20.89235 | 84.61776 | -0.25 | 0.8051 |
| retany | 34.22765 | 64.34245 | 0.53 | 0.5950 |
| retmany | -1.02983 | 81.47490 | -0.01 | 0.9899 |
| conslight | 94.96573 | 43.16762 | 2.20 | 0.0284 |
| consheat | -32.60807 | 56.39008 | -0.58 | 0.5634 |
| type1 | -116.44457 | 130.05462 | -0.90 | 0.3711 |
| type2 | -96.66598 | 134.62094 | -0.72 | 0.4731 |
| C3H | 3.99695 | 0.61598 | 6.49 | <.0001 |

***Table 18***: Natural Gas Intensity: *Size Group 1: 1000-5000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_NATURALGAS

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 12 | 1.23268 | 0.10272 | 5.30 | <.0001 |
| Error | 424 | 8.21587 | 0.01938 | | |
| Corrected Total | 436 | 9.44856 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.13920 | R-Square | 0.1305 |
| Dependent Mean | 0.14058 | Adj R-Sq | 0.1059 |
| Coeff Var | 99.02066 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | 0.16765 | 0.42410 | 0.40 | 0.6928 |
| B1 | -0.00004455 | 0.00021428 | -0.21 | 0.8354 |
| B2 | -0.00000652 | 0.00000635 | -1.03 | 0.3046 |
| quebec | 0.02273 | 0.01843 | 1.23 | 0.2181 |
| prairie | 0.04887 | 0.01825 | 2.68 | 0.0077 |
| bc | -0.00363 | 0.02745 | -0.13 | 0.8949 |
| retany | 0.00632 | 0.02087 | 0.30 | 0.7622 |
| retmany | -0.00211 | 0.02643 | -0.08 | 0.9364 |
| conslight | 0.02123 | 0.01400 | 1.52 | 0.1303 |
| consheat | -0.00803 | 0.01829 | -0.44 | 0.6608 |
| type1 | -0.03453 | 0.04219 | -0.82 | 0.4135 |
| type2 | -0.03407 | 0.04367 | -0.78 | 0.4357 |
| C3H | 0.00144 | 0.00019981 | 7.21 | <.0001 |

***Table 19***: Natural Gas Usage: *Size Group 2: 5000-10000 Sq ft.*

Model: MODEL1
Dependent Variable: NATURALGAS_TOTAL_USAGE TOTAL USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 12 | 24392391 | 2032699 | 2.59 | 0.0027 |
| Error | 314 | 246446610 | 784862 | | |
| Corrected Total | 326 | 270839001 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 885.92427 | R-Square | 0.0901 |
| Dependent Mean | 748.37108 | Adj R-Sq | 0.0553 |
| Coeff Var | 118.38035 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -852.35959 | 3012.59022 | -0.28 | 0.7774 |
| B1 | -0.01895 | 1.52133 | -0.01 | 0.9901 |
| B2 | 0.08788 | 0.03580 | 2.45 | 0.0146 |
| quebec | 181.36694 | 137.90972 | 1.32 | 0.1894 |
| prairie | 60.54805 | 148.27660 | 0.41 | 0.6833 |
| bc | 221.21778 | 167.15471 | 1.32 | 0.1867 |
| retany | -18.69935 | 139.55923 | -0.13 | 0.8935 |
| retmany | 55.46991 | 176.06703 | 0.32 | 0.7529 |
| conslight | 55.83165 | 103.70590 | 0.54 | 0.5907 |
| consheat | 103.97851 | 157.39214 | 0.66 | 0.5093 |
| type1 | 435.79787 | 249.68119 | 1.75 | 0.0819 |
| type2 | 533.63200 | 269.26253 | 1.98 | 0.0484 |
| C3H | 5.68490 | 1.44056 | 3.95 | <.0001 |

***Table 20***: Natural Gas Intensity: *Size Group 2: 5000-10000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_NATURALGAS

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 12 | 0.45192 | 0.03766 | 2.39 | 0.0059 |
| Error | 314 | 4.95723 | 0.01579 | | |
| Corrected Total | 326 | 5.40915 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.12565 | R-Square | 0.0835 |
| Dependent Mean | 0.11006 | Adj R-Sq | 0.0485 |
| Coeff Var | 114.16002 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | -0.06462 | 0.42727 | -0.15 | 0.8799 |
| B1 | 0.00002914 | 0.00021576 | 0.14 | 0.8927 |
| B2 | -0.00000428 | 0.00000508 | -0.84 | 0.4001 |
| quebec | 0.02316 | 0.01956 | 1.18 | 0.2372 |
| prairie | 0.00267 | 0.02103 | 0.13 | 0.8990 |
| bc | 0.02913 | 0.02371 | 1.23 | 0.2201 |
| retany | -0.00053610 | 0.01979 | -0.03 | 0.9784 |
| retmany | 0.00268 | 0.02497 | 0.11 | 0.9145 |
| conslight | 0.00864 | 0.01471 | 0.59 | 0.5573 |
| consheat | 0.00858 | 0.02232 | 0.38 | 0.7009 |
| type1 | 0.06256 | 0.03541 | 1.77 | 0.0783 |
| type2 | 0.08136 | 0.03819 | 2.13 | 0.0339 |
| C3H | 0.00088594 | 0.00020431 | 4.34 | <.0001 |

***Table 21***: Natural Gas Usage: *Size Group 3: 10000-50000 Sq ft.*

Model: MODEL1
Dependent Variable: NATURALGAS_TOTAL_USAGE TOTAL USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 12 | 414899490 | 34574957 | 10.59 | <.0001 |
| Error | 603 | 1969315134 | 3265863 | | |
| Corrected Total | 615 | 2384214624 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 1807.16977 | R-Square | 0.1740 |
| Dependent Mean | 1676.94959 | Adj R-Sq | 0.1576 |
| Coeff Var | 107.76530 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | 4965.26449 | 5690.04353 | 0.87 | 0.3832 |
| B1 | -3.04372 | 2.84576 | -1.07 | 0.2852 |
| B2 | 0.06868 | 0.00742 | 9.25 | <.0001 |
| quebec | -159.16615 | 204.37679 | -0.78 | 0.4364 |
| prairie | 571.56053 | 203.80915 | 2.80 | 0.0052 |
| bc | -11.55724 | 262.98272 | -0.04 | 0.9650 |
| retany | 2.04989 | 208.17717 | 0.01 | 0.9921 |
| retmany | 106.40377 | 254.99360 | 0.42 | 0.6766 |
| conslight | 87.31889 | 150.83437 | 0.58 | 0.5629 |
| consheat | 348.14834 | 239.20602 | 1.46 | 0.1461 |
| type1 | 489.02981 | 391.83500 | 1.25 | 0.2125 |
| type2 | 404.56689 | 407.18948 | 0.99 | 0.3208 |
| C3H | 4.83906 | 2.24742 | 2.15 | 0.0317 |

***Table 22***: Natural Gas Intensity: *Size Group 3: 10000-50000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_NATURALGAS

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 12 | 0.18891 | 0.01574 | 2.71 | 0.0014 |
| Error | 603 | 3.49973 | 0.00580 | | |
| Corrected Total | 615 | 3.68863 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.07618 | R-Square | 0.0512 |
| Dependent Mean | 0.08032 | Adj R-Sq | 0.0323 |
| Coeff Var | 94.85201 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | 0.31341 | 0.23987 | 1.31 | 0.1918 |
| B1 | -0.00014865 | 0.00011997 | -1.24 | 0.2158 |
| B2 | -3.76399E-7 | 3.129348E-7 | -1.20 | 0.2295 |
| quebec | -0.00379 | 0.00862 | -0.44 | 0.6605 |
| prairie | 0.02144 | 0.00859 | 2.50 | 0.0128 |
| bc | -0.00250 | 0.01109 | -0.23 | 0.8217 |
| retany | 0.00480 | 0.00878 | 0.55 | 0.5844 |
| retmany | -0.00265 | 0.01075 | -0.25 | 0.8055 |
| conslight | 0.00679 | 0.00636 | 1.07 | 0.2860 |
| consheat | 0.01893 | 0.01008 | 1.88 | 0.0610 |
| type1 | 0.02940 | 0.01652 | 1.78 | 0.0756 |
| type2 | 0.02413 | 0.01717 | 1.41 | 0.1604 |
| C3H | 0.00023299 | 0.00009474 | 2.46 | 0.0142 |

***Table 23***: Natural Gas Usage: *Size Group 4: > 50000 Sq ft.*

Model: MODEL1
Dependent Variable: NATURALGAS_TOTAL_USAGE TOTAL USAGE

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 12 | 29122268924 | 2426855744 | 13.11 | <.0001 |
| Error | 206 | 38122197454 | 185059211 | | |
| Corrected Total | 218 | 67244466378 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 13604 | R-Square | 0.4331 |
| Dependent Mean | 10550 | Adj R-Sq | 0.4001 |
| Coeff Var | 128.94965 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | 114265 | 71841 | 1.59 | 0.1133 |
| B1 | -57.20215 | 35.77639 | -1.60 | 0.1114 |
| B2 | 0.07176 | 0.00693 | 10.35 | <.0001 |
| quebec | 217.98664 | 2677.30727 | 0.08 | 0.9352 |
| prairie | 8727.35940 | 2438.82415 | 3.58 | 0.0004 |
| bc | -913.00441 | 3505.47239 | -0.26 | 0.7948 |
| retany | 1264.37422 | 2515.76165 | 0.50 | 0.6158 |
| retmany | -530.56678 | 2803.78399 | -0.19 | 0.8501 |
| conslight | 1510.95775 | 2148.00849 | 0.70 | 0.4826 |
| consheat | 3486.57151 | 5460.82990 | 0.64 | 0.5239 |
| type1 | -12939 | 6079.89184 | -2.13 | 0.0345 |
| type2 | -14560 | 5928.56295 | -2.46 | 0.0149 |
| C3H | 59.54467 | 23.61370 | 2.52 | 0.0124 |

***Table 24***: Natural Gas Intensity: *Size Group 4: > 50000 Sq ft.*

Model: MODEL2
Dependent Variable: INTENSITY_NATURALGAS

Analysis of Variance

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 12 | 0.12030 | 0.01003 | 3.03 | 0.0006 |
| Error | 206 | 0.68208 | 0.00331 | | |
| Corrected Total | 218 | 0.80238 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 0.05754 | R-Square | 0.1499 |
| Dependent Mean | 0.06846 | Adj R-Sq | 0.1004 |
| Coeff Var | 84.04910 | | |

Parameter Estimates

| Variable | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| Intercept | 0.47302 | 0.30388 | 1.56 | 0.1211 |
| B1 | -0.00021337 | 0.00015133 | -1.41 | 0.1601 |
| B2 | 3.130408E-8 | 2.932858E-8 | 1.07 | 0.2871 |
| quebec | 0.00865 | 0.01132 | 0.76 | 0.4459 |
| prairie | 0.04237 | 0.01032 | 4.11 | <.0001 |
| bc | -0.00241 | 0.01483 | -0.16 | 0.8712 |
| retany | -0.00421 | 0.01064 | -0.40 | 0.6927 |
| retmany | 0.01563 | 0.01186 | 1.32 | 0.1890 |
| conslight | -0.00449 | 0.00909 | -0.49 | 0.6215 |
| consheat | 0.02534 | 0.02310 | 1.10 | 0.2739 |
| type1 | -0.04366 | 0.02572 | -1.70 | 0.0911 |
| type2 | -0.05635 | 0.02508 | -2.25 | 0.0257 |
| C3H | 0.00028002 | 0.00009988 | 2.80 | 0.0055 |

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