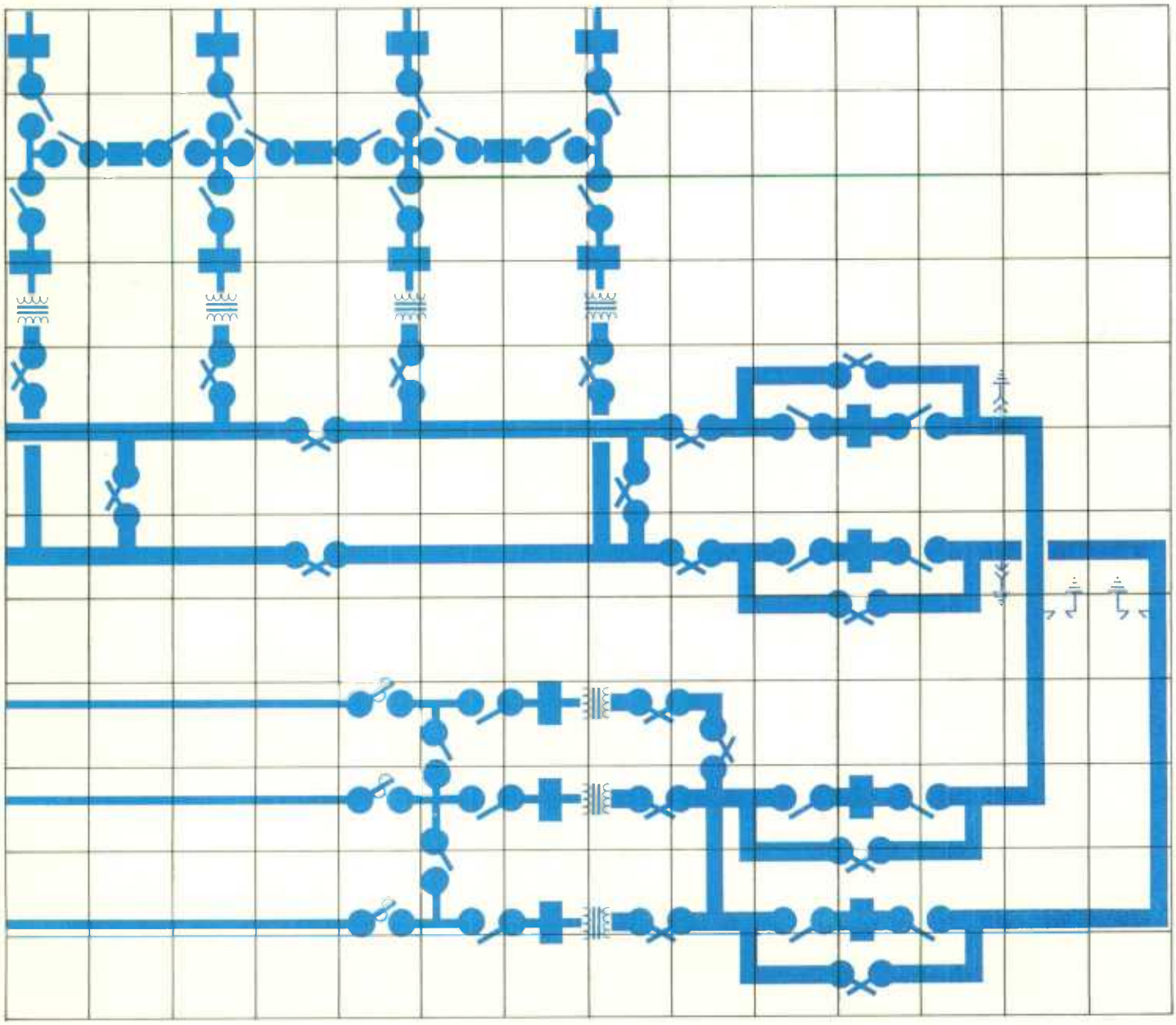
CATALOGUE Nº 62-526 OCCASIONAL

Price Indexes OF Electrical Utility Construction

1956—65



DOMINION BUREAU OF STATISTICS

DOMINION BUREAU OF STATISTICS
Prices Division
Wholesale Prices Section

PRICE INDEXES OF ELECTRIC UTILITY CONSTRUCTION

1956 - 65

(1961 = 100)

Distribution Systems
Transmission Lines
Transformation and Switching Stations

Reference Paper

Published by Authority of
The Minister of Trade and Commerce

June 1967
8205-501

Price: 75 cents

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa

PREFACE

This publication introduces a new series of annual input price indexes which measure the movement through time of materials, labour, and equipment used in the construction of some electric utility facilities. Base-weighted indexes are presented herein for the period 1956 to 1965 for distribution systems, transmission lines, and for transformation and switching stations. Indexes for hydro-electric generating stations and for steam-electric generating stations are being developed.

The electric utility construction price indexes represent a valuable extension in coverage of the area of price statistics relating to elements of gross fixed capital formation. In this connection the Bureau would like to acknowledge the generous contribution made to the design and planning of this difficult project by the Canadian Electrical Association.

The indexes were prepared in the Capital Expenditures Price Indexes Unit of the Prices Division under the supervision of Mrs. Constance M. Jones.

WALTER E. DUFFETT,

Dominion Statistician.

TABLE OF CONTENTS

Charts and Tables

Appendices

SECTION I. SUMMARY

The base-weighted price indexes of the costs of constructing electrical utility distribution systems, transmission lines and stations in Canada express prices in a given year for materials, labour and equipment as a percentage of prices for the same components of cost in the base year 1961. Annual indexes from 1956 to 1965 are presented herein and subsequent indexes will be published annually in "Prices and Price Indexes", DBS Catalogue No. 62-002.

In electric utility terms, the index is designed to provide an estimate of the impact of price change on the cost of materials, labour and equipment used in constructing and equipping electric utilities in a specified base period. The index provides an estimate of how much more, or less, it would cost to reproduce the base-period programme of construction in another period, using the same construction technology as in the base period and assuming rates of profit and productivity in construction are the same in both periods.

As the market does not yield comparable selling prices for such unique transactions as, for example, the sale of a transmission line, it was not possible to produce an index of the prices of completed structures. Completed structure indexes would be appropriate for users wishing either to estimate reproduction costs or to deflate capital formation. For such uses the indexes introduced in this publication have specific shortcomings. Nonetheless, they may be helpful for such purposes provided the users understand the deficiencies. Thus the reader is asked to make particular note of Section III, Capital Expenditures Price Indexes—The Necessity for Compromise and Section XI, Uses and Limitations. In addition, because particular construction projects are unique, the **aggregate** indexes will not likely be appropriate to specific projects since they relate to an average mix of materials, labour and equipment derived from a variety of projects in a specific base period. Thus, if the component price indexes and their weights included in the aggregate index presented herein are inappropriate for a particular purpose the user should consider selecting appropriate component indexes from among those published herein. These indexes could then be combined into an aggregate index by utilizing weights derived from the projects or assets to be costed or deflated.

Prices used in the indexes are for the most part selling prices reported monthly by manufacturers for materials or equipment. The price reported is for units and terms of sale representative of the volume sales of the manufacturer. Where sales to electric utilities form a small share of the total sales of the manufacturer, the price reported may not adequately represent the price to the construction trade and others directly involved in constructing and equipping electric utility facilities. In such cases, prices charged other manufacturers or wholesalers have been included in the index. Federal sales tax changes are reflected in the index but no adjustments have been made for provincial tax changes. Wage rate data have been supplied by the Department of Labour and represent minimum hourly rates paid to construction workers on federal government contracts.

Construction has been defined as new construction or major reconstruction for distribution systems, transmission lines and transformation or switching stations. Maintenance and operating costs are excluded. Cost data were supplied by major utilities, relating to own account and to contract construction erected during the last half of the 1950's. Weights were derived from these data which indicated the relative importance of the major inputs to the construction. The components of cost relating to distribution and transmission facilities encompass such items as poles, hardware, conductor, insulators, meters, distribution transformers and expenditures for labour, e.g.—linemen and groundmen. Costs relating to construction equipment such as trucks, and components of equipment operating costs such as tires, gasoline and repairs were also included. Transformation and switching stations encompass some of the items listed above but the most important elements of cost relate to transformers and switching equipment. Expenditures for land and rights-of-way have been excluded.

The term Canadian electric utility has been defined to include municipal as well as non-municipal utilities but the majority of the cost data tabulated was derived from the major non-municipal utilities. Manufacturers who produce electricity for their own use and who may also sell electricity have been excluded from the cost survey.

SECTION II. INTRODUCTION

This publication presents new price indexes for materials, labour and equipment used in the construction of electric utility distribution systems,[1] transmission lines[2] and transformation and switching stations.[3,4]

Throughout the development of these indexes the Dominion Bureau of Statistics has received the close co-operation of the Canadian Electrical Association.[5] Indeed, demand for the development of these indexes was first received from the CEA in 1958, and it was only because this organization agreed to provide necessary technical advice that the Bureau agreed to undertake a project in this difficult area of price measurement.

CEA technical advisors were appointed and through their efforts agreement was reached with the electric utilities as to the nature and volume of cost data which would be reported to the Bureau by the utilities and used in the derivation of weighting diagrams. In addition, specifications were provided by the advisors for the commodities for which it would be necessary and appropriate to ask manufacturers to provide prices. Technical advisors and other CEA members have reviewed the weighting patterns and the price indexes published herein and their comments have been most helpful in terms of minimizing errors and inconsistencies and most importantly in suggesting sensible compromises in the face of some formidable data shortages.

The following sections deal with the characteristics of the indexes, their uses and limitations and the various technical features of their construction. Annual indexes for 1956 to 1965[6] are presented numerically and in chart form. The base-period weighting diagrams are also presented. Finally a number of detailed appendices are provided for the assistance of those making extensive use of the indexes.

---

[1] A distribution system is that portion of an electric system which is used to deliver electric energy from points on the transmission or bulk power system to consumers. Distribution lines operate at relatively low voltage as compared with transmission lines.

[2] Transmission lines relate to that portion of utility plant used for the transfer of electric energy in bulk between points of supply and points at which it is transformed for delivery to ultimate consumers, or is delivered to the electric systems of others.

[3] Stations (or substations) are assemblages of equipment for the purpose of switching and/or changing or regulating the voltage of electricity. Customers' service equipment, line transformer installations or minor distribution or transmission equipment are not classified as stations.

A switching station is an assemblage of equipment for the sole purpose of tying together two or more electric circuits through switches, selectively arranged to permit a circuit to be disconnected or to change the electric connections between circuits. It is a type of station.

[4] Indexes of a similar nature to those discussed herein are under preparation for steam-electric generating stations and for hydro-electric generating stations. No estimate can be given as to the probable date of completion of these indexes.

[5] This organization will be referred to as the CEA.

[6] Subsequent indexes will be published from time to time in "Prices and Price Indexes", DBS monthly publication, Catalogue No. 62-002, $4.00.

SECTION III. CAPITAL EXPENDITURES PRICE INDEXES – THE NECESSITY FOR COMPROMISE

The essential elements of any price index are **prices of items** and **weights** representing the relative importance which should be attached to the movement through time of prices of individual items or groups of items. In addition a **time base** period during which prices are defined as equal to 100 and a **weight base** period for establishing weights to be assigned to the items, are required.

The price component is the most important and difficult element of any index but particularly so in an area such as construction which rarely produces standard products which are reproduced in other time periods. The solution or lack of solution, to the problem of lack of comparability over time conditions decisions about all elements of the indexes, but particularly the selection of prices for the indexes. A thorough understanding of the prices used is, therefore, of first importance in the interpretation and use of the indexes.

Price is by definition, the value in exchange of a specified unit of a commodity or service, at a specific time and location, and under given conditions of purchase or sale. Further, for measurement of price change over time, it is essential that the prices being compared relate to the identical or equivalent quantity and quality of commodity or service.

It is obvious that electric utility facilities, like most other engineering construction projects, are unique and complex aggregations of commodities and services for which the collection of comparable prices through time is a practical impossibility.

A number of solutions to the problem of price comparison have been suggested. One possible solution has been tested in the United States by the Bureau of the Census and applied to housing with what those testing the technique believe to be a fair degree of success. It consists of establishing statistically the amount of variation in the price of a product, (in this case, a house), associated with differences in characteristics of such a product (number of rooms, square feet of floor space, type

of structure – wood, brick, etc., types of heating, and so on). On the basis of that knowledge, differences in the prices of such products "caused" by differing characteristics or qualities of units sold in successive time periods can be estimated and eliminated from the measurement of change in price between two time periods. In addition to copious quantities of data from respondents, this technique requires that there be no major discontinuities in characteristics of the object being priced. There are also statistical problems in interpreting the validity of the results. It was not thought possible to make use of this technique in the development of the present indexes.

Another alternative is to price portions of projects rather than completed projects. This technique was applied in the development of the "Price Indexes of Highway Construction"[7] wherein bid prices for specific elements from contracts let by provincial governments were employed, for example, a ton of crushed gravel in place. The method developed to determine a useable price can be described as follows. Plots of the bids and their quantities on scatter diagrams revealed the total amount of variation in the bids. Major causes of the variation were identified which permitted the classification of the bids into groups wherein the bids of any given group were of essentially similar characteristics. The price average derived for any given group is compared only with averages derived for the same group in other years. This procedure requires that a number of conditions prevail. In general it assumes that:

(a) Most work is done by contract.

(b) Most work is done to a uniform set of specifications.

(c) The contracts are let in such a way that quantities and values are recorded on the contract for the major contract items.

For any given major item which is being analyzed for price index purposes it assumes further that:

(a) Sufficient contracts are let each year so that group averages can be calculated.

(b) The variation in price caused by the unavoidable variation in geologic, geographic and other conditions not accounted for in the classification system is relatively minor.

[7] DBS Occasional Paper, Catalogue No. 62-520.

The conditions outlined in the two preceding paragraphs do not prevail for electric utility construction and it has been necessary to fall back on the traditional input approach which has been adopted here. The ideal index for most users would be an output index – an index of the price of the finished or completed product. In such an index, price movements would reflect changes in profits of contractors and changes in productivity in construction which were passed on to the buyers of the completed construction. In a traditional input index, these two factors are not permitted to influence the movement of the index. Thus the decision to adopt an input approach for the present indexes was made only because no other alternative was feasible.

The input-cost indexes weight together changes in wage rates as well as changes in prices for materials and equipment[8] in the proportion revealed by the examination of the base period cost data. No alteration will be made in the published weights until the index is revised. Further, when the input indexes are used as substitutes for output indexes, there is the implicit assumption that no changes occur in construction industry productivity nor in construction industry profit and loss margins. It is known that both these assumptions are faulty. It is believed that by missing the effect of changes in productivity the input index is caused to rise more steeply than would an output index over long periods of time, and that failure to include the effect of changes in profits causes the input index to be too stable within short periods of time, i.e., cyclical movements of output prices are not reflected by it.

Having found it unavoidable to follow an input approach, utilities were asked to provide cost data in sufficient detail to determine the relative proportion of materials, labour and equipment. Sellers[9] of goods and services which were used by contractors and utilities in the erection of these facilities were asked to report prices.

[8] The term equipment, as used here and elsewhere in the text, encompasses both construction machinery and equipment used only in erecting the facilities, and production machinery and equipment which is installed during construction and remains for a period of time to serve the utility in a productive capacity. For a further explanation of this classification system see Section VI, page 13.

[9] Manufacturers and others supplying prices have co-operated generously in providing the necessary data.

SECTION IV. SOURCES AND COLLECTION OF PRICE DATA

Prices used in the index fall into the following general classes:

1. Products of manufacturing industries:
   (a) mass-produced standard items;
   (b) non-standard items;
   (c) mass-produced goods wherein price families cannot be identified.
2. In-place prices.
3. Wage rates.
4. Substitute prices.

The characteristics of these prices follow.

Products of Manufacturing Industries

Mass-produced standard items. – Inasmuch as prices for many of the items falling in this category were available from the Industry Selling Price Indexes or were collected specifically for the present index following similar procedures, it is useful to review the characteristics of industry selling prices.[10] They are as follows:

(a) The value of shipments for the commodity priced (or for the price family the commodity represents) represented an important portion of sales for the industry in the weight-base period.

(b) Because it is expected that nearly similar commodities will exhibit similar price movement, the pricing specification of the commodity selected will usually represent price change not only for itself but for a larger family of nearly similar commodities. (For example, one bare copper conductor of a particular diameter will exhibit similar price change to bare copper conductors of many other diameters.) The specific commodity selected for pricing is usually the one with the largest volume of sales within the price family.

(c) Prices of the specific commodity selected to represent the price family relate to new order prices taken on or near the 15th of the month. New order prices have been collected for the Industry Selling Price Indexes because they reflect the most recent prices produced by the market. If there is a lag between ordering and shipment and if prices are changing rapidly, new order price indexes can be misleading if used as indicators of shipment prices. It would be more consistent with the characteristic of the electric utility construction indexes to have used shipment prices which would more closely represent prices paid by the contractors or utilities. However, for the commodities included in the indexes the lag between ordering and shipping is usually relatively short. This inappropriateness of the price series is not thought to be of significance.

(d) The price requested is the actual transaction price which means that all discounts and other concessions and rebates are to be deducted from the price reported to the Bureau.

(e) While Industry Selling Price Indexes do not reflect changes in Federal Sales Tax, indexes reflecting prices paid for goods and services used in electric utility construction should reflect changes in Federal Sales Tax. As a result, all prices have been adjusted, where appropriate, to reflect changes in Federal Sales Tax.[11]

(f) Prices are either f.o.b. plant or are prevented, as far as is possible, from reflecting changes in transportation rates. This condition is also incompatable with the needs of an electric utility construction price index but the resources necessary to provide an appropriate measure of transportation-rate price change are not available currently.

When it was necessary to extend price coverage manufacturers already reporting prices were asked to expand their price reporting or additional manufacturers were asked to report prices for the items needed. As was suggested previously, the new reporting was on a basis specifically appropriate for use in the present index if sales to electric utilities constituted a significant portion of sales. Otherwise prices represent sales to a more important class of customer such as contractors or wholesalers. All other conditions outlined previously prevailed for the new price collections.

To obtain a commodity index, calculations proceed as follows for the electric utility indexes:

(a) The price reported by a given manufacturer is converted into a ratio (price relative) by comparing the currently quoted price with a comparable base period price, i.e., current price is expressed as a percentage of the base period price.

(b) The process outlined in (a) is repeated for all other manufacturers reporting prices for the same commodity.

(c) The ratios from steps (a) and (b) are then averaged, equal weight being given to each ratio. This average is interpreted as representing the average price ratio (current price as percent of base price) for all manufacturers sales in that month to electric utilities for the commodity specified.

(d) The annual index or ratio for the commodity is derived by calculating a simple average of the 12 monthly ratios.

Non-standard items. – Pricing of non-standard custom-made commodities was necessary for metal-clad switchgear, power circuit breakers, large and power transformers and steel transmission towers. For most of these items the element of engineering and design is high and standard production runs are rarely possible. Thus it is impossible to ask the manufacturer to report a new order price for a comparable transaction in a number of consecutive periods.

The problem of lack of comparability was treated as follows:[12]

(a) Metal-clad switchgear. – Metal-clad switchgear is made up of components some of which are mass-produced but the combination of which will rarely be the same for successive purchasers.

---

[10] A copy of the price collection form used for collecting these and other prices can be found in Appendix G.

[11] In Appendix B will be found a summary of the Federal Sales Tax rates which were used to adjust the prices.

[12] The techniques outlined were developed as a result of consultations between manufacturers, the Canadian Electrical Manufacturers Association and those preparing the Industry Selling Price Indexes.

Model pricing has been resorted to, whereby manufacturers agreed to a package of commonly purchased components, and in successive months report prices which are in fact the sum or prices of the components in the model. The danger in using this technique is that discounts or other price concessions granted to actual purchasers may not be reflected in the price quoted for the model.

(b) Power circuit breakers. –

(i) Four classes of circuit breakers were established.[13]

(ii) Class indexes are calculated quarterly as follows:

For each reporting company, current sales are compared with base-period sales and those which are identical as to number, class and type are retained for the price comparison. The matched quantities retained are valued first in the transaction prices of the current period and then in the transaction prices of the base period. The products resulting are summed and a ratio (index) of the following type is derived:

$$\frac{\Sigma(p_1 q_a)}{\Sigma(p_0 q_a)} \times 100$$

(iii) The class indexes (ratios) are combined for each company by means of weights derived from base-period shipment values.

(iv) The resulting "company" index is combined with indexes derived similarly for other reporting companies to yield the published index for power circuit breakers.[14] The company indexes are combined using weights derived from base period sales.

(c) Power transformers. – Companies reporting define a model for which they can report list prices through time. The list price is adjusted in each period by the following ratio:

$$\frac{\text{current sales valued at actual transaction prices}}{\text{current sales valued at list prices}}$$

The purpose of the adjustment is to allow competitive conditions affecting transaction prices to influence prices used in the index.

The adjusted list prices are then used in the derivation of price ratios. Company ratios are given equal weight in the derivation of the indexes. Indexes are prepared for both large and small power transformers.

(d) Steel transmission towers. – Attempts are being made to prepare a selling price index for steel transmissions towers. This is proving difficult because of the variability in prices bid and because of the small number of contracts let in any given year. In the interim an index for light structural steel shapes is being used as a substitute until either a selling price index is developed or until a more complete input index can be devised for steel transmission towers.

Mass-produced goods wherein price families cannot be identified. – Initial pricing of wood poles proceeded on the assumption that price families existed. Accordingly each company was asked to supply prices for one or two sizes of poles and it was assumed that the price movement of the 70 or 80 varieties not priced would be similar to that derived from the sample. Technical advisors reviewing the resulting pole index reported that the movement did not reflect the experience of pole purchasers. In subsequent discussions with a number of pole sellers it was decided that the best solution would be to increase the sample size in the anticipation that the substantial variation in price behaviour for individual varieties of poles would be better captured by the expanded sample. The variation arises because of the volatility of the supply of poles available in the forest as it relates to the equally variable demand for individual varieties of poles from the utilities. Demands generated by the export market can further affect the domestic price for individual varieties of poles. Further, no single size of pole is a volume seller.

This same problem is thought to exist in several other areas but the necessary investigations and adjustments to reporting procedures have not been made as yet.

In-place Prices

Highway construction price indexes, which are in-place prices[15] reflecting provincial highway department purchase prices from the construction industry, were available for such components as earth excavation and crushed gravels. There was, therefore, a choice between use of (a) prices in in-place construction reflecting output or end-product price movements for such items and (b) prices of only the basic inputs of such work. The arguments for using the highway indexes were as follows:

(a) The price indexes were available. If the input approach were followed equipment rental rate indexes should be prepared and a long period of time would be required to develop them.

(b) One or two indexes would replace scores of indexes.

(c) Reliable weighting data necessary to link the input indexes together were not available.

The only argument favouring use of prices of basic inputs was that of consistency with other components of the aggregate index. It was decided that prices (indexes) from the highway indexes would be used where available.

For those wishing to use the indexes as a proxy measure of price change for final product, the use of in-place prices will serve to cancel to an

[13] For an outline of the characteristics of the four classes, see Appendix A, page 22.

[14] A current-weighted index is also calculated.

[15] See page 9 for a further description of these prices.

unknown extent part of the error that will result in their use as output indexes because for all the other construction components, changes in construction industry profit and loss and in productivity do not affect the movement of the indexes.[16] For the user wishing an input series only, several indexes have been introduced whose characteristics are incompatable with his needs.

Wage Rates

Wage rates calculated for the construction trades by the Labour Standards Branch of the Department of Labour are utilized as the price data for the labour index. Rates calculated by the Department are used as minimum rates on all federal government construction contracts. For the cities for which rates are published herein the Department of Labour believes that no differentials exist between the federal government rate and the rates prevailing on non-government engineering construction. The rates used for the trades and cities price sample[17] should be interpreted as reflecting union scale because collective agreement rates are paid by most of the employers surveyed. The unit cost of fringe benefits is excluded from the rate used in the index.

The method of collecting these data is as follows. Annual surveys are made in each city of all employers of the construction trades for which the department collects rates. From these surveys a frequency distribution is prepared for each trade. As wages for many trades are now by agreement, the variation in the frequency distribution is narrow.[18] For the cities included herein[19] the rate published by the Department is the rate most commonly reported by the construction industry.

The Department of Labour reports changes in agreements to DBS. Where the agreements have retroactive clauses in them the wage series used herein are revised to give affect to the retroactivity.

No adjustments have been made to the series published herein to attempt to remove any effects caused by changes in the quantity or quality of work done for a given hours work within a particular trade.

Substitute Prices

Finally, mention needs to be made of the system of substitute pricing which was necessary to estimate price movement when specifically appropriate series were not available. Generally, the most nearly appropriate series were borrowed from the General Wholesale Index, the Industry Selling Price Indexes, or the unpublished Machinery and Equipment Price Indexes to fill the gaps. In Appendix A will be found a summary of the characteristics of the appropriate prices together with the years for which the appropriate prices have been included in the index. Substitute series are also described. A brief description of the Machinery and Equipment Indexes is to be found in Appendix C, page 27.

[16] Users will note that these indexes are used only in the Stations Index and that the weight given earth excavation and gravel is small. Hence the error reduction must also be small. However, it is proposed to use these series for the earth and gravel fill component of dam construction. As these components constitute a large proportion of total expenditure the affect of this substitution will be substantial.

[17] See Appendix A, page 22.

[18] Because of the agreements the Department does not always find it necessary to re-examine each trade annually. Nonetheless the field survey does cover all trades from time to time to check on the validity of the rates published.

[19] St. John's, Halifax, Saint John, Montreal, Toronto, Winnipeg, Regina, Edmonton, Vancouver.

SECTION V. COMPARABILITY OF PRICES THROUGH TIME

Nowhere is the distance between the theoretically desirable and the practically possible more apparent than when attempts are made to ensure that prices used in indexes are comparable through time. In fact, if theoretic exactitude were insisted upon it would be recognized immediately that it is impossible to produce precise index number comparisons because the economic environment in which prices are generated is not in a static state. As a result, it is impossible to select transactions for two different periods of time which are precisely comparable. Thus the art of index construction is one of minimizing major changes in the characteristics of transactions in such a way that the raw prices, or if necessary, the adjusted prices, used in index calculations are as nearly comparable as it is possible to make them.

Widespread discussions are currently taking place about the problems of price comparability. Hopefully, these will lead to improvements which will enable index makers to become more precise in the types and kinds of adjustments which can be made. Nonetheless it must be recognized that currently there is no agreed "best" method of making adjustments to raw price data so that "pure price change" can be derived.

In the meantime indexes are produced wherein a variety of conventions are applied when instances of discontinuity are recognized. The convention followed in making adjustments to the prices used in this index is, for the most part, the same as that applied to the industry selling price series. The following brief description of this technique comes from page 11 of the "Industry Selling Price Indexes" reference paper.[20]

"Switching from a price indicator matching one description to another with a different description, as models and varieties of products change in the

[20] DBS Occasional Publication, Catalogue No. 62-515.

market, necessitates comparing the price of a different product with that of its predecessor. A reconciliation of these differences may be pursued through a relationship between characteristics common to the two products through which their prices may be equated. The problem is approached by assessing the inputs of the two, and from their relationship estimating their price equivalent. In detail, this is accomplished by comparing direct costs of labour and materials valued at the same level of price and technological development for both products. In other words the relative quantities of direct labour and material inputs provide the standard of assessing a price equivalent for the new product. The analogy is restricted to quantities of labour and materials inputs rather than all inputs because of the number of circumstances in which manufacturers do not record other costs on an individual commodity basis. This technique has been applied in many but not all cases of substitution in 1958 and with increasing frequency thereafter. Prior to 1958 there were several methods applied which were largely subjective."

In Appendix D of this paper, a more expanded explanation of this technique is given.

SECTION VI. AN EXPLANATION OF THE TERMS CONSTRUCTION AND EQUIPMENT

DBS classification systems group expenditure for gross fixed capital formation in two categories: construction, and machinery and equipment. For electric utilities all elements of the completed facilities which are mechanically or electrically dynamic such as transformers, switchgear, and meters are classed as machinery and equipment and all elements which are static are classed as construction.

Readers who look at the method used in organizing the indexes may gain the impression that there has been a lack of rigour in applying these definitions. What has happened is that compromises have been made which preserve the essence of the classification system while giving the utilities some relief in reporting detailed values of construction expenditure to DBS. Accordingly, all transmission line expenditure, as expenditure has been defined herein,[21] is classed as construction even though small amounts of equipment expenditure occur for such things as switches. The same reasoning caused stations expenditure to be classed solely as equipment. For distribution systems, only transformers and meters are classed as equipment and all other expenditure falls in the construction component.[22]

When the decision was made to prepare input indexes for electric utility construction the two classes of expenditure were divided further as follows:

Construction
- Materials
- Labour
- Machinery and equipment (referred to in the text as "construction equipment")

Machinery and equipment
- Machinery and equipment (referred to in the text as "production equipment")
- Installation costs

Construction materials and labour are terms which are self-evident. **Construction equipment** refers to the machinery and equipment brought on to the jobsite by either a contractor or a utility to erect the facilities. There are two elements of cost involved: one relating to the capital used in doing the work and the other relating to expenses for operating the equipment. Unpublished DBS Machinery and Equipment Selling Price Indexes[23] have been used, as necessary, to represent the price movement of the capital-used component. It would have been preferable to have made some use of equipment rental rates and it is planned to investigate the possibility of pricing in this difficult area in the next few years. Industry Selling Price Indexes for such elements of cost as tires, repairs, and fuels were used to represent price change for the material operating components. Further investigations into weights and an expansion of price coverage relating to operating costs will proceed over the next few years.

Production equipment refers to equipment which is not normally used in the erection of the facilities but which is put in place for subsequent use by the utility in generating or distributing electricity. Industry Selling Price commodity indexes for such things as transformers, meters, etc. have been used to represent the prive movement of the production equipment component. Because of the lack of suitable weighting data, installation costs remained a component of construction labour for the three lines of capital for which indexes are presented herein.

[21] See Appendix E. Pages 31 to 32 for the definitions of cost used.

[22] Because this classification system may cause difficulty to some utilities, an additional index is published for distribution systems which combines construction materials and production equipment.

[23] A brief summary of the characteristic of these indexes is given in Appendix C, page 27.

SECTION VII. TIME BASE FOR THE INDEX

The time reference base chosen for this index was 1961, i.e., 1961 = 100. The year 1961 was selected as the new base year for DBS indexes, to which as many as possible of the official indexes will be converted as time and resources permit. The use of a uniform base year facilitates direct comparison of movements of various statistical indicators which may be employed in various combinations in a wide range of studies and analyses.

SECTION VIII. INDEX WEIGHTS

As was suggested earlier, the function of a weighting system is to establish suitable proportional representation for the price ratios included in the indexes. As was also suggested earlier, the method of selecting the weights and prices is determined by the uses to which the indexes will be put, a procedure which must be modified to circumvent the measurement problems inherent in the particular area being studied. Accordingly the utilities were asked to report their gross expenditures for new plant and equipment or for major reconstruction in whatever detail was available which would indicate costs for materials, labour and equipment.

Most utilities contacted were able to supply gross annual capital additions for three or four years in the late 1950's in varying amounts of detail. The utilities chose years wherein the expenditure patterns could be considered to be representative of company practice. Gross annual fixed capital additions are the cost of the projects as recorded in the utilities' fixed capital accounts for any given year before any retirements of fixed capital are made for that year. These data relate to an aggregation of projects, because projects of this kind are usually completed within one year and a number of projects would normally be undertaken in any one year by the utilities reporting. It was expected that such a regular, reasonably repetitive pattern of expenditure would permit the derivation of reliable average inputs into electric utility construction.[24]

Where gross capital additions data could not be reported in a form which would be useful to DBS without an excessive search of records, utilities selected what they considered to be representative projects. Sometimes the utility provided a weighting system whereby the individual projects could be aggregated into a simulation of gross capital additions. In other cases the individual projects were transformed into ratios and each set of ratios was given an equal weight in the simulation of an average company project.

However, before the data were transformed from dollars into ratios, the cost data were corrected for price change. This was necessary because the utilities had not reported costs for the same years. Further, to eliminate any distortion in the weights because of different rates of price change it is usual to adjust costs for price change so that they are expressed in the prices of the time reference base used for the index, i.e., 1961. As a result the following calculations were made:

(a) For each respondent's average cost data a middle year was selected.

(b) For each element of cost for which it was intended to publish price indexes, the price index or the best available substitute was used to transform the costs into values at 1961 prices. A cost element, where 1956 had been chosen as the middle year of the period to which the reported cost data related, would be transformed as follows:

$$p_{56}q_{56} \times \frac{\frac{p_{61}}{p_{61}}}{\frac{p_{56}}{p_{61}}} = p_{61}q_{56}$$ [25]

where $p_{56}q_{56}$ is the cost element and the ratios the selected price indexes.

The weighting patterns derived in this fashion, while acceptable for a first-generation set of index numbers, suffer from the following defects.

(a) It was assumed that the utilities reporting cost data within a province would represent that province in the Canada weighting pattern. Provincial gross expenditure data in the detail required to achieve the direct assembly of company data were not available and various estimates had to be made. Indeed, for stations, dollar values were discarded and proportions derived from increases in generating capacity were used to assemble together data provided by individual utilities. There were additional problems of a similar nature wherever the provincial total had to be apportioned among all utilities reporting for a given province.

(b) Every major generating utility[26] is represented in the weighting pattern. However, because of the problems implicit in the section above, it is difficult to estimate what proportion of the total construction expenditure undertaken during the last half of the 1950's was utilized in the preparation of the weighting patterns. While generating utilities are well represented, municipal distribution systems are underrepresented.

(c) Gross capital additions are rarely recorded by the utilities in the amount of detail required for price index weighting patterns. Gaps in the data were patched either by means of estimates

[24] The conditions outlined in the paragraph did not prevail for hydro- or steam-electric generating plant. Because of the relative infrequency of their erection, their uniqueness and the length of time which is necessary to complete any given project, it is not possible to find a regular repetitive pattern of expenditure which can be considered representative of expenditure for a particular utility. Thus utilities provided cost data for individual projects and the company weighting patterns have been derived from these individual projects. In the face of formidable data shortages and extreme variations in the data received, it has not been decided yet whether or not it would be possible to do more than prepare a weighting diagram from a simple average of projects analyzed.

[25] For a further explanation of this type of transformation see Appendix F, page 33.

[26] Manufacturers who produce electricity for their own use have been excluded from the survey.

derived from data provided by other utilities, or by making use of estimates provided by technical advisors.

(d) Systems of accounts maintained by the utilities are not uniform. This problem was of little consequence when dealing with individual projects because these data were usually reported in sufficient detail that it was necessary only to reorganize the costs to fit the established pattern. With gross capital additions it was necessary to resort to estimating techniques so that the derived expenditure patterns simulated the definition of cost used in the index. These estimates were made in a fashion similar to the techniques outlined in the preceding paragraph.

Because weights derived from an average of many utilities may well be inappropriate for the use of a particular utility, users were advised above to use the indexes of the component detail which can be re-weighted according to weights derived from the particular utilities own cost records. This advice is valid irrespective of the quality of the weights. Where there are known data deficiencies which reduce the accuracy of the weights the argument is further reinforced.

In Appendix E, page 31 will be found outlines for each of the three systems of capital indicating how cost was defined for index purposes.

SECTION IX. INDEX FORMULA

The formula for the index may be written as follows:

$$I_n = \frac{\Sigma p_n q_0}{\Sigma p_0 q_0} \times 100$$

$$= \Sigma \frac{p_n}{p_0} \times \left\{ \frac{p_0 q_0}{\Sigma p_0 q_0} \times 100 \right\}$$

$$= \Sigma \frac{p_n}{p_0} \times w_0, \text{ where } w_0 = \frac{p_0 q_0}{\Sigma p_0 q_0} \times 100$$

where:

I_n	= index for year n
Σ	= summation over all items
p_n	= price of an item in year n
p_0	= price of an item in year o, the base year
$\frac{p_n}{p_0}$	= price in year n, as a ratio of price in year o, (This price ratio is often referred to as a price relative or an index.)
w_0	= relative importance of the price movement of an item in the index
q_0	= quantity of a particular item in the weight base period
$p_0 q_0$	= value of a particular item in the weight base period
$\Sigma p_0 q_0$	= value of all items in the weight base period
$\frac{p_0 q_0}{\Sigma p_0 q_0} \times 100 = w_0$	= relative value, or weight, of an item in the weight base period

SECTION X. REGIONAL INDEXES

It became clear early in the planning stages of the project that utility users would prefer to have the indexes made available on a regional basis. This was not done for two reasons: (a) more comprehensive cost data would have been required to establish weighting patterns; (b) even with regional weighting patterns, it was thought that there would be sufficient differences between the regional weighting pattern and the experience of a particular utility that the provision of regional indexes alone would not eliminate the necessity for many utilities to re-weight the indexes to suit themselves.[27]

In the absence of regional weights it seemed sensible to provide regional price coverage wherever possible. A modest start has been made in obtaining this type of price coverage and the programme will be continued and expanded with the additional series being published as they become available.

An index of transportation rates would be a useful companion for the regional price series but there is no hope of such an index being provided within the near future.

[27] The Bureau will be pleased to provide advice to utilities and others wishing to re-weight the indexes to suit a particular purpose.

SECTION XI. USES AND LIMITATIONS

Price indexes have an important role to play as one of the many indicators which can be of use in analyzing economic problems.

Anyone interested in analyzing price movement for a wide range of materials and services relating to this particular area of construction is being provided with greatly expanded price coverage. Regional price coverage has been given more emphasis than has been usual and it is intended to seek the necessary prices to expand the regional coverage even further.

However, an important need is for price indexes which can be used to obtain estimates of values of construction from which the affect of price change has been removed.[28,29] It is unfortunate that the values which would relate precisely with the indexes presented are not the values which National Accounts statisticians and utility analysts must use in their analyses. As has been outlined earlier, the price-index maker is currently able to do no more than provide price indexes relating to a portion of the input side of the construction process. The problem is less one of the quality of the input series presented, but primarily that the components included in the indexes presented herein fall short of what is required in the preparation of input indexes to be used as adequate proxy measures of price change for final product or the value of construction in place. If it were possible to capture completely the price change of all the inputs, the sum of the changes plus or minus the change attributable to improved productivity in the utilization of the inputs should correspond to the change which would be shown if price change were measured on the final product side. The areas not covered in the indexes presented herein present the price-index maker with formidable problems: the direct measurement or the finding of suitable alternatives for measuring price change for profits and losses, rates of interest and overheads, and the measurement of productivity change for this type of construction. As was stated earlier, it is believed that the omission of an adjustment for productivity change causes the indexes published to rise more steeply than they should over long periods of time and that ignoring changes in profit and loss causes the index to be too stable within short periods of time. The price movement of the other omitted components is more likely to move similarly to the elements included in the indexes.

These biases are associated more with the construction component of the indexes than with the equipment components, assuming that installation costs are a small portion of the cost of the installed equipment and that manufacturers selling prices are available for the equipment components. Where it is necessary to resort to traditional input pricing for equipment also, then precisely the same biases will be present.

Users of the indexes, in being made aware of these deficiencies, can then bring to bear on the application of the indexes, as much supplementary information and judgement as possible.

---

[28] In Appendix F, page 33 will be found an algebraic illustration of this statement.

[29] Utility interest in deriving such a value series arises from the fact that capital requirements for electric power supply and distribution are heavy, periods of construction are protracted and physical assets are expected to be in useful service for very long periods of time. Any studies or analyses involving investments, must therefore, encompass a long span of years. Because prices do not hold constant during such time periods, the dollar values of capital investment expenditure are rendered not comparable and have limited analytical usefulness.

CHART-1

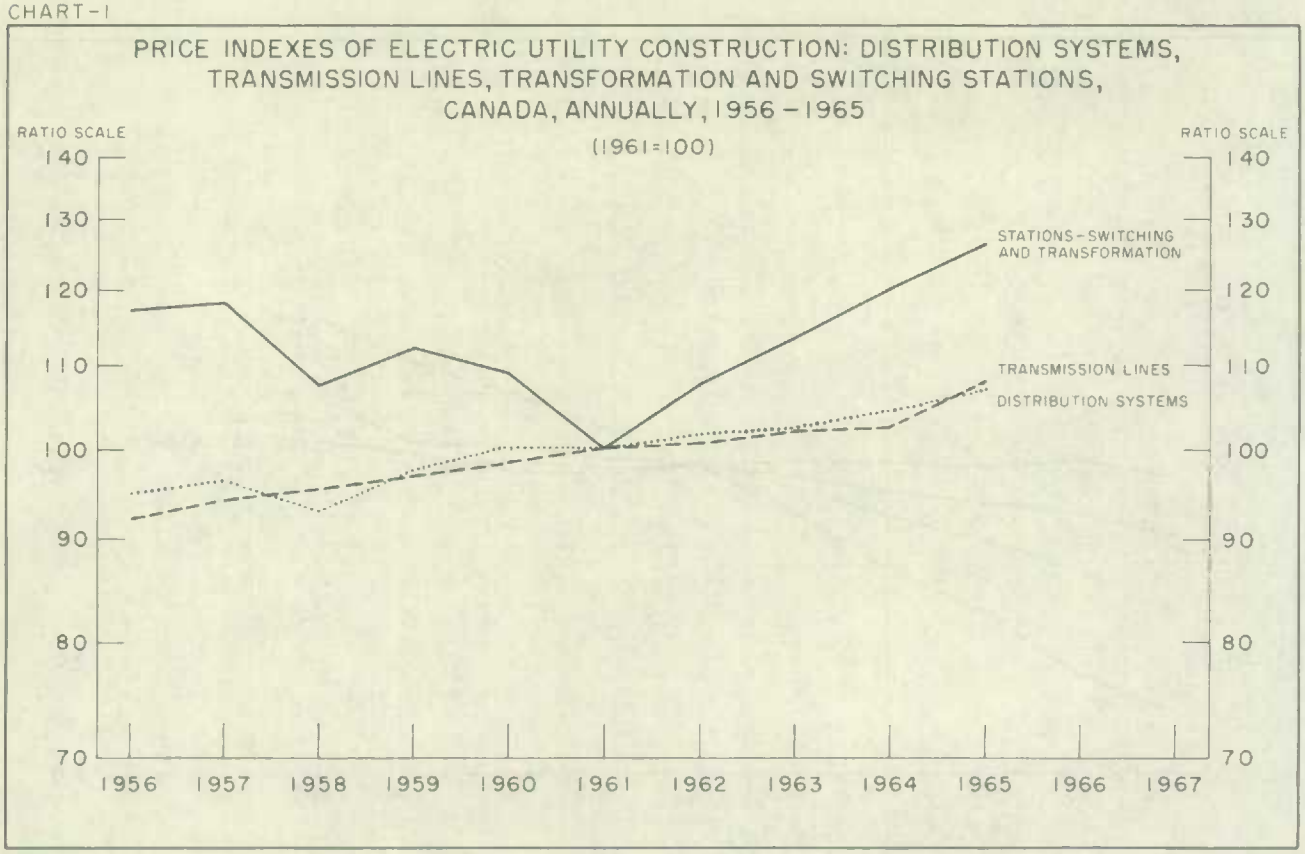


CHART-2

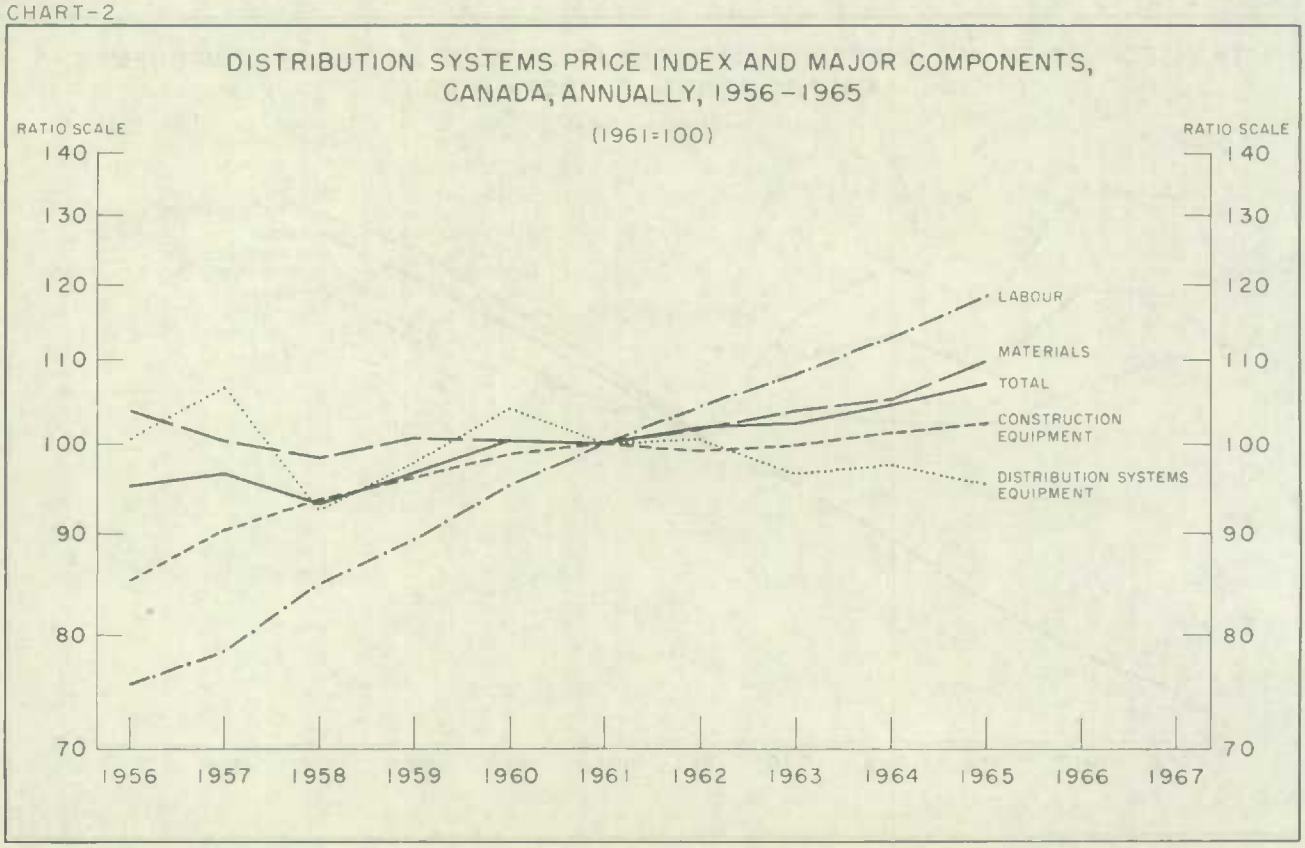


CHART – 3

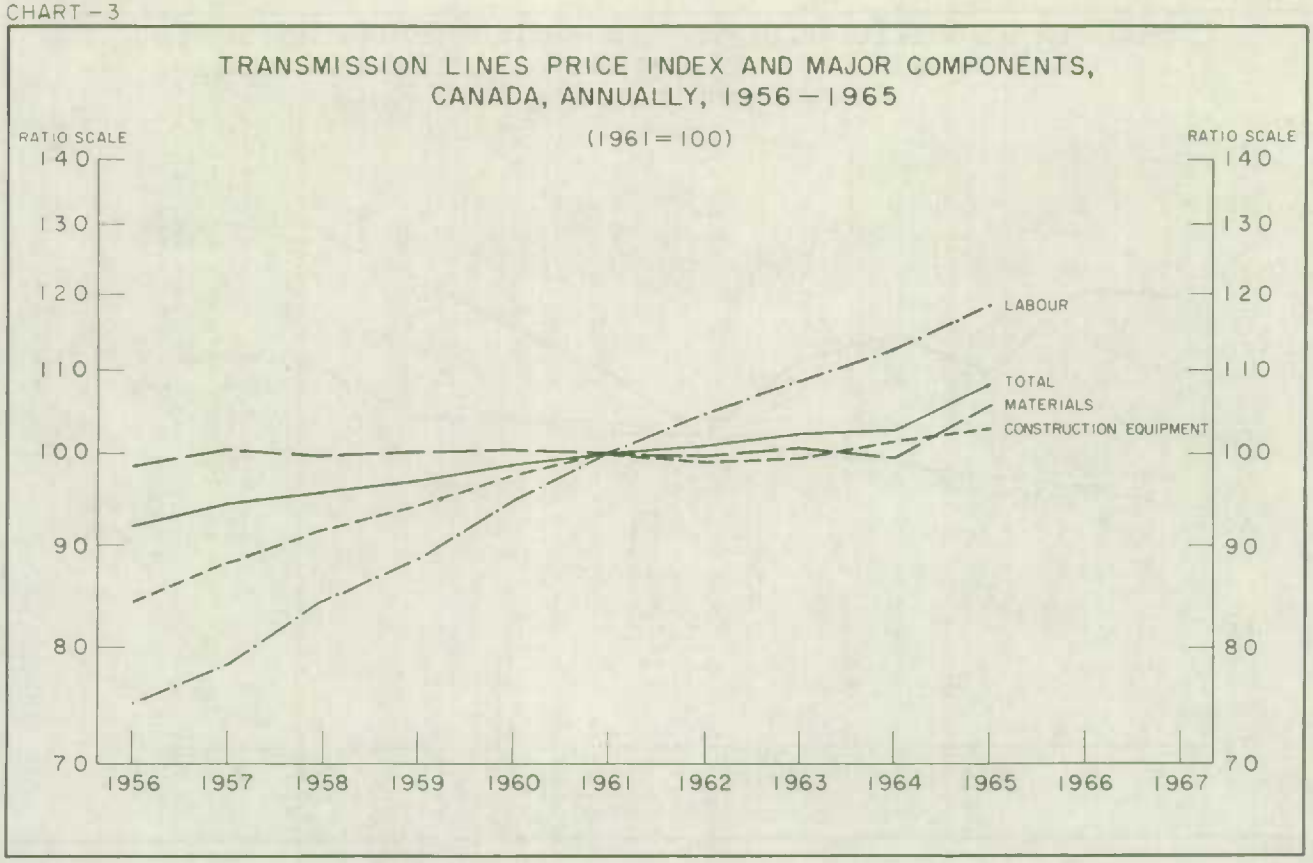


CHART – 4

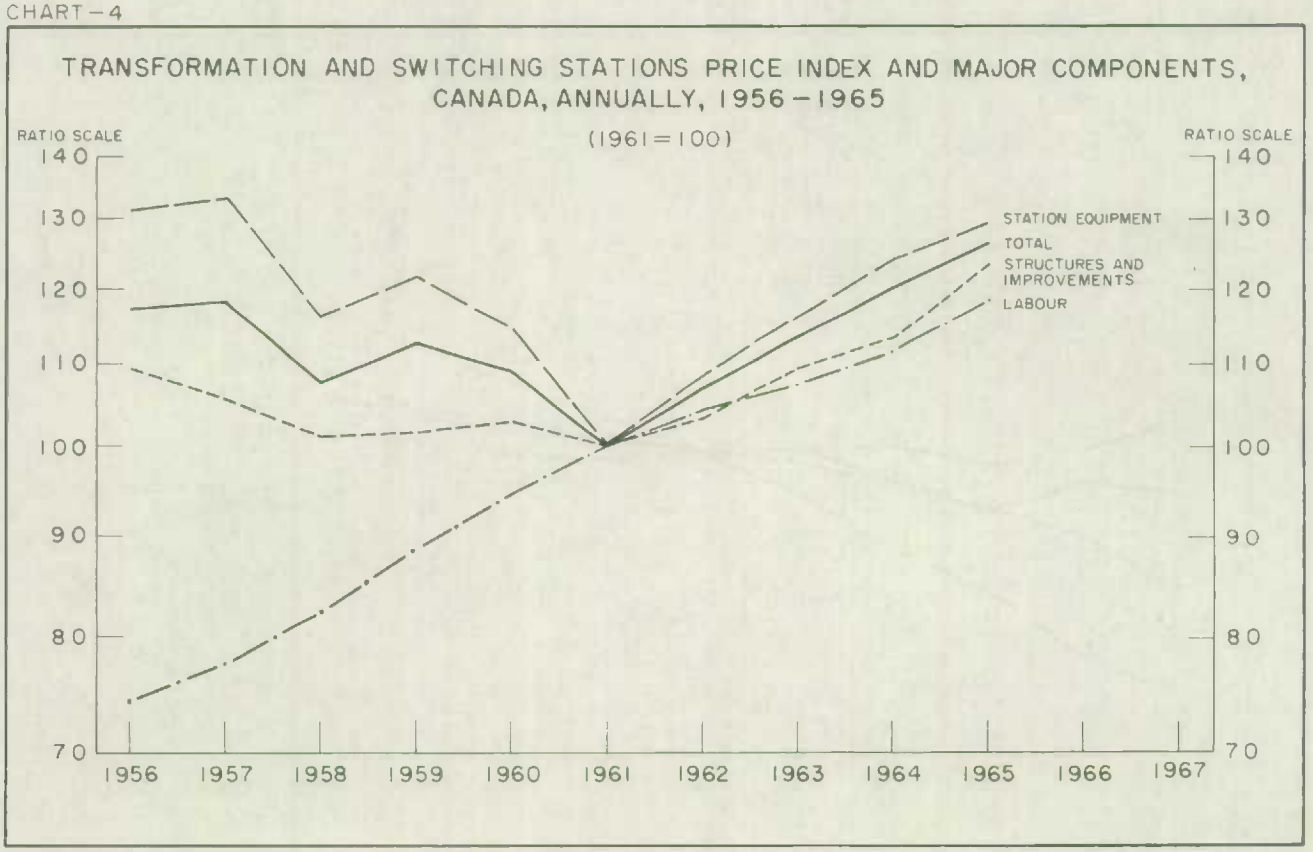


TABLE 1. Price Indexes of Electric Utility Distribution Systems, Major Components and Items, Canada, Annually, 1956-65
(1961 = 100)

Total, major components and items	Weights	Indexes									
		1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Distribution systems	100.0	95.1	96.5	93.2	96.8	100.3	100.0	101.9	102.5	104.6	107.3
Construction	69.0	92.7	91.9	93.5	96.3	98.5	100.0	102.5	105.2	107.8	112.7
Materials[1]	40.5	103.8	100.4	98.7	100.6	100.3	100.0	101.8	103.9	105.2	110.0
Poles	8.8	99.1	97.5	99.1	104.8	99.3	100.0	104.0	108.4	107.3	121.1
Eastern cedar	.6	120.8	101.9	101.3	116.2	100.2	100.0	109.0	112.1	109.1	109.8
Western cedar	8.2	97.7	97.2	99.0	104.1	99.2	100.0	103.6	108.1	107.2	121.8
Crossarms	2.6	113.1	97.4	94.9	110.2	105.7	100.0	111.9	116.6	128.0	128.2
Hardware	5.1	96.5	97.4	99.5	99.7	100.0	100.0	101.3	103.5	103.5	102.0
Secondary racks	1.4	95.9	96.7	98.8	99.6	99.9	100.0	102.6	104.4	104.4	98.6
Other hardware	3.7	96.8	97.7	99.8	99.7	100.0	100.0	100.9	103.2	103.2	103.3
Conductors	20.4	107.9	103.4	99.1	98.1	100.2	100.0	99.7	100.6	102.3	106.6
Triplex	9.9	102.9	105.5	102.3	97.8	100.0	100.0	98.1	97.4	97.2	99.4
Polyethylene insulated – Aluminum	5.4	102.9	105.5	102.3	97.8	100.0	100.0	98.1	97.4	97.3	99.6
Copper	5.1	123.0	96.9	89.3	99.0	100.7	100.0	104.6	110.3	117.5	128.0
Insulators	.9	94.9	95.2	95.9	98.7	102.0	100.0	100.6	101.4	101.4	106.0
Luminaires	2.7	96.1	97.1	97.0	99.2	100.1	100.0	101.2	102.7	103.0	98.5
Labour	24.8	75.7	78.5	84.9	89.3	95.3	100.0	104.3	108.3	112.8	118.6
Groundmen	9.9	75.0	78.1	84.6	88.8	95.0	100.0	104.3	108.5	113.0	118.5
Linemen	14.9	76.1	78.8	85.1	89.6	95.5	100.0	104.2	108.2	112.8	118.8
Construction equipment	3.7	85.2	90.1	93.8	96.2	98.9	100.0	99.4	100.0	101.3	102.4
Equipment-trucks	1.9	82.6	90.5	95.7	97.8	99.6	100.0	102.3	103.5	103.7	103.6
Operating expenses[2]	1.8	87.7	89.7	91.9	94.5	98.2	100.0	96.4	96.6	99.0	101.2
Distribution systems equipment[1]	31.0	100.4	106.6	92.5	97.9	104.3	100.0	100.4	96.4	97.6	95.4
Meters	11.9	89.4	96.7	98.3	99.1	100.0	100.0	100.0	99.1	98.6	98.6
Transformers	19.1	107.3	112.9	88.9	97.1	107.1	100.0	100.6	94.7	96.9	93.3
		102.3	103.1	96.0	99.4	102.1	100.0	101.2	100.6	101.9	103.6

[1] Combined materials and distribution systems equipment index.
[2] Detailed commodity detail for operating expenses is shown in Table 2.

TABLE 2. Price Indexes of Electric Utility Transmission Lines, Major Components and Items, Canada, Annually, 1956-65
(1961 = 100)

Total, major components and items	Weights	Indexes									
		1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Transmission lines	100.0	92.1	94.5	95.7	97.0	98.9	100.0	100.9	102.3	102.7	108.3
Materials	69.6	98.5	100.3	99.8	100.0	100.3	100.0	99.9	100.5	99.6	105.7
Poles, towers and fixtures	35.1	95.8	97.3	98.8	102.0	100.3	100.0	101.3	103.1	103.5	108.7
Poles, western cedar	10.9	97.7	97.2	99.0	104.1	99.2	100.0	100.4	103.8	101.8	115.2
Crossarms	3.1	113.1	97.4	94.9	110.2	105.7	100.0	111.9	116.6	128.0	128.2
Hardware	5.5	96.8	97.7	99.8	99.7	100.0	100.0	100.9	103.2	103.2	103.3
Towers	15.6	90.8	97.1	99.0	99.8	100.0	100.0	100.0	100.0	100.0	102.2
Conductors and insulators	34.5	101.2	103.5	100.9	97.9	100.3	100.0	98.5	97.9	95.5	102.6
Conductors, ACSR	29.0	102.4	105.0	101.9	97.7	100.0	100.0	98.1	97.3	94.4	101.9
Insulators	5.5	94.9	95.2	95.9	98.7	102.0	100.0	100.6	101.4	101.4	106.0
Labour	22.6	75.2	78.5	84.5	88.7	94.9	100.0	104.6	108.6	112.8	118.4
Groundmen	13.6	74.7	78.0	84.2	88.3	94.6	100.0	104.7	108.8	113.0	118.4
Linemen	9.0	76.0	79.3	85.0	89.3	95.4	100.0	104.5	108.2	112.5	118.4
Construction equipment	7.8	84.2	88.2	91.5	94.3	97.5	100.0	99.2	99.4	101.4	103.0
Equipment	3.9	78.2	84.3	89.9	93.2	96.1	100.0	104.1	104.9	107.2	109.0
Bulldozers	1.3	76.9	82.6	87.9	92.0	95.3	100.0	104.2	106.2	111.0	112.3
Compressors	1.3	75.1	79.9	86.0	89.8	93.5	100.0	105.6	105.0	106.8	111.2
Trucks	1.3	82.6	90.5	95.7	97.8	99.6	100.0	102.3	103.5	103.7	103.6
Operating expense	3.9	90.2	92.2	93.1	95.4	98.8	100.0	94.3	93.8	95.7	97.3
Diesel fuel	.2	99.1	103.2	97.9	99.6	100.0	100.0	101.7	103.1	101.3	98.1
Gasoline	1.0	96.5	99.6	99.8	99.9	99.5	100.0	98.3	90.7	91.5	88.4
Lubricating oils	.1	91.0	94.1	94.5	96.0	98.4	100.0	100.0	99.8	99.2	99.5
Tires	1.2	94.4	94.1	92.8	96.2	101.7	100.0	79.1	79.6	81.9	84.6
Tubes	.1	93.1	92.5	89.7	88.9	88.9	100.0	100.8	100.8	100.8	102.5
Repair parts	.3	93.4	95.3	96.6	97.3	98.7	100.0	101.0	103.7	103.5	103.9
Mechanics	1.0	75.2	78.5	84.5	88.7	94.9	100.0	104.6	108.6	112.8	118.4

TABLE 3. Price Indexes of Electric Utility Transformation and Switching Stations, Major Components and Items, Canada, Annually, 1956-65

(1961 = 100)

Total, major components and items	Weights	Indexes									
		1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Transformation and switching stations	100.0	117.2	118.4	107.6	112.4	109.2	100.0	107.0	113.6	120.1	126.5
Structures and improvements	16.2	109.3	105.4	101.2	101.8	102.9	100.0	103.2	109.6	113.3	123.7
Materials	12.9	100.0	99.8	99.0	99.6	100.5	100.0	101.3	104.6	110.0	118.2
Ready-mix concrete	1.6	99.8	100.0	100.0	100.0	100.0	100.0	107.2	112.4	114.1	117.3
Steel structures	5.8	92.3	97.4	99.0	99.8	100.6	100.0	100.1	102.4	107.1	114.6
Wooden structures	1.0	102.2	97.1	97.1	103.9	102.5	100.0	104.2	108.9	116.0	125.0
Buswork and conductors	4.5	109.6	103.5	99.0	98.3	100.2	100.0	100.0	103.5	110.8	121.8
In-place prices	3.3	145.9	127.3	109.8	110.5	112.3	100.0	110.9	129.2	126.2	145.1
Earth excavation	2.0	157.2	131.2	111.8	115.5	119.2	100.0	117.3	141.1	135.7	156.4
Crushed gravels	1.3	127.4	121.0	106.4	102.3	101.1	100.0	100.4	109.7	110.7	126.7
Labour	18.3	74.3	77.6	82.4	88.6	94.7	100.0	104.3	107.6	111.5	118.6
Common	6.4	71.2	75.4	81.3	87.3	93.9	100.0	105.6	109.3	114.2	120.8
Electricians	11.9	76.0	78.8	83.1	89.3	95.1	100.0	103.6	106.8	110.0	117.4
Station equipment	65.5	131.1	133.0	116.2	121.6	114.8	100.0	108.7	116.2	124.2	129.4
Power transformers	32.3	148.9	155.2	126.1	133.1	119.7	100.0	115.7	125.2	135.6	138.7
Metalclad switchgear	16.7	132.1	125.1	115.9	119.9	116.0	100.0	103.0	109.0	113.9	125.2
Circuit breakers	14.9	95.2	97.3	96.7	101.1	104.4	100.0	100.9	106.4	112.8	115.8
Disconnect switches	1.6	96.5	100.7	98.8	97.2	99.9	100.0	100.1	102.4	107.1	114.6

TABLE 4. Indexes for Labour Components[1] of Electric Utility Construction Price Indexes Canada and Nine Cities, Annually, 1956-65

(1961 = 100)

	Weights		Indexes									
	For distribution systems	For transmission lines	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Linemen:												
St. John's	2.0	.4	74.2	76.6	87.9	90.6	96.9	100.0	104.3	105.5	107.4	109.0
Halifax	2.3	2.9	74.2	76.6	87.9	90.6	96.9	100.0	104.3	105.5	107.4	109.0
Saint John	1.8	6.0	74.2	76.6	87.9	90.6	96.9	100.0	104.3	105.5	107.4	109.0
Montreal	28.0	28.0	73.9	75.0	81.8	86.9	93.7	100.0	109.7	113.6	118.7	127.8
Toronto	27.5	27.8	78.2	81.2	83.9	85.6	94.6	100.0	103.4	106.7	110.4	114.1
Winnipeg	12.9	2.9	77.6	80.8	88.5	94.2	97.4	100.0	100.0	105.1	110.9	116.0
Regina	9.0	9.6	77.6	80.8	88.5	94.2	97.4	100.0	100.0	105.1	110.9	116.0
Edmonton	5.0	9.7	77.4	82.2	86.3	91.1	94.5	100.0	102.4	104.1	108.2	112.3
Vancouver	11.5	12.7	74.2	78.2	87.7	95.4	98.2	100.0	101.8	107.4	112.3	121.2
Linemen:												
For distribution system	100.0		76.1	78.8	85.1	89.6	95.5	100.0	104.2	108.2	112.8	118.8
For transmission lines		100.0	76.0	79.3	85.0	89.3	95.4	100.0	104.5	108.2	112.5	118.4
Groundmen:												
St. John's	2.0	.4	81.0	86.4	90.5	92.5	96.6	100.0	106.1	110.9	115.6	117.7
Halifax	2.3	2.9	81.0	86.4	90.5	92.5	96.6	100.0	106.1	110.9	115.6	117.7
Saint John	1.8	6.0	81.0	86.4	90.5	92.5	96.6	100.0	106.1	110.9	115.6	117.7
Montreal	28.0	26.0	73.9	75.0	81.8	86.9	93.7	100.0	109.7	113.6	118.7	127.8
Toronto	27.5	27.8	74.0	78.2	84.4	86.0	94.6	100.0	102.9	106.2	109.4	113.0
Winnipeg	12.9	2.9	77.6	80.8	88.5	94.2	97.4	100.0	100.0	105.1	110.9	116.0
Regina	9.0	9.6	77.6	80.8	88.5	94.2	97.4	100.0	100.0	105.1	110.9	116.0
Edmonton	5.0	9.7	71.8	73.9	79.8	85.6	91.0	100.0	103.2	107.4	109.0	112.8
Vancouver	11.5	12.7	73.1	78.1	83.6	89.5	95.0	100.0	102.3	107.3	111.9	116.4
Groundmen:												
For distribution system	100.0		75.0	78.1	84.6	88.8	95.0	100.0	104.3	108.5	113.0	118.5
For transmission lines		100.0	74.7	78.0	84.2	88.3	94.6	100.0	104.7	108.8	113.0	118.4

[1] All wage rate indexes are derived from data supplied by the labour Standards Branch of the Department of Labour.

TABLE 4. Indexes for Labour Components[1] of Electric Utility Construction Price Indexes, Canada and Nine Cities, Annually, 1956 – 65 – Concluded

(1961 = 100)

	Weights	Indexes									
		1956	1957	1958	1959	1960	1961	1962	1963	1964	1965
Common labourer:											
Halifax	2.7	81.0	86.4	90.5	92.5	96.6	100.0	106.1	110.9	115.6	117.7
Saint John	2.1	82.9	91.0	94.6	94.6	96.4	100.0	103.6	103.6	106.3	117.1
Montreal	31.7	73.9	75.0	81.8	86.9	93.7	100.0	109.7	113.6	118.7	127.8
Toronto	37.6	66.8	72.8	78.2	85.1	93.1	100.0	105.0	108.6	114.6	120.0
Winnipeg	6.1	67.3	74.5	80.0	89.7	95.2	100.0	100.0	100.0	100.0	109.1
Regina	4.8	77.6	80.8	88.5	94.2	97.4	100.0	100.0	105.1	110.9	116.0
Edmonton	4.2	71.8	73.9	79.8	85.6	91.0	100.0	103.2	107.4	109.0	112.8
Vancouver	10.8	73.1	78.1	83.6	89.5	95.0	100.0	102.3	107.3	111.9	116.4
Common labourer	100.0	71.2	75.4	81.3	87.3	93.9	100.0	105.6	109.3	114.2	120.8
Electrician:											
Halifax	2.7	78.3	81.7	85.2	88.3	92.6	100.0	102.2	104.3	108.7	110.0
Saint John	2.1	79.0	82.0	86.0	89.5	96.0	100.0	100.0	106.5	110.0	115.0
Montreal	31.7	80.0	80.0	83.2	90.0	95.2	100.0	106.0	108.8	112.0	124.0
Toronto	37.6	71.6	75.6	79.5	85.7	93.5	100.0	102.5	105.3	108.1	113.2
Winnipeg	6.1	73.6	80.4	85.0	91.1	96.8	100.0	101.4	105.5	106.1	108.9
Regina	4.8	88.0	89.3	92.7	96.6	98.7	100.0	106.8	111.1	114.5	118.8
Edmonton	4.2	77.4	82.2	86.3	91.1	94.5	100.0	102.4	104.1	108.2	112.3
Vancouver	10.8	74.2	78.2	87.7	95.4	98.2	100.0	101.8	107.4	112.3	121.2
Electrician	100.0	76.0	78.8	83.1	89.3	95.1	100.0	103.6	106.8	110.0	117.4

[1] All wage rate indexes are derived from data supplied by the Labour Standards Branch of the Department of Labour.

APPENDIX A. Characteristics of Prices Used in the Electric Utility Construction Price Indexes

Item and characteristics of appropriate prices collected as of December 1965	Date of introduction to index	Characteristics of substitute prices used currently or used prior to date specified in preceding column
MATERIALS AND EQUIPMENT COMPONENTS		
Distribution systems		
Poles:		
Eastern cedar:		
35', Class 4, untreated	1961	General Wholesale Cedar Index[1] 4-15
Western cedar:		
35', Class 4, penta, full-length treated	1961	A weighted average of the following three indexes: 1. General Wholesale Cedar Index 4-15 2. General Wholesale Asphalt Index 7-22 3. Department of Labour Construction Wage Rates for Common Labour
40', Class 3, penta, full-length treated	1961	As above for the 35', Class 4 treated pole
Crossarms:		
Douglas fir, dressed, untreated, drilled, two-pin holes: 6" x 8" x 16' 3¾" x 4¾" x 6'4" 3¾" x 4¾" x 8' 6" x 8" x 24'	1963	Industry Selling Price Index[2] 2851 for Douglas Fir lumber
Hardware:		
Various items represented including: 3 wire racks Suspension clamps Steel guy grips Galvanized guy clamps Line splicing sleeves Crossarm pins Crossarm braces Ground rods Pole top pins	1956	Only some elements were available from 1956. Coverage was expanded in 1964
Conductors:		
Aluminum:		
No. 4 triplex polyethylene insulated, No. 4 ACSR bare neutral	1962	Industry Selling Price Index Aluminum and ASCR Index 3592
No. 3/0 seven strand, polyethylene insulated	1963	Industry Selling Price Index Aluminum and ASCR Index 3592
Copper:		
No. 2 solid, MHD copper, polyethylene insulated	1963	Industry Selling Price Index Copper Conductor Index 3592
Insulators:		
High tension, pin and suspension types	1956	Price coverage was expanded in 1962
Meters:		
75-100 ampere 230 volt, 3 wire, 1 phase, 60 cycle	1956	
Transformers:		
25 kva. 60 cycle, 2400-120/240 volt with standard taps, hangars and oil	1956	
Luminaires:		
400 watt mercury with ballast	1963	Industry Selling Price Index Fluorescent Light Fixtures 3591
250 watt mercury with ballast	1963	
Trucks:		
16,001 to 19,500 gross wt., cab and chassis, 151", 174", 175" w.b. Industry Selling Price Index 3340	1956	
Gasoline:		
Regular and Premium Industry Selling Price Index 3751	1956	
Tires:		
Heavy service, balloon, tubed type for bus, truck, and transit vehicles: 8.25-20 10 ply 9.00-20 10 ply 10.00-20 12 ply 6.50-16 6 ply Industry Selling Price Index 2390	1956	

[1] Prices collected for the General Wholesale Index are similar in characteristic to those collected for the Industry Selling Price Indexes.

[2] A further description of the Industry Selling Price Indexes can be had from DBS Occasional Paper, Catalogue No. 62-515.

APPENDIX A. Characteristics of Prices Used in the Electric Utility Construction Price Indexes – Continued

Item and characteristics of appropriate prices collected as of December 1965	Date of introduction to index	Characteristics of substitute prices used currently or used prior to date specified in preceding column
MATERIALS AND EQUIPMENT COMPONENTS – Continued		
Distribution systems – Concluded		
Lubricating oils: Heavy duty SAE No. 20, heavy duty SAE No. 30 and general purpose machine oil. Industry Selling Price Index 3751	1956	
Tubes: Heavy service truck and transport type: 8.25-20 9.00-20 10.00-20 Industry Selling Price Index 2390	1956	
Repairs: Parts: Brakes, generators, filter, spark plugs, etc.	1956	Industry Selling Price Index 3350 Motor Vehicle Parts Index – with some elements removed
Mechanics		Wage Rate Index for groundmen and linemen
Transmission lines		
Poles: Western cedar: Full length treated, penta 50' Class 3 55' " 2 60' " 1, 2, 3 65' " 1, 2, 3 70' " 1, 2, 3 Butt treated. 50' Class 3 60' " 1, 3 65' " 1 70' " 1	1961	As in western cedar distribution poles
Crossarms: As in distribution systems	1963	As in distribution systems
Hardware: As in distribution systems but excluding secondary racks	1956	
Towers		Hot-rolled products: Light structural steel shapes including angles and channels Industry Selling Price Index 3253
Conductor: Aluminum conductor, steel reinforced, bare: 1/0 CM, 6/1 2 CM, 6/1 1.3 MCM, 54/19		
Trucks: As in distribution systems	1956	
Compressors: Wheel-mounted, portable, diesel powered, rotary and piston type, including capacities ranging from 250 to 1200 CFM. Machinery and Equipment Index 22-19		
Bulldozers: Diesel powered, turbo charged, torque converter, 12 volt, straight and angle blade, and track and tire mounted 12,600# to 45,500#. Machinery and Equipment Index 22-10	1956	
Diesel fuel: Diesel fuel Industry Selling Price Index 3751	1956	
Gasoline: As in distribution systems	1956	
Lubricating oils: As in distribution systems	1956	
Tires: As in distribution systems	1956	

APPENDIX A. Characteristics of Prices Used in the Electric Utility Construction Price Indexes – Continued

Item and characteristics of appropriate prices collected as of December 1965	Date of introduction to index	Characteristics of substitute prices used currently or used prior to date specified in preceding column
MATERIALS AND EQUIPMENT COMPONENTS – Concluded		
Transmission lines – Concluded		
Tubes:		
As in distribution systems	1956	
Repairs:		
Parts:		
As in distribution systems	1956	
Labour:		
As in distribution systems	1956	
Stations		
Grading:		
Highway Construction Price Indexes for earth excavation crushed gravels.	1956	
Ready-mix concrete for equipment foundations:		
3,000 psi ready-mix concrete	1956	
Industry Selling Price Index 3680		
Steel structures:		
Light structural steel shapes	1956	
Insulators from Transmission Lines and Distribution Systems Indexes.		
Industry Selling Price Index 3253		
Wooden structures:		
Transmission Lines Indexes for	1956	
Western cedar poles		
Crossarms		
Hardware		
Insulators		
Buswork and conductors:		
ASCR Aluminum Conductor Index	1956	
Industry Selling Price Index 3592		
Copper Conductor Index	1956	
Industry Selling Price Index 3592		
Large and small power transformers:		
Priced according to DBS – CEMA – manufacturers agreements. See description of technique in the text.	1956	
Industry Selling Price Index 3520		
Circuit breakers:		
Indoor, oil or oilless, 69 KV or less		
Outdoor, oil or oilless, 69 KV or less		
Outdoor, with oil, 70 KV and over		
Outdoor, oilless, 70 KV and over		
See description of technique in text		
Industry Selling Price Index 3520		
Disconnect switches:		
3 pole, single throw, 600 ampere, 3 insulator stack	1956	
Industry Selling Price Index 3520		
Metal clad switchgear:		
Priced according to DBS – CEMA – manufacturers agreements. See description of technique in the text.		
Industry Selling Price Index 3520		
LABOUR COMPONENTS		
Common:		
Fair Wage Rates for common labourers on Federal Government contracts for cities of:	1956	
St. John's		
Halifax		
Fredricton		
Montreal		
Toronto		
Winnipeg		
Regina		
Edmonton		
Vancouver		

APPENDIX A. Characteristics of Prices Used in the Electric Utility Construction Price Indexes – Concluded

Item and characteristics of appropriate prices collected as of December 1965	Date of introduction to index	Characteristics of substitute prices used currently or used prior to date specified in preceding column
LABOUR COMPONENTS – Concluded		
Electricians: As above for electricians	1956	
Groundmen[3]		Fair Wage Rates were used as follows: To represent groundmen for: St. John's – Labourer, Halifax Halifax – " " Saint John – " " Montreal – " Montreal Toronto – Dragline operators, Toronto Winnipeg – Labourer, Regina Regina – " " Edmonton – " Edmonton Vancouver – " Vancouver
Linemen[3]		Fair Wage Rates were used as follows: To represent linemen for: St. John's, Halifax, Saint John – Structural steel erectors, Halifax Montreal – Labourer, Montreal Toronto – Carpenter, Toronto Winnipeg – Labourer, Regina Regina – " " Edmonton – Electrician, Edmonton Vancouver – " Vancouver

[3] Wage rates for groundmen and linemen are not collected by the Labour Standards Branch of the Department of Labour. Substitutes were chosen by comparing other Fair Wage Rates with the wage rates for linemen and groundmen published by the Economics and Research Division of the Department of Labour. The Fair Wage Rates moving most similarly to the linemen and groundmen rates were chosen as substitutes. Economics and Research Division data were not used directly in the indexes because of problems in coverage and timeliness of publication.

APPENDIX B. Federal Sales Tax Rates for Commodities Used in Electric Utility Construction Price Indexes[1]

Commodity	Tax exempt item	Tax rates for commodities subject to tax					
		1/1/56 to 29/4/59	30/4/59 to 31/12/65	1/1/56 to 13/6/63	14/6/63 to 31/3/64	1/4/64 to 31/12/64	1/1/65 to 31/12/65
		per cent					
Distribution systems and transmission lines:							
Towers		10	11				
Poles, wooden	x						
Crossarms		10	11				
Hardware		10	11				
Conductor:							
Aluminum		10	11				
Copper		10	11				
Insulators		10	11				
Meters		10	11				
Transformers		10	11				
Luminaires		10	11				
Trucks		10	11				
Bulldozer		10	11				
Compressors		10	11				
Gasoline		10	11				
Diesel fuel		10	11				
Lubricating oils		10	11				
Tires		10	11				
Tubes		10	11				
Parts		10	11				
Stations:							
Earth excavation and embankment	x						
Gravels	x						
Ready-mix concrete	x						
Steel structures:							
Steel				0	4	8	11
Insulators				0	4	8	11
Wooden structures:							
Poles	x						
Crossarms				0	4	8	11
Insulators				0	4	8	11
Hardware				0	4	8	11
Busworks and conductor				0	4	8	11
Power transformers				0	4	8	11
Circuit breakers				0	4	8	11
Disconnect switches				0	4	8	11
Metal clad switchgear				0	4	8	11

[1] Indexes or prices used in these indexes were adjusted to reflect Federal Sales Tax rates generally applicable on sales of these commodities to electric utilities.

APPENDIX C. Characteristics of Prices Used in the Machinery and Equipment Price Indexes

The principal use of the as yet unpublished Price Indexes of Machinery and Equipment has been to deflate current dollar values of the machinery and equipment component of business gross fixed capital formation in the National Accounts. Some development problems in commodity selection, weighting, and adjustments for price discontinuities have prevented publication so far, although the index has been calculated since 1955.

The sample of items for which prices are collected is designed to measure price movement through time of machinery and equipment purchased by industries classified according to the Standard Industrial Classification.

The major source of prices is manufacturers of such items of capital equipment rather than the purchasers who are considered to be in the market too infrequently to be able to provide comparable price quotations over time. Manufacturers in both Canada and the United States are surveyed.

Canadian price collection follows practices employed for the broad system of Industry Selling Price Indexes, that is, prices requested are manufacturers selling prices to the main class of customer, with appropriate discounts and concessions removed, f.o.b. factory or distributing point.

U.S. manufacturers are asked to quote selling prices for machines sold to the Canadian economy. These prices are then adjusted for exchange rate and duty.

Federal sales tax is added to the producers' selling prices, where it is applicable, to approximate more closely the purchasers' prices.

The sample of machines priced is designed to represent major purchases by industry. The machine coverage was selected largely through extensive study of trade journals to determine types of machinery and equipment which appeared regularly in advertisements, and could be deemed to be available in the market on a regular continuing basis and not subject to frequent or radical design changes. Items advertised were assumed to be important from the point of view of both selling and purchasing.

Prices have not been collected from distributors even though they may sell a large volume of machinery and equipment because of the difficulty they may have in providing cost information when price discontinuities occur.[1]

Deficiencies in the price collection include:

1. The problem of price discontinuities: changing technology and improvements in production methods and machines make the identification of price change as distinct from quality change for machinery and equipment a complex subject. The means used to estimate price change when discontinuities occur mainly represent an attempt to assess the relative qualities of the replacement item and the replaced item rather than the absolute quality differential.

   The methods used may be summarized as follows:

   (a) Compare the relative prices at a particular time of the replacement item, and the replaced item when both have been on the market at the same time. It is assumed that the market has assessed the relative qualities, as reflected by their respective prices.

   (b) Assuming a direct relationship between total input costs and selling price at a point in time, one can compare the input costs of producing or supplying the two items. The essence of the method used is to estimate what would have been the price of the old model if it had been currently produced or what would have been the price of the new model if it had been produced in the earlier period.

   The different approaches used are the following:

   (a) Comparison of the input cost of the "extras".[2] The producer costs of these extras can be removed from the total costs, enabling the comparison of basic machines. This process minimizes variation in the comparison.

   (b) More comprehensive than the above is the comparison of the input cost of total labour and materials for the replaced item and the replacement item. Information which is required from the producer for this comparison is as follows:
      (i) the money costs of labour and materials per unit for the unchanged components of the two items, and for the deleted and added components separately;
      (ii) the percentage by which the money costs of labour and materials would be altered if the first item were produced under the same technology as the second, in the later time period;
      (iii) the selling prices of the two items in their respective time periods.

[1] If a machine is replaced by a different model, one of the methods used to estimate pure price change as distinct from quality change is to make use of cost of inputs for the two machines being compared. See Appendix D which describes the Industry Selling Price technique in detail.

[2] Extras may be equipment which replaces the standard features of the item (such as higher horsepower car engines) or additional equipment demanded by the purchaser.

From this information, an estimated price is calculated for the substitute item in the earlier time period (when no overlapping price is available) for comparison with its reported price in the current time period.

In the Machinery and Equipment Price Index, the use of method (b) above is only in its beginning stages. (See Appendix D for detailed description of the method).

In the absence of overlapping prices, a method of last resort occasionally used, is to impute the change that has occurred in the rest of the industry to the missing price comparison.

2. Price collection has not been attempted so far for custom-made or non-recurring machine purchases, with the result that significant areas of purchases of machinery and equipment are not being measured directly. The assumption implicit is that price movement of custom-made machinery is similar to that of machine types which are priced.

3. Some elements of the conceptually correct installed price to user are missing, for example, freight, insurance, and installation costs.

4. By largely excluding distributors from the price sample, price movement to the purchaser may not be reflected accurately. On the other hand where respondents are distributors not affiliated with the manufacturer, it is diffucult to obtain cost data without also contacting the manufacturer of the machine.

5. In many cases purchases by Canadian industry represent only a small, intermittent proportion of a U.S. company's value of shipments. If many months elapse between comparable transactions to Canada, it is impossible to follow price movement on a regular basis. The more sensible if not the only possible course of action, to reflect actual transactions, is to measure price changes affecting the company's main class of customer even if it is to U.S. customers.

6. Commodities are given equal weight within an industry index, thus reflecting a lack of detailed information about patterns of machine purchases. Because no volume-of-sales data were available, companies reporting prices for a specific commodity were also given equal weight when commodity indexes were being derived.

K. Kemp,
Prices Division,
November 1966.

APPENDIX D. Technique Used in the Industry Selling Price Indexes for Evaluating Quality Change

For the purposes of this index quality is defined in terms of physical characteristics and, ideally, would be measured by the cost of total inputs embodies in them at a given time with a given technology. Lack of adequate data – particularly the current costs of capital used – has resulted in the utilization of a proxy measure for cost of total inputs, namely, costs of direct labour and materials. Underlying the choice of this proxy measure is the assumption that changes in the costs of direct labour and materials are in the same direction and roughly in the same proportion as changes in costs of total inputs.

To compare the quality of, say, a 1966 model automobile to that of a 1965 model, the procedure followed is to convert the costs of direct labour and materials of both models to a common basis with regard to both time and technology. The quality comparison is then, in effect, a comparison of the deflated dollar value of the direct labour and material costs of the two models after eliminating from these costs those differences due to changes in technology.

Assuming that there is at any given time a direct relationship between the cost of total inputs and selling price, pure price change – as distinct from model price change – between 1965 and 1966 can be estimated by making an adjustment for quality difference in the two models as outlined in the following examples:

Example I

(Assume no change in materials prices and wage rates)

	Unit prices and costs	
	1965	1966
	dollars	
Selling price	1,200.00	1,300.00
Direct labour and material costs:		
Totals	1,000.00	990.50
Identical components	990.00	940.50
Components removed	10.00	
Components added		50.00
% by which 1966 technology would have increased (+) or decreased (–) the 1965 cost of direct labour and materials of identical components		–5%

Procedure

Convert 1965 models total direct labour and material costs to equivalent costs in terms of 1966 technology:

$$\$1{,}000 \times \frac{95}{100} = \$950.$$

The assumption of no change in the prices of direct labour and materials makes it unnecessary to deflate the relevant costs, and a quality ratio can be calculated directly as follows:

$$\frac{\text{Quality of 1966 model}}{\text{Quality of 1965 model}} = \frac{\text{Cost of 1966 direct labour and material in terms of 1965 prices and 1966 technology}}{\text{Cost of 1965 direct labour and materials in terms of 1965 prices and 1966 technology}^{1}}$$

$$= \frac{990.50}{950}$$

$$= 1.0426$$

The quality ratio can now be used to estimate what the 1966 model would have been sold for in 1965:

$\$1{,}200 \times 1.0426 = \$1{,}251.$

Since the selling price in 1966 is $1,300, the change in selling price, i.e. pure price change, is:

$$\frac{1{,}300}{1{,}251} = 1.03917, \text{ or } 3.917\%$$

If both technology and the prices of direct labour and materials had changed between 1965 and 1966 it would then not be possible to convert direct labour and material costs to a common time and technology base in one step as in the above example. To derive a quality ratio these costs have to be stated for a common time base – i.e., the price changes of direct labour and materials have to be eliminated; and a common technology base – i.e. differences in direct labour and material costs resulting from changes in technology have to be eliminated.

The effect on total direct labour and materials costs of changes in materials prices and wage rates can be estimated from the costs of direct labour and materials of **identical** components for both years and the estimated effect of the 1966 technology on the 1965 costs of direct labour and materials of identical components. To illustrate:

Example II

(Data as in Example I except as follows)

	1966
Direct labour and material costs:	
Total	$1,010.30
Identical components	959.30
Components added	51.00
Average price change of direct materials %	1.0
Average change in direct labour wage rates %	3.0

[1] See footnote on page 30.

Procedure

Convert 1965 cost of direct labour and materials of identical components to an equivalent cost in terms of 1966 technology:

$$\$990 \times \frac{95}{100} = \$940.50$$

The price change of direct labour and materials of identical components is given by:

$$\frac{\$959.30}{940.50} = 1.02 = 2\%$$

The average price change of direct materials and average change in wage rates obtained from respondents and/or independent sources, can be used as a rough check on the price change derived above. In this example, assuming equal weights for direct materials and direct labour, the check (.5 x 3%) + (.5 x 1%) = 2% confirms the derived price change with a precision to be found only in contrived examples.

To calculate a quality ratio, the 1966 and 1965 models' total direct labour and materials costs have to be adjusted for price change and technology effect respectively.

$$\text{Quality ratio} = \frac{\text{Cost of 1966 models' total direct labour and material in terms of 1965 prices and wage rates and 1966 technology}}{\text{Cost of 1965 models' total direct labour and material in terms of 1965 prices and wage rates and 1966 technology}^2}$$

$$= \frac{1{,}010.30 \div 1.02}{1000 \times .95}$$

$$= \frac{990.5}{950} = 1.0426$$

The change in selling price is calculated as in Example I.

---

[2] It is assumed that the 1966 technology's estimated effect on the direct labour and material costs of components removed is the same as its effect on direct labour and material costs of identical components.

Erik van der Walt,
February 1967.

APPENDIX E. Electric Utility Distribution Systems Transmission Lines and Transformation and Switching Stations. Scope and Definition of Cost Used in Deriving the Weighting Pattern

	Additional elements of expense included in addition to the obvious costs for each item
Distribution systems	
Included costs:	
Construction:	
Materials:	
Poles	Street lighting poles, switching structures, platforms, mountings
Crossarms	Wood pins
Hardware	
Conductor	Street lighting conductor, services
Insulators	
Luminaires	Expenditures for mast arms, relays, time switches, associated with street lighting equipment
Labour	Expenditure for installing distribution equipment, board and travel time
Construction equipment[1]	
Distribution equipment:[1]	
Meters	
Transformers	Relays, switches, protective equipment, capacitors, condensers and grounding associated with distribution transformers
Excluded costs	Rights-of-way Land Service buildings Credits for retirals or salvage Underground system Any expense in relation to a transformation, switching or generating station or to transmission lines Most indirect expenditure when costs for individual projects were being analysed
Transmission lines	
Included costs:	
Construction:	
Materials:	
Poles	Sundry construction material for excavation and backfill for foundations and cribbing
Crossarms	
Hardware	Include hardware for poles and for conductor
Towers	Steel grillage footings, extension, miscellaneous light structural steel shapes
Conductor	Overhead ground wire, rods and connectors, protection shields, counterpoise wire
Insulators	
Labour	Board and travel time
Construction equipment	Hauling, unloading, sorting and handling materials
Excluded costs	Land Rights-of-way Clearing and overbuilding Ducts and manholes Underground system Buildings, roads and bridges Most indirect expenditure when costs for individual projects were analyzed Any expense relating to distribution systems, transformation, switching or generating stations.

[1] See definition of construction, and machinery and equipment, page 13.

APPENDIX E. Electric Utility Distribution Systems Transmission Lines and Transformation and Switching Stations. Scope and Definition of Cost Used in Deriving the Weighting Pattern – Concluded

	Additional elements of expense included in addition to the obvious costs for each item
Transformation and switching stations	
Included costs:	
Structures and improvements:	
Excavation, grading, gravelling	
Equipment foundations	
Steel structures	Fencing, insulators
Wooden structures	Hardware, insulators, crossarms and timbers
Buswork and conductor	Grounding system, control cable, conduit
Station equipment	Metering, communications, supervisory equipment Protective devices, load interrupting and not load interrupting switches, Other switches, switchgear, relays, reactors, capacitors, auxiliary equipment, switchboards, regulators, batteries
Transformers	
Circuit breakers	
Metal clad switchgear	
Disconnect switches	
Labour	Expenditure for construction equipment Board and travel time
Excluded Costs	Land and land rights Buildings Credits for retirals or salvage Underground system Any expense relating to distribution, transmission or generating systems. Most indirect expenditure when costs for individual projects were analyzed

APPENDIX F. Removing Price Change from a Value Series

An algebraic statement for the value of a specific commodity can be stated

$$V = p_n q_n$$

where p is the price per unit of the commodity and q is the number of units of the commodity in time n.

A value series can be stated as

$$p_1q_1 \qquad p_2q_2 \qquad p_3q_3 \quad \ldots\ldots\ldots\ldots \quad p_nq_n$$

A value index can be derived as follows using p_1q_1 as the base

$$\frac{p_1q_1}{p_1q_1} \qquad \frac{p_2q_2}{p_1q_1} \qquad \frac{p_3q_3}{p_1q_1} \quad \ldots\ldots\ldots\ldots \quad \frac{p_nq_n}{p_1q_1}$$

Change in such an index can be caused by price or quantity changes. Such ratios are often referred to as cost or value indexes as opposed to price indexes or volume indexes.

Users of value series often wish to convert them into volume indexes, and price indexes can be used to achieve the conversion.

A price ratio or index for a single commodity can be defined as follows:

$$\frac{p_1q_1}{p_1q_1} \qquad \frac{p_2q_1}{p_1q_1} \qquad \frac{p_3q_1}{p_1q_1} \quad \ldots\ldots\ldots\ldots \quad \frac{p_nq_1}{p_1q_1}$$

which equals

$$\frac{p_1}{p_1} \qquad \frac{p_2}{p_1} \qquad \frac{p_3}{p_1} \quad \ldots\ldots\ldots\ldots \quad \frac{p_n}{p_1}$$

To derive the desired volume series the value series is divided (or "deflated") by the price ratio

$$\frac{\frac{p_1q_1}{p_1}}{\frac{}{p_1}} \qquad \frac{\frac{p_2q_2}{p_2}}{\frac{}{p_1}} \qquad \frac{\frac{p_3q_3}{p_3}}{\frac{}{p_1}} \quad \ldots\ldots\ldots\ldots \quad \frac{\frac{p_nq_n}{p_n}}{\frac{}{p_1}}$$

which results in

$$p_1q_1 \qquad p_1q_2 \qquad p_1q_3 \quad \ldots\ldots\ldots\ldots \quad p_1q_n$$

which is a volume series in which quantities are valued in terms of price of a given year.

The volume series can be expressed in index form by selecting a base year and dividing each year by the base period value

$$\frac{p_1q_1}{p_1q_1} \qquad \frac{p_1q_2}{p_1q_1} \qquad \frac{p_1q_3}{p_1q_1} \quad \ldots\ldots\ldots\ldots \quad \frac{p_1q_n}{p_1q_1}$$

SELLING PRICE REPORT

CONFIDENTIAL

For D.B.S. Use

For Respondents Use

PRODUCT GROUP: –

DESCRIPTION OF PRODUCT TO BE PRICED: –
(The product chosen to represent the price movement of the product group shown above)

TERMS OF SALE: –[1]

N.B. Is the above product description specific enough to ensure that only one price can be reported for it at any given time? Yes ☐ No ☐

If "no" please complete description:

Are you liable to the government for federal sales tax for the transaction described above? Yes ☐ No ☐

If "yes" and the rate is other than 11% please specify rate(s) and explain

Enter "nil" if no order taken during current month	Enter below selling price (not list price) for orders taken[2] on the 15th of the month or nearest earlier date in month after discounts and concessions[3] have been removed before federal sales tax added	TRADE DISCOUNT PRACTICE Enter below all rates of discount usually allowed on list to each class of purchaser to whom you sell indicate major type of purchaser each month by circling the appropriate rate of discount.							CHECK (√) EITHER "YES" OR "NO" EACH MONTH IF "NO" complete A, B, C, D & E below table and explain overleaf					Price quoted refers to domestic sales	Federal sales tax has been excluded from the price quoted	What is the value, included in price quoted, of transportation paid to common and contract carriers?
1966	check (√) $ Can. ☐ U.S. ☐	To Wholesaler %	To Retailer %	To Manufacturer %	To Contractor %	To Utilities %	To Governments %	Toother[4] specify %	Discounts have been removed from quoted price A.	Value of other concessions has been removed from quoted price B.	Price quoted refers to product physically identical to that of last month C.	Terms of sale are the same as last month D.	Is the price movement of the product priced representative of the price movement of the product group E.			$
Jan									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Feb									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Mar									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Apr									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
May									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Jun									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Jul									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Aug									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Sept									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Oct.									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Nov									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	
Dec									Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	Yes ☐ No ☐	

If price changes are large or unusual explain on reverse side

[1] Terms of sale – Unit of sale, quantity of sale, delivery point, class of customer.
[2] Do not quote prices of sale to subsidiary or affiliated companies.
[3] Concessions – Premiums, quantity discounts, extra units free, promo allowances, etc.
[4] E.G. farmers, jobbers, mining companies, professional sales.

A. Specify discounts that have not been removed from quoted price.
B. Specify concessions and their value not deducted from quoted price.
C. Describe physical change and give new specifications.
D. Specify new terms of sale.
F. Give description incl. terms of sale of a product that represents the price movement of the product group.

Name of officer completing this form _____ Title _____

8206-163.1