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ON

EXPORT OF ELECTRICITY FROM
CANADA

AND REPORT

OF THE

POWER CONTROLLER



OTTAWA

J. de LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
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68 PAGES

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REPORT ON EXPORT OF ELECTRICITY FROM CANADA

By Sir HENRY DRAYTON

P.C. 2531.

CERTIFIED COPY of a Report of the Committee of the Privy Council, approved by His Excellency the Governor General on the 11th September, 1917.

The Committee of the Privy Council have had before them a report, dated 31st August, 1917, from the Minister of Inland Revenue, stating that, at the present time, large quantities of electrical power are being developed at Niagara Falls by the three following companies:—

The Ontario Power Company,
The Canadian Niagara Power Company,
The Electrical Development Company,

which have installed plants at the Falls in recent years. In addition to the quantity of electricity consumed in Canada, a large portion of power has been, and still is, being exported to the United States.

That the exportation of this electricity has been controlled by license issued by the Department of Inland Revenue, since the passing of the Electricity and Fluid Exportation Act in 1907.

That the demand for power in the province of Ontario has been increasing from time to time, and on that account, the exportation, within the last two years, has been substantially decreased.

That an application has been made by the Hydro-Electric Power Commission of Ontario to further reduce the quantity of power to be exported, in order that this may be at the disposal of Canadian consumers.

That the Hydro-Electric Power Commission, who, some weeks ago, acquired the Ontario Power Company, refuse to consent to the reduction of the quantity of power which they are licensed to export claiming that they have export contracts, which were made prior to the passing of the Electricity and Fluid Exportation Act.

That the other two power companies take issue with the Ontario Power Company, now the property of the Hydro-Electric Power Commission, and dispute the justice of this claim.

That in order that the Department of Inland Revenue should arrive at a satisfactory conclusion as to the proper course to be followed in issuing the licenses for the exportation of electricity for this and subsequent years, it has come to the conclusion that a commission should be appointed to make a full investigation into the matter of the exportation of electricity by these companies in reference to the actual and full needs of the Canadian consumer, and also in reference to all circumstances which might justify further reduction of the exportation of electricity.

The Minister, therefore, recommends that a commission for the above purpose be appointed, and that Sir Henry L. Drayton, Chairman of the Board of Railway Commissioners, be the Commissioner nominated therefor.

The Committee concur in the foregoing recommendation, and submit the same for approval.

RODOLPHE BOUDREAU,

Clerk of the Privy Council

P. C. 3142

CERTIFIED COPY of a Report of the Committee of the Privy Council, approved by His Excellency the Governor General on the 6th November, 1917.

The Committee of the Privy Council have had before them a Report, dated November 5, 1917, from the Sub-Committee of Council appointed to inquire into the question of the production, distribution, etc., of electrical energy in the province of Ontario.

The Committee, on the recommendation of the said Sub-Committee, advise that, under "The War Measures Act," Sir Henry L. Drayton, K.C., Chief Commissioner of the Board of Railway Commissioners for Canada, be appointed Controller of the production and distribution of electrical energy by companies generating or distributing electrical energy in the Province of Ontario.

The Committee, on the same recommendation, further advise as follows:—

That it shall be the duty of such Controller to determine preferences and priorities in the supply of such electrical energy to the end that a sufficient supply shall be furnished to factories and users engaged, directly or indirectly, in munition work or work for any of the Allied Governments, and also for Municipal and public utility requirements.

That all Companies generating or distributing electrical energy in the said Province shall to the fullest capacity of their plant and equipment supply such energy to users thereof entitled to preferences and priorities hereunder in the quantities and as and when from time to time directed by the said Controller.

That it shall be the duty of such Controller to restrict the disposal of electrical energy to users other than those provided for by the clause next preceeding, until such preferences and priorities have been first met.

To the extent that any Company, Commission, Municipality, or other Vendor of electrical energy, by reason of any action, direction, or request of such Controller, is rendered unable to supply electrical energy under any contract or obligation for the time being existing, such Company, Commission, Municipality, or other Vendor of Electrical Energy, shall be, and the same is hereby, relieved from all liability for damages in respect of such failure.

That, in the event of a dispute between any user of electrical energy supplied in preference or priority hereunder, and any Company, the price at which such preferred or prior electrical energy shall be supplied to the user shall be fixed and determined by the said Controller.

That any order or regulation which the said Controller is empowered to make hereunder shall be final, binding, and conclusive.

That, as a great deal of the electrical energy now exported from Canada into the United States at the present time is used in connection with the war requirements of both countries or of their Allies, a copy of this Order in Council shall be furnished to the British Ambassador at Washington, accompanied with the request that such Ambassador arrange if possible with the proper authorities of the United States so

that a conference may be held between such authorities and said Controller, with the view of insuring the closest co-operation between Canada and the United States in the generation and utilization of electrical energy on both sides of the International Boundary, to the end that the maximum efficiency may be obtained in the use of such electrical energy on both sides of the International Boundary without regard to geographical location.

All orders, determinations, or regulations made by the said Controller hereunder shall have the force of law and may be varied, extended or revoked by any subsequent order, determination, or regulation made by the said Controller.

Any company generating or distributing electrical energy neglecting or refusing to comply with or contravening any requirement of these regulations or any order, determination, or regulation made by the said Controller hereunder shall be liable to a penalty not exceeding Five Thousand Dollars; and any Manager, or other official in charge of such company, and any other person violating or contravening any of these regulations or any such order, determination, or regulation made by the Controller shall be liable to a like penalty, or imprisonment for any term not exceeding five years, or to both fine and imprisonment, and such penalty may be recovered or enforced by summary proceedings and conviction under the provisions of Part XV of the Criminal Code.

The Committee submit the foregoing for Your Excellency's approval.

RODOLPHE BOUDREAU, —

Clerk of the Privy Council.

REPORT OF COMMISSION.

To His Excellency the Governor in Council:

The Report of the Commission appointed to investigate the question of the exportation of electricity from Canada by certain companies.

MAY IT PLEASE YOUR EXCELLENCY:

I, the Commissioner appointed by Order in Council dated September 11, 1917, have the honour to present my report to Your Excellency.

The subject matter of the reference and the directions to your Commissioner require a full investigation into the matter of the exportation of electricity at Niagara Falls by the Ontario Power Company, the Canadian Niagara Power Company, and the Electrical Development Company, with reference to the actual and full needs of the Canadian consumer; and also with reference to all circumstances which might justify further reduction in the exportation of electricity.

The issues raised call for inquiry as to and report upon,—

1st. The status, rights, and obligations of the respective companies, not only as against the Crown, but having regard to their rights and status one against the other.

2nd. The amount of power available for distribution by these companies at Niagara Falls.

3rd. The extent of the demands for this power in Canada.

4th. The amount of power in the past exported by these companies, and the present demands of their American customers.

I deal in the first instance with the rights of the companies to develop power in Canadian territory, and to export power developed.

THE ONTARIO POWER COMPANY.

Under the Statute 50-51 Victoria, Chapter 120, the Canadian Power Company was incorporated. The company was empowered to construct, equip, maintain and operate a canal and hydraulic tunnel from some point in the Welland river, at or near its conjunction with the Niagara river, to a point or points on the west bank of the Niagara river about or north of the whirlpool; and by means of and through these works to supply electricity or other power.

The company was also authorized to enter into agreement with any company which had erected or might thereafter erect a bridge across the Niagara river under which one or more wires for electric light or other purposes could be carried upon and over the bridge to the United States shore.

Authority was also given to connect such wires with the wires of any electric light company, or other company, in the United States.

The Act further provided that none of the works authorized should be constructed, or the powers given by the Act exercised, within the present limits of the Niagara Falls Park reservation, except by the consent of the proper authorities.

The Act provided that construction of the work should be commenced within three years and be completed within six years after the passing of the Act, which was assented to June 23, 1887.

By 54-55 Victoria, Chapter 126, assented to July 10th, 1891, the time for the commencement and completion of the work was extended for a period of three years for the commencement and six years for the completion from the passing of the amending Act.

By 56 Victoria, Chapter 89, further amendments were made. They are not of moment to the present issue; but the time of commencement and completion of the work was again extended for the period of three and six years respectively, from July 10th, 1894.

The provision with reference to works in the Niagara Falls Park reservation was continued. Under the amending Act no works could be constructed and none of the powers given to the Company exercised within the limitations of the Queen Victoria Niagara Falls Park, except with the consent of the Lieutenant-Governor of Ontario in Council.

By 62-63 Victoria, Chapter 105, the name of the Company was changed to "The Ontario Power Company of Niagara Falls".

The time for the completion of the Company's works capable of delivering at least 15,000 horse power, was extended for three years from the passing of the amending Act, which was assented to July 10th, 1899; and the Company was given power to extend and enlarge its works from time to time to meet the demands for power for manufacturing and other purposes.

The provision as to construction in Queen Victoria Niagara Falls Park was continued. The provision provided that none of the Company's powers should be exercised, except with the consent of the Lieutenant Governor of Ontario in Council and of the Commissioners of the said Park.

By 63-64 Victoria, Chapter 113, assented to July 7th, 1900, the time for the completion of the work, capable of delivering at least 15,000 horse power, was extended for six years from the passage of the Act.

A further statute, 2 Ed. VII, Chapter 86, respecting the Ontario Power Company of Niagara Falls, was enacted. Its provisions do not appear at all pertinent to the present inquiry.

As a result, the Company is entirely a Dominion incorporation, but the exercise of its powers in the Niagara Park are made subject to the approval of the Lieutenant-Governor of Ontario in Council and the Provincial Commissioners administering the Provincial Parks.

The Company's works have been constructed under the terms of agreements with the Commissioners of the Queen Victoria Niagara Falls Park and approved by the Lieutenant-Governor of the Province of Ontario in Council.

The first, or general agreement, is dated July 11th, 1900. Under it, the Company received its license permitting it to carry on its works in the Park for the considerations in the agreement set out, for a period of fifty years, with provision for a renewal.

This agreement contemplates the transmission of electricity in the United States as well as in Canada. Paragraph 30 reads:—

"For the transmission of electricity or pneumatic power to points beyond the Park in Canada or the United States the Company shall have the right to convey the same by wires, cables, pipes or other appliances in conduits, beneath the surface of the park at such depth and in such locations as the Commissioners may from time to time determine, including the right to cross the so-called chain reserve so far as the same is within the jurisdiction of the Commissioners, at any point or points approved of by the Commissioners between Fort Erie and Niagara-on-the-Lake, but subject to any rights which the Commissioners may have created or licensed or which may be created, without prejudice, however, to the exercise by the Company of any of its rights and powers."

Paragraph 33 relates to the duty of the Company under the agreement to supply power in Canada, and reads:—

"The Company, whenever required, shall, from the electricity or pneumatic power generated under this agreement, supply the same in Canada to the extent of any quantity not less than one-half the quantity generated, at prices not to exceed the prices charged to cities, towns and consumers in the United States at

similar distances from the Falls of Niagara for equal amounts of power and for similar uses, and shall, whenever required by the Lieutenant-Governor-in-Council, make a return of prices charged for such electricity or power, verified under oath by any chief officer of the Company, and if any question or dispute arises involving the non-supply of prices of electricity or power for consumption in Canada, the High Court of Justice of Ontario shall have jurisdiction to hear and determine the same and enforce the facilities to be given or the prices to be charged."

The electricity exported by the Ontario Power Company is sold to the Niagara, Lockport & Ontario Power Company. The contract is of date July 16th, 1904, and calls for the delivery of 45,000 kilowatts (60,000 horse-power) on or before January 1st, 1907, Future and additional deliveries were also contracted for; which are not of moment under the present question. The contract was to remain in force until April 1st, 1950, with certain provisions of renewal.

The intention of the agreement is directly expressed in that the agreement shall operate as a firm sale of 45,000 kilowatts, and invests in the Transmission Company, i. e., the Niagara, Lockport & Ontario Power Company, two options under each of which it may secure 45,000 kilowatts.

The power is delivered by the Ontario Power Company to the Transmission Company at the International Boundary Line—the cost of the construction and maintenance of the crossing between the eastern cliff and the western cliff of the Niagara River being divided under the contract equally between the parties.

The contract provides penalties for default, either in the supply of power or in the paying for it. The limitations and penalties provided, however, are qualified by Article 9 of the Agreement, in instances where cases of default are fairly found not to be controlled by the party in default. Article 9 reads:—

"None of the remedies specified in the preceding Seventh or Eighth Articles shall be used by either party against the other in case of a default by either party, providing the default be fairly attributable to riots, strikes, fire, tempest, explosion, or other cause fairly beyond the control of the party in default, but in such cases the deduction in payment by the Transmission Company to the Power Company shall be adjusted in the manner prescribed in the Fifth Article hereof."

It is claimed that the plant of the Niagara, Lockport & Ontario Power Company was constructed for the purpose of distributing the power purchased from the Ontario Power Company.

In 1906, in the report of Capt. Charles W. Kutz, of the Corps of Engineers of the Water Department of the United States of America, has described this Company's construction and investment. His report reads:—

"9. The Niagara, Lockport and Ontario Power Company is building, switching and transforming stations and constructing transmission lines for the purpose of carrying out its contract with the Ontario Power Company. In furtherance of its plans the Company has acquired a private right of way containing about 3,200 acres of land, with an unbroken strip 300 feet wide from the Niagara River to Lockport, a distance of 17 miles; thence 200 feet wide to the suburbs of Rochester, a distance of 55 miles; thence a 100 feet wide from the suburbs of Rochester to Fairport, a distance of 12 miles. In addition, a similar private right of way, owned in fee simple 100 feet wide, has been acquired from Lockport southward through the suburbs of Buffalo to the Lackawanna Steel Company's plant, a distance of 27 miles.—The Company has erected two transmission lines from the International Boundary to Lockport, each with a capacity of 30,000 horse-power. From Lockport to Syracuse a single line partly over the right of way of the West Shore railroad has been completed with a capacity of

10,000 horse-power, and a second line of greater capacity is under construction. On the double line from Lockport to Buffalo work is in progress, 60 per cent of the poles having been erected. Each of the Buffalo lines is to have capacity of 30,000 horse-power."

"10. The books of this Company show an expenditure of \$2,785,000, of which \$1,200,000 is represented by right of way and \$1,162,000 is represented by construction. The Niagara, Lockport and Ontario Power Company has actually executed contracts which call for the delivery within the near future of 6,000 horse-power, with provision for fixed increases at intervals varying from three months to three years, so that at the expiration of that time they will have a firm contract with their present customers for 14,240 horse-power, with options on the part of the purchasers which give them the right to increase the amount to 50,000 horse-power. The first of these contracts is dated June, 1905, three others in the Fall of 1905, one in March, two in April, and two in May, 1906. In addition the Company claims to have contracts verbally closed for 13,000 additional firm horse-power, and negotiations pending for 25,000 firm horse-power, making a total of 52,000 horse-power, for which they hope to have a market in the near future. The optional amounts named in these contracts and negotiations aggregate 166,000 horse-power. At the time of the examination, this Company was actually transmitting to the United States 700 horse-power."

The Company in its own submissions at the present inquiry says:—

"Between August, 1904, and April, 1917, it acquired a private right of way leading from Niagara river to the City of Syracuse, with lateral lines to the City of Lackawanna, adjacent to Buffalo, and to the city of Auburn, and constructed upon these rights of way, in the main, two high tension steel tower transmission lines, with carrying capacity for the distribution of the 60,000 horse-power it had purchased from the Ontario Power Company; and secured customers whose aggregate firm demands were as stated on the schedule of contracts between the Niagara, Lockport and Ontario Power Company and its customers, hereto annexed. Furthermore, in this period of time it had constructed large and extensive sub-stations and switching stations at Lockport, at Gardenville (near Buffalo), at Mortimer (south of Rochester), and at Solvay, adjacent to the westerly corporation limits of the City of Syracuse. For the creation of this property during the period of time mentioned, there was expended approximately \$10,000,000. Aside from this, customers secured by the Company had been busy during the same period purchasing and installing equipment for taking the power purchased from the Niagara, Lockport and Ontario Power Company, in connection with which millions more had been expended."

Beyond all question a substantial investment has been made by the Niagara, Lockport and Ontario Power Company in its plant, which has in the past been and still is, used for the purpose of distributing in part power generated in Canada by the Ontario Power Company.

The Niagara & Lockport Company has made contracts with its customers, obligating it to make specific deliveries of firm power, while the Company also supplies power as and when it is in a position to deliver it off peak.

The form of contract limits its liability as follows:—

Eighth.—(a) In case the Power Company shall be prevented from delivering said electric power, or in case the Purchaser shall be prevented from receiving said electric power, by strike, riot, fire, lightning, invasion, explosion, act of God or the public enemies, or any other cause reasonably beyond its or his control, then the Purchaser shall not be obligated to pay for such power during the period of such interruptions, and the Power Company shall not be obligated to deliver such power during such period; but nothing herein contained shall be

construed as permitting the Power Company to refuse to deliver power or the Purchaser to refuse to receive the same as soon as the cause of interruption is removed, and each of the parties hereto shall be prompt and diligent in removing and overcoming such cause or causes.

(b) In case the Power Company shall be prevented from delivering power by the necessity for repairs or any other cause than those specified above, then the Purchaser shall be entitled to a deduction equal to the service charge of the then firm power at the price specified in Article Second, for twice the period of the interruption.

The Ontario Power Company is now owned by the Hydro-Electric Power Commission of Ontario, that Commission having purchased practically all of the stock of the Ontario Power Company, the stock being acquired under agreement dated April 12, 1917.

To this agreement John Joseph Albright (the Vendor); The Hydro-Electric Power Commission of Ontario, (the Purchaser); His Majesty the King, as represented by the Lieutenant Governor in Council of the Province of Ontario (the Guarantor); The Ontario Power Company of Niagara Falls; The Ontario Transmission Company, Limited; and the Niagara, Lockport and Ontario Power Company are parties.

The Ontario Transmission Company, Limited, is a subsidiary of the Ontario Power Company, which owns all of the stock of the Transmission Company. Section 8 of the agreement is pertinent to the present inquiry, and reads,—

Eighth. The Lockport Company, The Power Company, and the Purchaser mutually agree—

(a) that on the first day of April, 1950, if all the now outstanding bonds of the Lockport Company shall have been paid and retired on or before that date, and otherwise as soon after the first day of April, 1950, as all of the said bonds of the Lockport Company shall have been paid and retired, and in any event not later than the first day of November, 1954, the existing contract between the Power Company and the Lockport Company, evidenced by four agreements made between the Lockport Company and the Power Company and dated respectively the 16th day of July, 1904, the 30th day of December, 1904, the 31st day of October, 1905, and the 30th day of December, 1913 (hereinafter called the existing power supply contract) and any extension or renewal of or right of either party thereto to extend or renew the same shall cease and determine; and

(b) that in case the Power Company shall at any time or times be prevented by any competent authority other than the Legislature or Government of the Province of Ontario or by strike, lockout, riot, fire, invasion, explosion, act of God or the King's enemies, or any other cause reasonably beyond its control, from delivering to the Lockport Company the power deliverable under the existing power supply contract, or any extension or renewal thereof, or any part of such power, or in case the Lockport Company shall at any time be so prevented from taking such power or any part thereof, then the Power Company shall not be bound to deliver such power during such time or times, or be liable for any penalties or damages or deductions for non-delivery during such time or times, and the Lockport Company shall not be bound to pay for such power during such time or times but as soon as the cause of such interruption is removed, the Power Company shall without any delay, deliver the said power as aforesaid, and the Lockport Company shall take the same, and each of the said parties (the Power Company and the Lockport Company) shall, so far as such party can do so, and as nearly as possible, remove and overcome such cause or causes of interruption.

The Lockport Company covenants with the Power Company and the Purchaser, and each of them, that all the said bonds of the Lockport Company will be paid and retired before or on the first day of November, 1954.

The Power Company agrees with the Lockport Company and the Purchaser agrees with and guarantees to the Lockport Company, and agrees with and guarantees to the Vendor that the Power Company will duly abide by, observe and perform the existing power supply contract between the Power Company and the Lockport Company (as varied by this agreement) and all extensions or renewals thereof; and the Purchaser and the Guarantor undertake and agree with the Power Company, the Lockport Company, the Transmission Company, and the Vendor, to use their best endeavours from time to time with the Government and Parliament of Canada and with the Legislature of Ontario to place and keep the Power Company and the Transmission Company at all times in such a position that they and each of them may lawfully carry out the terms of the existing power supply contract between the Power Company and the Lockport Company (as varied by this agreement) and any extensions or renewal thereof so far as relates to the export of the power required for the purpose of such contract, as so varied, and any extensions or renewals thereof.

The Purchaser, The Power Company and the Lockport Company mutually agree that except as by this paragraph (eighth) varied, the existing power supply contract shall continue and remain in full force and effect."

As a result, the rights of the Niagara, Lockport and Ontario Power Company to obtain power from the Ontario Power Company are continued, and are supplemented by the guarantee of the Hydro-Electric Power Commission of Ontario.

As a result of negotiations between the Hydro-Electric Power Commission and the Niagara, Lockport and Ontario Power Company, that Company has agreed to release for use in Canada 10,000 horse-power of the 60,000 horse-power called for by the agreement, during the currency of the war.

The returns made by the Ontario Power Company to the Department of Inland Revenue show that power has been generated for export expressed in terms of horse-power years, as follows:—

Year.	Horse-power.
1903.....	4,110.56
1904.....	20,173.62
1910.....	26,621.10
1911.....	29,898.00
1912.....	32,494.65
1913.....	33,912.66
1914.....	43,168.36
1915.....	31,160.30
1916.....	30,473.28
1917.....	50,258.03

The Company develops 158,678 horse-power but is capable of carrying a load of 162,000 horse-power.

CANADIAN NIAGARA POWER COMPANY.

On April 7, 1892, an agreement was made between the Commissioners for the Queen Victoria Niagara Falls Park and Albert D. Shaw, and others,—the intention being that Mr. Shaw and his associates would cause themselves to be incorporated into a Company to carry out the agreement.

Under the agreement, a license was given to take water from the Niagara River and to construct works,—the right to take water from the Niagara River being subject only to rights existing and already granted.

Among other rights, the Company was given the direct right to pass a conduit under the electric railway within the park to enable electricity, or pneumatic power to be conveyed between the railway and the edge of the cliff as far as the Niagara Falls and Clifton suspension bridge.

The sale of electricity in Canada is covered by Paragraph 11. of the agreement, which reads as follows:—

"11. The Company whenever required shall from the electricity or pneumatic power generated under this agreement supply the same in Canada (to the extent of any quantity not less than one-half the quantity generated) at prices not to exceed the prices charged to cities, towns, and consumers in the United States at similar distances from the Falls of Niagara for equal amounts of power and for similar uses, and shall whenever required by the Lieutenant Governor in Council make a return of prices charged for such electricity or power, verified under oath by any chief officer of the company, and if any question or dispute arises involving the non-supply or prices of electricity or power for consumption in Canada the High Court of Justice of Ontario shall have jurisdiction to hear and determine the same and enforce the facilities to be given or the prices to be charged."

Mr. Shaw and his associates, at the following session of the Legislature of Ontario, and under the provisions of 55 Victoria, Chapter 8, were incorporated under the name of the "Canadian Niagara Power Company".

Under the Statute, the Company was authorized to construct, maintain, and operate works for the construction, distribution, and sale of electricity and pneumatic power. The Act further provided—

"And the said company shall have power, upon receiving proper authority so to do, to take its lines or conductors across any bridge over the Niagara River, subject always to any agreement that may be entered into with respect thereto with the owners for the time being of such bridge."

The original agreement with the Park Commissioners was modified by an agreement dated July 15, 1899.

Under this agreement, rentals were charged and the limitation contained in the original contract under which the Commissioners bound themselves not to grant or to confer upon any other Company or person the right to take or use the water of the river was cancelled.

A further agreement extended the time for construction. On June 19, 1901, the time for the completion of the work was extended to the first of July, 1904, subject to the provisions of the agreement.

Another agreement, relating to details of the work, was also entered into on June 19, 1901. The agreements have been duly approved by the Lieutenant Governor in Council.

As a result, the Company was given the right under Provincial Legislature to carry on business, and enjoyed the rights granted by the Park Commissioners and confirmed by this Legislature, to take water from the Falls.

The Company is closely connected with the Niagara Falls Power Company,—a Company incorporated by and doing business in the State of New York. It was financed by the American Company which owns practically all the stock the Canadian Company has issued.

The Canadian Company now shows it generated power for export as follows:—

AVERAGE HORSE-POWER GENERATED FOR EXPORT BY CANADIAN NIAGARA POWER COMPANY.

Year.	Months.	Days.	Hours.	Horse-Power.
1905.....	5	4	7.96	4,605
1906.....	12	.....	.....	12,399
1907.....	12	.....	.....	27,818
1908.....	12	.....	.....	31,724
1909.....	12	.....	.....	39,308
1910.....	12	.....	.....	42,424
1911.....	12	.....	.....	44,062
1912.....	12	.....	.....	49,298
1913.....	12	.....	.....	58,729
1914.....	12	.....	.....	59,786
1915.....	12	.....	.....	59,727
1916.....	12	.....	.....	55,918
1917.....	8	.....	.....	36,807

The Company develops 100,000 horse-power.

THE ELECTRICAL DEVELOPMENT COMPANY.

This Company was incorporated by the Province of Ontario with the usual powers to enable it both to produce and transmit electrical power, the Company being incorporated under Provincial Charter dated February 18, 1903.

The Company's rights in the Queen Victoria Niagara Falls Park are exercised under an agreement made between the Commissioners of the Queen Victoria Niagara Falls Park and William MacKenzie, Henry Mill Pellatt, and Frederic Nichols, who are referred to in the agreement as "The Syndicate".

Under the agreement, the Syndicate was licensed to take water from the river in a quantity sufficient to develop 125,000 electrical horse power, the development to be made upon the plans agreed to between the parties.

The licence granted was for a period of 50 years from February 1, 1903, at rents and with right of rental as in the agreement set out.

The agreement made provision for the erection of overhead high tension wires or cables, or other appliances in conduits, for the transmission of electricity or pneumatic or other power to points beyond the Park in Canada or the United States.

Section 21 of the agreement reads as follows:—

The Syndicate, whenever required, shall from the electricity or pneumatic power, generated under this agreement, supply the same in Canada to the extent of any quantity not less than one-half the quantity generated at prices not to exceed the prices charged to cities, towns and consumers in the United States, at similar distances from the Falls of Niagara for equal amounts of power and for similar uses, and shall whenever required by the Lieutenant Governor in Council, make a return of prices charged for such electricity or power, verified under oath by any chief officer of the Syndicate, and if any question in dispute arises, involving the non-supply of prices of electricity or power for consumption in Canada, the High Court of Justice of Ontario shall have jurisdiction to hear and determine the same and enforce the facilities to be given or the prices to be charged.

The syndicate assigned the agreement to the Electrical Development Company by Indenture of Assignment dated March 21, 1903, which was duly approved by the Lieutenant Governor in Council.

This Company, is the only one of the three that has developed in Ontario a transmission system of any large extent. The Company's transmission lines serve Toronto and intermediate territories. The transmission lines were built by the affiliated Company, the Toronto & Niagara Power Company. The whole system is now operated by the Toronto Power Company.

The returns made by the Electrical Development Company to the Department of Inland Revenue show that power has been generated for export expressed in terms of horse-power as follows:—

Year.	Horse-power.
1903.. .. .	252.32
1909.. .. .	710.43
1910.. .. .	3,441.25
1911.. .. .	3,766.00
1912.. .. .	1,266.25
1913.. .. .	3,421.51
1914.. .. .	6,443.53
1915.. .. .	Nil.
1916.. .. .	5,302.66
1917.. .. .	18,095.97

The Company states it develops an average of 125,000 horse-power with a peak capacity of 146,000 horse-power.

POSITION UNDER PROVINCIAL CONTRACTS.

Under the contracts made by the Companies with the proper Provincial authorities, the export of electricity into the United States is subject only to a stipulation that the Companies shall whenever required supply electricity in Canada to an extent and quantity not less than one-half of the total quantity generated by each company.

The Ontario Power Company with a development of some 162,000 horse-power is now only exporting 50,000 horse-power; the Canadian Niagara Power Company, with a development of 100,000 horse-power, is exporting some 36,000 horse-power; and the Electrical Development Company, with an average production of 125,000 horse-power, is exporting but 13,500 horse-power of firm power and 8,000 horse-power off peak under contract and in all an average approximating 22,000 horse-power.

The Canadian section of the International Waterways Commission (with reference to the clause in the Companies' contracts above referred to) in their report of December 31, 1906, say,

They (the Companies) do not comply with the conditions of their agreement unless and until they have severally or jointly built transmission lines in Canada to an equal extent as in the United States.

Your commission is of opinion that it was of the spirit of the agreement if not the letter that the Companies should themselves reach out and supply the Canadian public, and that it is not a fair interpretation of the agreement that Canadian consumers should be expected to build transmission lines to Niagara Falls as a condition of receiving any benefit from this public utility.

No complaint can be made against the Electrical Development Company on this score, and whatever the neglect and liability of the Ontario and Canadian Niagara Power Companies may have been in this regard, the construction of transmission lines in Ontario by these Companies is rendered altogether unnecessary by the very complete transmission system of the Hydro-Electric Commission, which to-day requires power for distribution in Ontario much in excess of 50 per cent of the output of these companies.

No attempt has been made to make out a case against either of these companies based on any default of their Provincial obligations. On the other hand, as a matter of fact, the Provincial contracts justify the export of power as now made by the Companies rather than any prohibitory Order.

DOMINION LEGISLATION.

The rights of the Companies thus obtained to export electrical power into the United States remained subject to the exercise of the powers of the United States Congress and the Dominion Parliament.

Action was first taken by Congress by an Act approved July 29, 1906, entitled "An Act for the Control and Regulation of the Waters of Niagara River for the preservation of Niagara Falls, and for other purposes".

Under the provisions of this Act, it became unlawful to transmit electrical power into the United States from Canada, except in accordance with permits issued by the Secretary of War. The amount of power which may be so transmitted to the United States is limited by the proviso as follows:—

"Provided—; and that the quantity of electrical power which may by permits be allowed to be transmitted from the Dominion of Canada into the United States shall be one hundred and sixty thousand horse-power; Provided further, that the Secretary, subject to the provisions of Section five of this Act, may issue revocable permits for the transmission of additional electrical power so generated in Canada; but in no event shall the amount included in

such permits, together with the said one hundred and sixty thousand horse-power, and the amount generated and used in Canada, exceed three hundred and fifty thousand horse-power; Provided always that the provisions herein permitting diversions and fixing the aggregate horse-power herein permitted to be transmitted to the United States, as aforesaid, are intended as a limitation on the authority of the Secretary of War, and shall in no wise be construed as a direction to said Secretary, to issue permits, and the Secretary of War shall make regulations preventing or limiting the diversion of water, and the admission of electrical power as herein stated; and the permits for the transmission of electrical power issued by the Secretary of War may specify the persons, companies or corporations by whom the same shall be transmitted, and the persons, companies or corporations to whom the same shall be delivered".

Section 5 of the Act reads:—

"Sec. 5. That the provisions of this Act shall remain in force for three years from and after date of its passage, at the expiration of which time all permits granted hereunder by the Secretary of War shall terminate, unless sooner revoked, and the Secretary of War is hereby authorized to revoke any or all permits granted by him by authority of this Act, and nothing herein contained shall be held to confirm, establish or confer any rights heretofore claimed or exercised in the diversion of water or the transmission of power."

Under this Act, the Honourable Secretary of War, in his memorandum dated July 14, 1906, after ascertaining that at that time the Canadian Niagara Power Company was producing and transmitting to the United States about 16,000 horse-power daily, and that the Ontario Power Company did not produce a greater amount, granted temporary permits for the transmission of no more than 25,000 horse-power of the output of each Company.

Permits to these Companies were subsequently enlarged and the Electrical Development Company was also permitted to transmit 40,000 horse-power. In the course of this inquiry the Electrical Development Company claimed that they ought to have the right to export power to as great an extent as the other Companies.

In 1907, the Dominion Parliament enacted "The Electricity and Fluid Exportation Act", which was assented to on the 27th of April of that year.

This Act prohibits the export of electrical power without a license. The Act provides for the issue of licenses by the Governor in Council, permitting the exportation of power where the right to export exists by lawful authority, and that such rights shall be revocable upon such notice to the licensee as the Governor-in-Council deems reasonable in each case.

Sub-section 1 of Section 5 of the Act reads:—

"5. Any such license may provide that the quantity of power or fluid to be exported shall be limited to the surplus, after the licensee has supplied for distribution to customers for use in Canada power or fluid to the extent defined by such license, at prices and in accordance with conditions, rules and regulations prescribed by the Governor-in-Council."

The Act authorized regulations to be made by the Governor-in-Council for the purpose of giving effect to the Act, and also provided for the imposition of export duties.

Regulations were adopted by the Governor-in-Council under the Order-in-Council dated November 4th, 1907. Section 4 of these regulations reads:—

"4. Any license issued hereunder shall be revocable at will by the Governor-in-Council if the licensee refuses, or neglects to comply with any of the conditions from time to time imposed by the Governor-in-Council with regard to the supply and distribution of electrical energy, gas or fluid in Canada, and, more-

over, whenever such electrical energy, gas or fluid is required for the use of purchasers in Canada, any such license shall be revocable upon such notice to the licensee as the Governor-in-Council deems reasonable in each case."

The regulations provide for the issuance of licenses through the Department of Inland Revenue.

Licenses have, in accordance with the Act and Regulations, been issued to each of the three Companies concerned in this inquiry, the first licenses being issued in 1907.

The license contains the following clauses,—

"This license being only for one year, licenses must not enter into any contract which they will not be able to carry out if this license is not renewed, or if the Electricity and Fluid Exportation Act or the Regulations made thereunder are changed."

"This license is subject to the Statutes of Canada, now in force, or hereafter to be enacted and also to the provisions of the Regulations regarding electrical power, etc., approved by the Governor General in Council on the 4th day of November, 1907, and to any Regulations which may hereafter be made, which Statutes and Regulations are made conditions thereof."

"Every contract made under this license shall contain a clause or clauses expressly setting forth that it is made by virtue of this license which is subject to the Electricity and Fluid Exportation Act and any amendments that may be made to it, and also is subject to the Regulations made or which may be made by the Governor General in Council regarding the same; and every contract made under this license shall have attached thereto a copy of this license and of the Electricity and Fluid Exportation Act, and of the Regulations approved by the Governor General in Council on the 4th day of November, 1907."

"This license, if renewed, shall be subject to the terms and conditions of such Regulations as may be made from time to time, either by Statute or the Governor in Council."

The intent and object of the Law was to insure a sufficient supply of electricity generated by Canadian plants from Canadian water powers for Canadian users.

While, under the Act, the legislation could be used for revenue purposes, that was not the main object of the Act, nor, as a matter of fact, has the Act been so administered. No export duty has been levied but a nominal fee is charged for the issuance of the licenses.

It could be noted that, in the year 1908, the Ontario Power Company only generated in all 5,675.16 horse-power, and that of this total only 1,004.60 was generated for consumption in Canada, the remaining 4,610.56 being generated for export. In the year 1912, the total output of the Company amounted to 63,274.12 horse-power, of which 30,552.17 was generated for consumption in Canada and the remaining 32,694.65 being generated for export.

The Canadian Niagara Power Company, in 1908, generated in all 13,052.61 horse-power, of which 602.10 was generated for consumption in Canada, and the remaining 12,450.51 being generated for export. Taking again the year 1912, this Company generated 46,982.47 horse-power, of which 1,821.52 was for the Canadian market and 45,160.95 for export.

In 1908, the Electrical Development Company generated 5,239.32 horse-power, of which 4,987.00 was generated for Canada and but 252.32 for export. In 1912, this Company generated 21,996.87 horse-power, 20,730.02 of which was for the Canadian market and 1,266.25 for the American market.

The power or right of the Dominion to prohibit the export of power is denied both by the Ontario Power and Canadian Niagara Power Companies.

The position of the Companies differ in that the Ontario Power Company is a Dominion incorporation, while the Canadian Niagara Power Company is entirely Provincial.

The Ontario Power Company claims that, under its then admitted right to export power, it entered into the agreement with the Niagara, Lockport & Ontario Power Company already referred to, and that both Companies had vested property rights in and under the contract which was enacted prior to the passage of the "Electricity and Fluid Exportation Act," and that these vested rights cannot be affected by subsequent legislation.

In my opinion, no Act of Incorporation, no matter how wide and general its terms may be, can, in the absence of an expressed intention, limit the power of Parliament in the exercise of its general control over the exports and imports of the country, including duties on exports as well as on imports.

Apart from any special exemption made by Parliament the exercise of the powers of incorporated companies just as well as those of individuals is subject to the general law extended or modified from time to time as the case may be. No rights can arise by implication as against the Crown.

The mere fact that an Act of Incorporation permits the incorporated company to either export or import any commodity cannot, in my opinion, impair the legislative power of Parliament and limit the operation of the general law subsequently enacted, so as to exclude the activities of the incorporated company. The Company's own course of action would indicate a concurrence with this view, as the Company has, ever since the "Electricity and Fluid Exportation Act" became effective, applied for and accepted licenses thereunder. The temporary character of these licenses is made plain on their face.

The Canadian Niagara Power Company was also under contract to export power prior to the passage of the "Electricity and Fluid Exportation Act." This company was financed by the Niagara Falls Power Company, of New York; and, under the agreement of October 1, 1901, between the companies, the Canadian company agreed,—

"From the said plant so constructed to supply power to the Niagara Company, when and as by it required, and for use only in the United States, at a price at all times equal to and never exceeding the price charged to cities, towns and consumers in Canada at similar distances from the Falls of Niagara for equal amounts of power and for similar uses."

There are other agreements between the companies, but a later agreement of June 12, 1906, and, therefore, also prior to the Dominion legislation, deals with the sale of power for use in the United States, as follows,—

"Subject to the provisions of its charter and of the provisions of law and regulations within the Dominion of Canada, the Canadian company shall furnish to the Niagara Company, or to others with whom the Niagara Company has power contracts and whom the Niagara Company may designate for the purpose, at points in the International boundary between the Dominion of Canada and the United States opposite Fort Erie and opposite Niagara Falls, respectively, at prices fixed as hereinbefore stated, the entire amount of the output of electrical power of the Canadian Company's plant, in the Queen Victoria Niagara Falls Park, which shall not be required for use and delivery by the Canadian Company within the Dominion of Canada and which the Niagara Company and such power users may desire and may be permitted to receive and transmit into the United States under the provisions of law and governmental regulations of the United States and the State of New York."

These agreements, however, were terminated by the agreement between the same Companies dated December 1, 1910. Under this agreement, the provisions for sale to the American Company read as follows:—

"Subject to the requirements of any provision of law or Governmental regulation, on the terms hereinafter stated and upon the demand of the Niagara Company, from time to time during the term hereof, the Canadian Company shall furnish the Niagara Company for its use or disposal such quantity as shall by it be demanded of the electrical energy that can be produced in the safe and proper operation of the Canadian Company's Hydro Electric plant at Niagara Falls, Ontario, as the said plant is now constituted or hereafter may be constituted, including any additions thereto or extensions thereof, except so much of such electrical energy as the Canadian Company shall be obligated under any provisions of its charter to sell to others in Canada, and except so much as the Canadian Company shall have sold and delivered or shall have contracted to sell and deliver to others in Canada or elsewhere."

"This agreement shall not prevent the Canadian Company from selling in Canada to others than the Niagara Company one-half of all the electrical energy generated at the said Hydro Electric plant of the Canadian Company, or from selling to others than the Niagara Company, whether in Canada or elsewhere, all or any part of the electrical energy generated at said plant that shall not be demanded and be taken under this agreement by the Niagara Company."

A further agreement was made between the companies dated June 28, 1917, which contains the following significant recital:

"Whereas the amount of electrical energy which the Canadian Company can furnish at the International Boundary Line for use in the United States has been greatly diminished and may soon be wholly cut off through action or requirement of the respective Governments of the Dominion of Canada and the Province of Ontario."

And the further recital, which shows the desire of the parties to amend the agreement covering conditions which have arisen subsequent to its execution,—

"And to provide a fair basis of payment for the electrical energy, if any, which the Canadian Company may be compelled to furnish."

The agreement continues a similar provision to that of the agreement of December 1, 1910, but contains the following saving clause,—

"This agreement will not prevent the Canadian Company from selling in Canada to other than the Niagara Company any part or all of the electrical energy generated at the said Hydro Electric plant of the Canadian Company."

Extended reference has already been made to the agreements of the Ontario Power Company. The provision contained in the agreement of purchase of the company's stock by the Hydro Electric Power Commission, and which has already been set out, is significant.

By it express exception is made in the Power Company's obligation to supply power when the delivery of power is prevented by any competent authority other than the Legislature or Government of the Province of Ontario.

Before this agreement was entered into, applications had been made by the Hydro Electric Power Commission to the Department of Inland Revenue requesting that the amount of power exported be materially reduced.

Beyond all doubt an authority the parties had in mind, if not indeed the only authority, was the Dominion. Attention is also called to the undertaking in the agreement of the Hydro Electric Power Commission and the Ontario Government to use their best endeavours from time to time with the Dominion authorities to place and keep the Power Company and Transmission Company at all times in such a position that they might lawfully carry out the power supply contract.

This undertaking has been carried out in the present inquiry by the Commission and by the Government of Ontario, who support the position of the Ontario Power Company, while demanding that export by the Canadian Niagara Power Company and the Electrical Development Company be prohibited altogether.

The interruption of power exported must work a certain amount of inconvenience and hardship; but the right of the Dominion to prohibit the export cannot be affected or limited by any contract that a producing company may have made. On the other hand, action by the Dominion is not hampered or impeded by provincial agreements. The mere fact that under the provincial agreements the companies may export 50 per cent of their production, does not bind Dominion action in regard to Canadian power necessities.

The companies have been well warned of the probability of much reduced export, if not an entire prohibition. The Department of Inland Revenue, on the 1st of November, 1916, wrote the following letters to the companies:—

November 1, 1916.

Ontario Power Company, Limited,
Niagara Falls, Ont.

GENTLEMEN,—

"With regard to the granting of licenses permitting the exportation of power for the fiscal year 1916-17, I may say that, after investigating the matter, this Department has decided that 45,000 k.w., or 60,000 h.p., is the outside limit which can be granted to the Ontario Power Company for the fiscal year 1916-17.

"I also wish to inform you that the Ontario Government has notified us that the Province of Ontario will require from 40,000 to 50,000 additional h.p. during the year, and that being the case, as the licenses granted to your company are on the distinct condition that when the power is required in Ontario it will be withdrawn from export, I am now giving you notice so that you will have ample time to arrange for your portion of this power to be withdrawn during the coming year.

"We will, therefore, not be able to grant you the same number of horsepower under license for the year 1917-18.

"Kindly acknowledge receipt of this notice and much oblige."

November 1, 1916.

Canadian Niagara Power Company,
Niagara Falls, Ont.

GENTLEMEN,—

"With regard to the granting of licenses permitting the exportation of power for the fiscal year 1916-17, I may say that, after investigating the matter, this Department has decided that 30,000 k.w., or 40,000 h.p., is the outside limit which can be granted to the Canadian Niagara Power Company for the fiscal year 1916-17.

"I also wish to inform you that the Ontario Government has notified us that the Province of Ontario will require 40,000 to 50,000 additional h.p. during the year, and, that being the case, as the licenses granted to your company are on the distinct condition that when the power is required in Ontario it will be withdrawn from export, I am now giving you notice so that you will have ample time to arrange for your portion of this power to be withdrawn during the coming year.

"We will, therefore, not be able to grant you the same number of horse-power under license for the year 1917-1918.

"Kindly acknowledge receipt of this notice, and much oblige."

November 1, 1916.

Electrical Development Company,
Niagara Falls, Ont.

GENTLEMEN,—

"With regard to the granting of licenses permitting the exportation of power for the fiscal year 1916-17, I may say that, after investigating the matter, this Department has decided that 12,000 k.w., or 16,000 h.p., is the outside limit which can be granted to the Electrical Development Company for the fiscal year 1916-17.

"I also wish to inform you that the Ontario Government has notified us that the Province of Ontario will require 40,000 to 50,000 additional h.p. during the year, and, that being the case, as the licenses granted to your company are on the distinct condition that when the power is required in Ontario it will be withdrawn from export, I am now giving you notice so that you will have ample time to arrange for your portion of this power to be withdrawn during the coming year.

"We will, therefore, not be able to grant you the same number of horse-power under license for the year 1917-1918.

"Kindly acknowledge receipt of this notice, and much oblige."

Yours very truly,

Deputy Minister of Inland Revenue.

It is, of course, quite true that the companies have all protested against reductions; but the fact remains that upwards of a year ago they were explicitly advised of the additional demands of the Hydro-Electric System; and that the power for export would be withdrawn when required in Ontario.

POWER DEMAND AND SUPPLY.

Beyond all doubt there is a shortage of power in the districts of Ontario served by the power produced at Niagara Falls. None of the parties really raise any issue on this head.

I adopt the figures given by Mr. Gaby in his evidence at Niagara Falls, where he states that the combined shortage of the Hydro-Electric and Ontario Power Systems in Ontario would approximate on December 1st, 1917, 102,000 horse-power. His evidence shows that the required generator capacity of the combined systems amounts to approximately 325,000 horse-power, and that of this total there is required in Canada 275,000 horse-power.

Under the contract to which the systems are parties, horse-power to the reduced amount of 50,000 is called for by the Niagara, Lockport & Ontario Power Company, leaving but 112,000 horse-power developed by the Ontario plant available.

The Canadian Niagara Power Company is supplying the Hydro-Electric with 50,000 horse-power, and the Toronto Power Company has in the past sold power to the Ontario Power Company, sometimes to as great an extent as 50,000 horse-power. A contract for some 27,000 horse-power has expired, and has not been renewed. The Toronto Power Company is now supplying the Ontario Power Company 13,500 horse-power, under contract expiring November 1st, 1917, which contract the Toronto Power Company states will not be renewed, claiming that they require the full amount of the power they produce. They are also under contract for a similar quantity expiring October 15th, 1920.

Mr. McDougall, who appeared for the Toronto Power Company, also agreed that there was a real power shortage.

Under such circumstances, and apart from other, and as your Commissioner ventures to think, controlling conditions, no licenses should be issued for the export of power until the demand in Ontario is first met.

The economic and transportation necessities, not only of Canada, but of the United States, would be thus best served.

Power is looked upon and is to a large extent a substitute for coal. The Ontario district is supplied by coal from the United States mines. The difficulties and cost of transportation of coal increase with the mileage it has to be carried. The more Canadian power is used at home, the less the transportation burden.

There is, further, no doubt or question but that under the treaty between the United States and Canada, power allotted to Canada thereunder ought to be used in that territory.

WAR MUNITIONS AND PRODUCTION.

The foregoing recommendations depend entirely upon normal conditions and what is conceived to be the strict right of the Dominion.

The present situation demands a fair consideration of other questions of grave national importance.

Electrochemistry and its products play a very large part in the present war. Niagara Falls is the chief centre for the production of these products. Many of the factories are on the American side. The industries in the neighbourhood of Niagara Falls must supply the bulk of ferro-alloys, all essential for the steel industry, both for armour plate and projectiles. Caustic sodium, potassium chlorate, and chlorobenzol are necessary to explosives. Chlorine is required, on the one hand, for gas shells; and, on the other, is necessary for water purification. Carborundum, aloxite, metallic silicium, and electrodes are all important. Electric power is used in the production of all these essentials and many others.

Mr. Gaby shows in his evidence that out of a total required for the Hydro Canadian use amounting to 275,000 horse power, no less than 169,636 horse power is required for munition work. The return filed showing the distribution of the load of the Toronto Hydro gives, as the estimated December load for munitions and war supplies, no less than 48,800 horse power, out of a total of 109,580 horse power, or 44.6 per cent.

The Buffalo General Electric Company, receiving some 37,500 horse power from the Canadian Niagara Power Company and its parent company, the Niagara Falls Power Company, and 13,500 horse power from the Toronto Power Company, in a similar statement filed by it shows an estimated consumption for December for munitions and war supplies of 67,000 horse power out of a total of 117,321, or 46 per cent.

It may be noted that the actual consumption by consumers and war materials as returned by the company for last August amounted 53,864 horse power.

This company (the Buffalo General Electric) will have completed November 15th a steam plant with a total rated capacity of 80,400 horse power to meet, with the Hydro power above referred to, an estimated demand of 147,321 horse power.

The other companies also show large demands for munition works. The Toronto Electric, (supplied by the Toronto Power Company) statement shows customers requiring 14,480 horse power for munitions. While other customers of the Toronto Power Company, apart from the Buffalo General Electric, using power for munition purposes are returned as consuming 53,600 horse power.

In like manner Mr. Corey, who appeared for the Niagara, Lockport & Ontario Power Company, showed that many important plants doing work for the respective Governments and producing munitions, obtained their power from his company. In addition to all this, a number of electric railway systems, whose operations are necessary in connection with industries engaged in war activities, are dependent upon the Niagara, Lockport & Ontario Power Company.

It is not to be understood that the whole amount of power used by munition plants is directly used for munition purposes. In some instances, the main activities of the undertaking produce a by-product that is required. Again shell plate and other war munitions cannot be produced without abrasives, yet a comparatively small amount of these abrasives would be sold direct to either Government.

Beyond all doubt most of the different companies engaged in munition work are also carrying on to some extent at least their previous business, and require power in connection with their previous output.

Your Commissioner is not in a position to report with exactness how much or how little power used by these plants is directly essential for war purposes. The fast increasing load, however, of the different companies since the war commenced of itself indicates the very large demand for munition work.

Munition plants are not receiving sufficient power. Manufacturers have made many complaints to the Imperial Munitions Board of power shortage.

Electrodes are manufactured by the Electro-Metals Company, of Welland. The supply of this plant has been cut down. It is now running at approximately 50 per cent of its capacity, with an output of but 60 to 70 tons, against a capacity which ought to be obtained of from 120 to 130 tons. The supply of electrodes to-day is absolutely insufficient to meet war requirements.

To give but another illustration. Calcium carbide is also urgently required. The Union Carbide Company, now operating with a firm contract of 16,000 horse-power, and getting an off-peak service which would bring its average up to approximately 25,000 horse-power in order to arrive at its maximum production requires 40,000 horse-power firm for the full 24 hours.

On the evidence more than 82 per cent of the output is used directly or indirectly for munitions; and, as a matter of fact, the company is behind, and seriously behind, in its deliveries both to the British and to the United States Governments.

Cases of only partial output in other essentials can be added, resulting from shortages in power, not only in Canada, but in the States.

Realizing to the fullest extent the resultant benefit to Canada that cheap and plentiful power entails, and also recognizing fully the undoubted right of the Dominion under the "The Electricity and Fluid Exportation Act," your Commissioner is of opinion that the pressing necessity and duty of the hour, the best interests of the Canadian people, lies in the successful prosecution of the war.

If the export of power were prohibited, undoubtedly more power would become available for munition plants in Canada; but, on the other hand, important manufacturing carried on in the United States, on which the Allies are dependent, would directly suffer. Their output would be still further decreased and in some instances probably stop. The overlying Canadian interest as I see it is best served by insuring the continued operation of munition plants both in Canada and the United States.

It is to be regretted that there is not more co-ordination and friendly co-operation between the Companies. If the Ontario districts were served by a combination of the Hydro and Toronto Power Systems, a better diversity and load factor could be obtained and more power thus rendered commercially available from the present plants.

The incorporation of the Toronto Power plant into the Hydro System would to an appreciable extent help the Ontario situation. With the present mutual distrust and lack of confidence, there appears to be no room for the hope of proper co-operation, entailing as it of necessity would, an entirely unselfish attitude and mutual assistance and trust.

To illustrate how great the lack of co-operation is,—the power supplied by the Toronto Power Company to the Ontario Power Company, under the contract expiring the 1st of November next, is used by the Union Carbide Company. The Toronto Power Company refuse to renew the contract. The power thus rendered available is urgently required by the Electro Metals Company at Welland, who receive power over a line of the Ontario Power Company.

If the Toronto Power Company are given the use and control of the branch line serving the industry, they are willing to supply the power to the industry direct. The Hydro System declines to lend or lease their lines to their competitor, pointing out as the fact is that they have other consumers served by the same line. The Toronto Power Company refuse to supply this power to the Ontario System, claiming that injury has been done their plant by short circuits on the Ontario System when the systems run in parallel. The charge of short circuiting and damage is in turn denied.

The result of it all is that, as matters now stand, essential war industries will have an already insufficient supply of power further reduced.

Your Commissioner, therefore recommends:—

1. That the different Companies now exporting power be allowed in the meantime to continue to export power to the extent that they are now actually exporting it, that is to say,—the Ontario Power Company a maximum of 37,500 horse-power on peak with deliveries off peak increasing the average power delivered to a maximum of 50,000 horse-power; the Canadian Niagara Power Company a maximum of 30,000 horse-power on peak with deliveries off peak increasing the average power delivered to a maximum of 36,000 horse-power; and the Toronto Power Company a maximum of 13,500 horse-power on peak with deliveries off peak increasing the average power delivered to a maximum of 22,000 horse-power.

2. That, as a great deal of the power so exported and used on the American side at the present time is for work in connection with military operations on which Great Britain and the United States depend, your commissioner is of the opinion that before disturbing the present situation in connection with power so exported or used by said companies, the proper American and Canadian authorities should enter into a conference with a view of ascertaining what if any of the power now exported can be retained in Canada without injuring the American effort and to the end that by close co-operation the maximum efficiency may be obtained from power now or which readily may be made available on either side of the International Boundary and without regard to geographical location.

3. That action be taken, under "The War Measures Act," insuring a supply of power to factories engaged, directly or indirectly, in munition work, or work for any of the Allied Governments, and also for necessary municipal and public utility activities; and that for these purposes preferences and priorities should be declared.

The Cabinet has not sufficient data before it to now declare what these preferences ought to be; but the Order in Council could provide the machinery through which the objects recommended could be obtained by empowering the Department of Inland Revenue to carry out the provisions of the Order in Council, or else by appointing an Electric Controller or Controllers, especially for the purpose.

The Order in Council should also provide that power producing companies or any companies selling power, be prohibited from selling electricity until such preferences and priorities have first been fulfilled; and provide that the operation of contracts for the supply of power already made by the Companies for uses other than those above set out should be suspended, in so far as the Companies are unable, with the exercise of due diligence, to carry out their contracts, in view of said preferences.

Respectfully submitted,

OTTAWA, October, 1917.

H. L. DRAYTON.

REPORT OF CONTROLLER OF THE PRODUCTION AND DISTRIBUTION OF ELECTRICAL ENERGY.

To his Excellency the Governor in Council.

Report of the Controller appointed under Order in Council P.C. 3142.

MAY IT PLEASE YOUR EXCELLENCY:

I. INTRODUCTORY.

I, the Controller of the production and distribution of electrical energy by companies generating or distributing electrical energy in the Province of Ontario, under Order in Council, P.C. No. 3142, have the honour to present my report to Your Excellency.

The Order in Council appointing me Controller provides as follows:—

"That it shall be the duty of such Controller to determine preferences and priorities in the supply of such electrical energy to the end that a sufficient supply shall be furnished to factories and users engaged, directly or indirectly, in munition work or work for any of the Allied Governments, and also for municipal and public utility requirements.

"That all companies generating or distributing electrical energy in the said Province shall, to the fullest capacity of their plant and equipment supply such energy to users thereof, entitled to preferences and priorities hereunder in the quantities and as and when from time to time directed by the said Controller.

"That it shall be the duty of such Controller to restrict the disposal of electrical energy to users other than those provided for by the clause next preceding until such preferences and priorities have been first met."

"To the extent that any Company, Commission, Municipality, or other Vendor of electrical energy, by reason of any action, direction, or request of such Controller is rendered unable to supply electrical energy under any contract or obligation for the time being existing, such Company, Commission, Municipality, or other Vendor of electrical energy shall be, and the same is hereby, relieved from all liability for damages in respect of such failure.

"That in the event of a dispute between any user of electrical energy supplied in preference or priority hereunder and any company, the price at which such preferred or prior electrical energy shall be supplied to the user shall be fixed and determined by the said Controller.

"That any order or regulation which the said Controller is empowered to make hereunder shall be final, binding, and conclusive.

"That, as a great deal of the electrical energy now exported from Canada into the United States at the present time is used in connection with the war requirements of both countries or of their Allies, a copy of this Order in Council shall be furnished to the British Ambassador at Washington, accompanied with the request that such Ambassador arrange, if possible, with the proper authorities of the United States, so that a conference may be held between such authorities and said Controller, with the view of insuring the closest co-operation between Canada and the United States in the generation and utilization of electrical energy on both sides of the International Boundary, to the end that the maximum efficiency may be obtained in the use of such electrical energy on both sides of the International Boundary without regard to geographical locations.

"All orders, determinations, or regulations made by the said Controller hereunder shall have the force of law, and may be varied, extended, or revoked by any subsequent order, determination, or regulation made by the said Controller.

"Any company generating or distributing electrical energy neglecting or refusing to comply with or contravening any order, determination, or regulation made by the said Controller hereunder shall be liable to a penalty not exceeding five thousand dollars and any manager or other officer in charge of such company, and any other person violating or contravening any such order, determination, or regulation, shall be liable to a like penalty or imprisonment for any term not exceeding five years, or to both fine and imprisonment, and such penalty may be recovered or enforced by summary proceeding and conviction under the provisions of Part XV of the Criminal Code."

The necessity for the Order in Council arose owing to the scarcity and insufficiency in the supply of electrical power in the Niagara district and in those sections of Ontario served by power generated by the force of the waters of the Niagara River.

II. EXPORT OF ELECTRICITY.

As directed by the Order in Council the matter of the exportation of electricity into the United States was immediately taken up with the United States authorities. The Honourable, the Secretary of War, appointed as his representatives, with full authority to deal with the power question, the Honourable Robert J. Bulkley and General Keller. These appointments were made at the earliest possible moment, and I desire to acknowledge at the outset the willingness of the Honourable Mr. Baker, the Secretary of War, and his representatives, to co-operate in the greatest degree and to assist as in their power lay in ameliorating the difficulties of the situation. The Honourable Mr. Bulkley in the first instance came to Ottawa with a view of going into the whole question, and I had the honour of meeting in conference the Secretary of War and his representatives at Washington, and his representatives on two different occasions at Buffalo.

The first question that was taken up was the release of power exported by Canada into the United States. It was found that owing to the very extensive programme of the War Department of the United States and to the fact that a great quantity of chemicals necessary for war purposes were produced by factories using Niagara power, that the shortage of electrical power in the adjacent territory of the United States was grave. It was entirely impossible to have any of this power released, but on the other hand as a matter of fact not only was power to the quantity exported from Canada used in the production of essential war materials but power was so used to a far greater extent.

The Honourable R. J. Bulkley and General Keller were able to effect economies in the Buffalo load to the extent of 25,000 horse-power. This was obtained by taking power from different companies as follows:—

International Paper Co.	3,000 H.P.
Niagara River M'fg. Co.	650 H.P.
2—Paper Companies	5,320 H.P.
Aluminum Company	6,000 H.P.
Buffalo General Electric	6,600 H.P.
Rochester Ry. & Light Co.	4,000 H.P.

As at this time there was, however, considerable shortage of power in American territory for the manufacturing of war supplies, the whole of the power thus saved was turned to the production of war material and the furtherance of the united war effort as contemplated by the Order in Council.

III. HYDRAULIC DEVELOPMENT AND SUPPLY.

The companies generating power from the river at Niagara Falls were the Ontario Power Company (the company owned and controlled by the Ontario Hydro-Electric Power Commission), the Electrical Development Company operated by the Toronto Power Company, and the Canadian Niagara Power Company.

The status and rights of these companies are set out in my report of October, 1917, and for the sake of brevity are not included in this report, but reference may be made to the former report for fuller information on these questions.

The demands upon the Ontario Power Company were materially greater than its resources. The Hydro-Electric Power Commission proper generated no electricity, its chief source of supply being its company, the Ontario Power Company.

Mr. Gaby, in his evidence, showed that the combined resources of the Ontario Power Company and the Hydro-Electric Power Commission, as of December 1, 1917, were as follows:—

	Horse Power.
Power generated by the Ontario Power Co.	169,900
Power purchased by the Ontario Power Co. from the Toronto Power Co. under an existing contract.	13,500
Power purchased by the Hydro-Electric Power Commission from the Canadian Niagara Power Company.	50,000
Total.	223,500

As of this date the demands on the two systems, that is, the Ontario Power Company and the Hydro-Electric Power Commission, were given by Mr. Gaby as amounting to some 325,000 horse-power.

By an agreement dated March 17, 1916, the Toronto Power Company agreed to sell to the Ontario Power Company the output of a single generator at the normal rate of 10,000 kilowatts for a period of eighteen months from May 1, 1916. This contract, therefore, expired on the first of November, 1917.

Efforts were made by the Hydro Electric Commission to secure a renewal of this contract. The Toronto Power Company, however, refused to renew the contract at its expiration date alleging that they had accepted munition loads in anticipation of the expiration of the contract.

On the application of the Hydro Electric Commission and the Ontario Power Company, and in view of the fact that these Systems urgently required the power, and that great dislocation of business would result should they not be able to obtain it, with a further material reduction in the production of munitions, the Sub-Committee of Council appointed to deal with the question before my appointment as Power Controller ordered the Toronto Power Company to continue the supply of the electricity which had been delivered under this lapsing contract, and which expressed in terms of horse power amounted to 13,500 H.P., thus reducing the shortage shown by Mr. Gaby to 88,000 horse power. As Controller I found it necessary to continue the order thus made.

The power used by the Commission found its way ultimately into what is known as a "pool", that is the total power available for the use of the Commission.

The power obtained from the Toronto Power Company by the Ontario Power Company was supplied by three over-head transmission lines which connected the plants of the Toronto and the Ontario Companies. The duty of the Toronto Power Company ceased when it delivered the power on these lines, the lines themselves being under the control of the Ontario Power Company.

In the production of the power supplied by the Toronto Power Company two generators were used. The out-put of these generators was carried to a bus common to both generators in the Toronto Power Company's plant, and fed from that bus over the transmission lines mentioned into the common bus of the Ontario Power Company. Power thus delivered went into "pool" with the power developed by the Ontario Com-

pany, and was, therefore, in parallel with the power produced by the more rugged machines of the Ontario Power Company. The amount of power the Ontario Power Company delivered to the Commission varied from time to time, having regard to the amount of current exported by that Company and which amounted to 50,000 H.P. on the average, and to the demands of its local system. As a result the load to the Hydro Electric Commission varied—perhaps a peak of 70,000 kilowatts, or 93,500 H.P., may be taken as characteristic.

This power was conveyed from the bus bar of the Ontario Power Company to the bus bar in the sub-station of the Commission by under ground cables connecting the two plants. The power produced by the Toronto Power Company under these operating conditions contributed its share to the amount of power obtained by the Commission.

No contract was made by the Commission and the Canadian Niagara Power Company for the 50,000 horse power which the Commission received from that source, but under an arrangement between the parties the power was delivered at a price of \$12 per horse power year.

This electricity is produced from five of the ten generators operated by the Canadian Niagara Power Company, that had been set apart for this service. The power produced by these five machines was conveyed by cables to the sub-station of the Commission. It was there connected to the same bus bar that received the power supplied by the Ontario Power Company, and in part generated by the Toronto Power Company. This bus bar formed the final electrical "pool" of electric energy placed at the disposal of the Commission.

IV. DIFFICULTIES OF OPERATION.

As a result of the conditions above set out generators of the three plants were all connected in parallel. Electrical disturbances, therefore, on one plant might affect the others, and as a further corollary, any serious trouble developing on the system of the Hydro Electric Commission due to short circuits or grounds, burning out of transformers, or the like, might affect in part any or all of these producing plants. Both the Toronto Power Company and the Canadian Niagara Power Company complained bitterly of these conditions.

However, in view of the emergency, and of the far greater use to which the electricity would be put when thus operated in parallel, I felt that no effect should be given to the Companies' objections, and that the supply of electricity must be maintained. The question came to a head owing to the refusal of the Canadian Niagara Power Company to continue its supply. The continuance of this supply was ordered for the reason set out in a Judgment which was delivered at the time (February 2, 1918) and which is as follows,—

"The power situation in Western Ontario is not only acute, but is surrounded by many difficulties. Not only is there a shortage of power when all plants are working to full capacity but the situation has been much aggravated by ice troubles and by the breaking down of machinery.

"When I was first obliged to take up this matter there were machines of the Toronto Power Company which sadly needed repairs and the Company was pressed to make these repairs with the greatest possible despatch. The repairs have all been completed, the eleven machines installed are to-day all working. Running all the machines at the same time—reserving no spare is not the best operation having regard to the maintenance of a steady production. Doubtless repairs in the future will become necessary and shortages again result. Fortunately this plant has not been much troubled by ice conditions and its output on this account has not suffered materially. The limited operation of its plant at Toronto has been sufficient to make good any temporary shortage

arising from ice troubles. Unfortunately, apart from the question of cost, the shortage of coal forbids the operation of the Company's steam plant at full capacity. Under these circumstances the Company has been able to meet the demands of its own customers and also to supply through the Ontario Power Company the Hydro-Electric Power Commission with 26,666 horse-power; 13,333 of this amount is delivered under contract with the Ontario Power Company, and 13,333 under my directions given against the Toronto Power Company's protest.

"There has been a very unfortunate shortage in the output of the Canadian Niagara Power Company. The normal output of that Company is 100,000 H.P. This Company has supplied the Hydro Electric Power Commission under an arrangement made in 1916 with 50,000 H.P. The terms of the contract have not yet been settled by the parties, but a price of \$12.00 a H.P. year was arrived at and the Commission is paying for power supplied on that basis.

"Owing to damage to the Company's generating units the Company's output of 100,000 H.P. was curtailed in part on December 21, 1917, and grave shortages of output have since developed. As a result for the whole month of January the Company was without the use of two of its generators, which, when in operation, produced 10,000 H.P. each, and for half the month was without the use of a third generator. The Company's output was, therefore, reduced for some two weeks or more by 30,000 H.P., and for the whole month by 20,000 H.P. This shortage of 20,000 H.P. still exists.

"In addition the troubles of the Canadian Niagara Power Company arising from winter and ice conditions during this period have been very great. At times the plant has been all but shut down. Its rated capacity of 100,000 horse-power has by reason of generator destruction and these ice troubles been reduced from time to time so that at certain periods only 25,000; 14,500; 12,000; 8,000; and finally 5,700 K.W. were being produced. It will, therefore, be seen that at a stated period, although it was but short, the maximum available output was cut down to 10,000 H.P., or 10% of the Company's normal capacity.

"The Hydro-Electric Power Commission has suffered severely, not only by reason of ice troubles on its own plant. (The Ontario Power Company System), but also from the shortage of power supplied the Commission by the Canadian Niagara Power Company.

"The Ontario Power Company's ice troubles have not been as severe as as those on the System of the Canadian Niagara Power Company, but these ice difficulties together with the lessened supply from the Canadian Niagara have rendered the operation of the Hydro Electric Power System extremely difficult.

"The returns showing the interruption in output of the Ontario Power Company afford a good illustration of the difficulty of working plants to their full capacity when subject to adverse weather conditions. The following is a summary as reported to me for the month of January:—

SUMMARY.

Date.	Average Shortage.	Hours.	Causes.
January 5.....	12,100 H.P.		Ice troubles.
" 6.....	20,550 "		
" 7.....	11,950 "		Ice troubles.
" 8.....	11,126 "		"
" 9.....	9,600 "		"
" 11.....	10,300 "		"
" 12.....	12,700 "		Rocks smashing gates.
" 13-14.....	11,500 "		Ice troubles.
" 13-14.....	11,700 "	5.43 a.m. to 2.15 p.m.	"
" 13-14.....	11,300 "	9.17 a.m. to 4.57 p.m.	Ice troubles resultant shortage between 9.17 a.m. and 2.15 p.m. 23,000 H.P.
" 14.....	12,000 "	3.15 p.m. to 4.15 p.m.	Repairs.
" 14.....	11,300 "	5.41 a.m. to 5.50 a.m.	Ice troubles.
" 15.....	12,700 "	8.34 to 10.26 p.m.	"
" 16.....	11,400 "	1.00 p.m. to 5.23 p.m.	"
" 18.....	12,700 "	12.45 a.m. to 7.02 a.m.	"
" 20-21.....	28,200 "	After midnight	"
" 21.....	34,800 "	Noon to midnight	"
" 21.....	43,000 "	(Actual)	"
" 22.....	28,200 "	Midnight to noon	"
" 23.....	15,000 "	4 a.m. to noon	"
" 23-24.....	12,000 "	To noon January 24	"
" 24-25.....	12,700 "	Up to 3.50 a.m.	"
" 24-25.....	9,600 "	After 4 p.m.	Repairs.
" 27.....	28,000 "	Up to noon	Ice troubles.
" 28.....	15,000 "	To noon January 28	"
" 28-29.....	15,000 "	Noon to noon	"
" 29-30.....	8,000 "	Noon to 5.14 p.m.	"
" 30-31.....	12,000 "	Noon to Noon	"
" 31-Feb. 1.....	16,000 "	"	"
February 1-2.....	13,000 "	"	"

"The above data is, I assume, more or less accurate. It is, I have no doubt, just as accurate as could be given under the quickly varying Ice and Water Power conditions at the Falls. From the above statement a fair idea may be formed of the troubles which the Plant Operators have to contend with at the present time of stress of power shortages and large overloads.

"The Hydro-Electric Commission is anxious to have returned to its service the machines of the Canadian Niagara Power Company that were injured on December 21st just as soon as repairs can be made. The Company objects to doing this and claims that to again place its machines on the Hydro Electric System would be simply to invite a repetition of the troubles of the past.

"In November last when similar questions were being discussed the Company made a return of interruptions to its service, and damage to its apparatus, due as they allege to troubles on the Commission's System covering the period from the time service was begun down to November 9th, 1917. The statement is as follows:—

INTERRUPTIONS TO SERVICE OF CANADIAN NIAGARA POWER CO. DUE
TO TROUBLES ON HYDRO ELECTRIC POWER COMMISSION'S CIRCUITS.

Date.	Time.		Duration of Interruption.	Cause.	K.W. Lost.
	From	To			
1916.					
July 30	1.52 p.m.	1.55 p.m.	3 min.	Trouble on H.E.P.C. system.	9,300 (Total.)
" 30	2.08 p.m.	2.11 p.m.	3 "	" "	9,300 "
" 30	7.19 p.m.	7.24 p.m.	5 "	" "	8,500 "
" 30	7.33 p.m.	7.36 p.m.	3 "	" "	8,000 "
" 31	2.41 a.m.	2.47 a.m.	6 "	" "	8,000 "
" 31	2.51 a.m.	8.40 a.m.	6 hrs. 11 "	" "	7,000 "
" 31	8.45 a.m.	9.31 a.m.	46 "	" "	7,000 "
Aug. 1	6.31 p.m.	12.00 Mid.	5 hrs. 29 "	" "	9,100 "
" 7	11.20 p.m.	11.24 p.m.	4 "	" "	9,200 "
" 10	4.35 a.m.	4.40 a.m.	5 "	" "	9,300 "
" 20	2.03 a.m.	2.10 a.m.	7 "	" "	7,300 "
" 20	2.45 a.m.	2.50 a.m.	5 "	" "	7,500 "
" 22	4.24 p.m.	4.28 p.m.	4 "	" "	18,100 "
" 22	4.50 p.m.	4.52 p.m.	2 "	" "	18,200 "
" 25	8.40 p.m.	8.47 p.m.	7 "	" "	
" 25	9.12 p.m.	9.15 p.m.	3 "	" "	
Sept. 7	5.23 p.m.	5.23 p.m.	2 "	" "	Total load lost.
" 15	8.02 p.m.	8.51 p.m.	49 "	Short circuit at Ont. P. Co.'s plant.	
" 17	7.53 a.m.	7.59 a.m.	6 "	Trouble at H.E.P. system.	16,900 (Total.)
" 20	9.28 p.m.	9.35 p.m.	7 "	" "	18,100 "
" 21	9.24 a.m.	12.30 p.m.	3 hr. 6 "	" "	Total load lost.
" 23	8.06 a.m.	8.09 a.m.	3 "	" "	18,000 (Total.)
" 28	9.07 a.m.	9.14 a.m.	7 "	" "	18,200 "
Oct. 12	12.23 p.m.	12.30 p.m.	7 "	Unknown.	18,300 "
" 16	9.53 p.m.	10.15 p.m.	20 "	Trouble on H.E.P. system. See Note (1).	18,400 "
" 25	3.28 p.m.	3.35 p.m.	7 "	" "	18,000 "
Oct. 31	12.55 p.m.	12.57 p.m.	2 min.	Trouble on H.E.P. system	
" 31	1.02 p.m.	1.03 p.m.	1 "	" "	
" 31	1.04 p.m.	1.24 p.m.	20 "	" "	
" 31	2.06 p.m.	2.18 p.m.	12 "	" "	
Nov. 7	9.42 a.m.		Bump	" "	5,000
" 24	11.46 a.m.	11.56 a.m.	10 "	" "	26,100 (Total.)
" 24	2.17 p.m.	2.35 p.m.	18 "	" "	25,500 "
See Note (1)					
Dec. 27	4.24 a.m.	4.30 a.m.	6 "	Trouble on H.E.P. system	33,000 (Total.)
" 27	5.00 a.m.	5.12 a.m.	12 "	" "	33,600 "
" 27	7.53 a.m.	8.16 a.m.	23 "	" "	30,000 "
1917.					
Jan. 2	11.02 a.m.		Bump	" "	3,000
"	11.06 a.m.			" "	
"	11.10 a.m.			" "	
" 5	9.22 a.m.	9.28 p.m.	6 min.	" "	10,000
" 22	3.08 a.m.	3.15 a.m.	7 "	" "	5,000
" 29	12.09 p.m.	12.25 p.m.	16 "	" "	26,000 (Total.)
Feb. 1	9.02 p.m.	1.33 p.m.	4 hrs. 31 "	" "	Total load lost.
" 19	5.35 p.m.	6.38 p.m.	1 hr. 3 "	" "	
" 26	2.30 a.m.	2.40 a.m.	10 "	" "	7,600
" 27	5.26 a.m.	6.49 a.m.	1 hr. 23 "	" "	23,500 (Total.)
Mar. 17	12.52 p.m.	1.02 p.m.	10 "	" "	Total load lost.
" 17	3.01 p.m.	3.17 p.m.	16 "	" "	29,400 (Total.)
" 23	10.23 p.m.	10.38 p.m.	15 "	" "	28,600 "
" 25	12.35 p.m.	12.42 p.m.	7 "	" "	7,400 "

¹As result of arcing grounds on H.E.P. Com. 110,000 volt system and blowing up of type C Westinghouse circuit breaker in H.E.P. Com. station causing voltage surges the winding of No. 7 generator broke down requiring replacement of one armature coil. On this account the Unit was out of service 23 hrs. and 21 min.

²At 2.17 p.m. on Friday, Nov. 24, 1916, employees of the H.E.P. Com. while erecting a 80 ft. pole near the Commission's transformer station allowed it to drop across its 44,000 volt lines supplying Welland. The resulting short circuit caused surges which resulted in break-down of insulation in No. 7 generator, the damage being so great as to require a complete new armature winding. On this account the unit was out of service for 489 hrs. and 43 mins. On account of damaged apparatus resumption of service to H.E.P. Com. was delayed as follows: 10,000 H.P. 18 mins.; 12,500 H.P. 2 hrs. and 54 mins.; 12,500 H.P. 489 hrs. and 43 mins.

INTERRUPTIONS TO SERVICE OF CANADIAN NIAGARA POWER CO.—Continued.

Date.	Time.		Duration of Interruption.	Cause.	K.W. Lost.
	From	To			
1917.					
April 20	3.20 a.m.	3.25 a.m.	5 min.	Trouble on H.E.P. System	8,000 (Total.)
" 20	1.58 p.m.	2.07 p.m.	9 "	"	30,000 "
May 1	4.16 p.m.	4.23 p.m.	7 "	"	Total load lost.
" 8	12.18 p.m.	12.25 p.m.	7 "	"	9,000
" 16	7.44 p.m.	8.08 p.m.	24 "	"	Total load lost.
" 18	3.30 p.m.	3.36 p.m.	6 "	"	32,100 (Total.)
" 22	6.31 p.m.	6.34 p.m.	3 "	"	32,000 "
June 6	7.48 a.m.	7.54 a.m.	6 "	"	Total load lost.
" 7	8.01 a.m.	.....	.....	"	10,000
" 7	8.25 a.m.	.....	.....	"	10,000
" 21	11.40 a.m.	12.20 p.m.	40 "	"	26,400
" 26	2.10 p.m.	.....	Bump	"	6,000
" 28	3.32 p.m.	3.55 p.m.	23 "	"	Total load lost.
" 26	4.30 p.m.	5.09 p.m.	39 "	"	"
June 27	7.57 a.m.	8.00 a.m.	3 min.	"	Total load lost.
" 28	4.48 a.m.	6.30 a.m.	1 hr. 42 "	"	25,400 (total).
July 4	10.55 p.m.	11.05 a.m.	10 "	"	22,300.
" 9	5.49 p.m.	.....	.....	Trouble on Ont. P. Co's system	5,000.
" 9	8.12 p.m.	8.18 p.m.	6 "	Trouble on H.E.P. System	Total load lost.
" 9	8.35 p.m.	8.39 p.m.	4 "	"	"
" 10	5.02 p.m.	5.17 p.m.	15 "	"	"
" 13	7.58 p.m.	8.05 p.m.	7 "	"	"
" 17	11.54 a.m.	12.24 p.m.	30 "	Trouble O.P. Co. and T.P. Co's System	"
" 20	5.33 p.m.	.....	.....	Trouble on H.E.P. system	6,000.
Aug. 25	5.35 p.m.	.....	.....	"	22,000.
" 25	4.32 p.m.	4.47 p.m.	15 "	"	Total load lost.
" 29	7.23 p.m.	7.30 p.m.	7 "	"	8,500.
" 31	6.11 a.m.	6.18 a.m.	7 "	"	29,500 (total).
" 31	8.42 p.m.	9.04 p.m.	22 "	20 B cable breaking down in M.H. 101. See Note (1)	Total load lost.
Sept. 1	10.24 a.m.	11.03 a.m.	39 min.	Trouble on H.E.P.C. system See Note (1)	Total load lost.
" 2	5.12 a.m.	.....	.....	Trouble on H.E.P. Co's system	7,000.
" 2	5.22 a.m.	.....	.....	"	7,600.
" 10	12.00 mid.	.....	.....	"	2,000.
" 30	3.15 a.m.	3.30 a.m.	15 "	"	7,000.
Oct. 8	8.58 p.m.	10.16 p.m.	1 hr. 18 "	Short circuit on busbars No. 2 and 8 See Note (1)	Total load lost.
" 13	7.02 a.m.	7.19 a.m.	17 "	Reactor switch opening at O.P. Company	Total load lost.
" 13	9.06 p.m.	9.17 p.m.	11 "	Trouble on H.E.P.C. system	"
" 14	6.07 p.m.	6.27 p.m.	20 "	Short circuit on Ont. P. Co's cables	"

(1) At 8.42 p.m. on August 31, 1917, a short circuit occurred in splice in under-ground cable of H.E.P. Com. Disconnecting switches in power house subway opened by repulsion and were completely destroyed, together with two current transformers and numerous minor pieces of apparatus. On account of the above mentioned damage to this Company's apparatus and on account of damage to the Commission's circuits resumption of service was delayed as follows: 10,000 H.P. 22 mins.; 20,000 h.p. 2 h. and 28 min.; 20,000 h.p. 13 h. and 33 min.

(2) At 10.24 a.m. on September 1, 1917, a short circuit occurred due to ground on H.E.P. Com. circuits between transformer stations of Ontario P.C. Co. and Toronto P. Co. Another ground was thus developed in bus junction cables in C.N.P. Co's plant resulting in short circuit, burning off bus junction cables and setting up surges which broke down winding of No. 10 generator. This necessitated dismantling the machine and replacement of 18 armature coils. On this account the unit was out of service for 303 hours and 39 minutes. On account of damage to apparatus resumption of service was delayed as follows: 10,000 h.p. 41 min.; 10,000 h.p. 57 min.; 10,000 h.p. 7 h. and 44 min.; 10,000 h.p. 8 h. and 59 min.; 10,000 h.p. 303 h. and 39 min.

(3) At 6.25 p.m. on Oct. 8, 1917, a ground was discovered on the 12,000 volt system. After many requests by our operators to the H.E.P. Com. attendants at its transformer station to reduce its load so that the ground could be located a short circuit developed at 8.55 p.m., in the C.N.P. Co's subway between bus junction cables and a potential transformer. The short circuit ruined two potential transformers, one current transformer, burned off bus junction cables, damaged bus bar supports and some minor apparatus. On account of damaged apparatus resumption of service was delayed as follows: 30,000 h.p. 18 in.; 10,000 h.p. 2 h. and 38 min.; 10,000 h.p. 14 h. and 10 min.

INTERRUPTIONS TO SERVICE OF CANADIAN NIAGARA POWER CO.—Continued.

Date.	Time.		Duration of Interruption.	Cause.	K.W. Lost.
	From.	To.			
1917.					
Oct. 26	3.57 p.m.	4.10 p.m.	13 min.	Trouble on H.E.P.C. sys.	Total load lost.
Nov. 8	9.30 a.m.	9.32 a.m.	2 "	"	6,000.
" 9	2.45 a.m.	3.04 a.m.	19 "	"	Total load lost.
" 9	6.14 p.m.	6.43 p.m.	29 "	"	"

"I have no information as to any interruption to its service which may have occurred between November 9th and December 21st, 1917. On the latter date, however, a serious interruption occurred, and between that date and the middle of January, 1918, the following interruption are reported by the Company:—

Dec. 21	7.03 p.m.	7.13 p.m.	10 min.	Trouble on H.E.P.C. sys.	Total load lost.
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¹Note.—Generating units 1 and 2 injured.

Dec. 29	1.16 a.m.	2.02 p.m.	46 min.	Trouble on H.E.	Total load lost.
Jan. 2	2.09 a.m.	2.23 a.m.	14 "	"	"
" 12	5.58 a.m.	6.05 a.m.	7 "	"	"
" 12	6.07 a.m.			"	4,000.
" 12	6.08 a.m.			"	2,000.
" 12	6.12 a.m.			"	5,000.
" 12	7.27 a.m.			"	19,000.
" 12	8.16 a.m.	8.25 a.m.	9 "	"	17,000.

²Note.—No. 9 generator armature badly wrenched and shifted slightly on bed plate.

" 15	2.28 p.m.	2.45 p.m.	17 min.	Trouble on H.E.	Total load lost.
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³Note.—Short circuit on H.E.P. 46,000 volt system.

"The Hydro-Electric Power Commission do not for a moment admit the claims of the Canadian Niagara Power Company. The position of the Commission may be shortly stated as follows: that their plant is operated in the best possible manner and by most competent engineers and that the Commission is not chargeable with the break-downs which took place in the Canadian Niagara Power Company's plant. Certain claims for damages, however, have been acceded to by the Commission and payment made. The question, however, was brought to a head by the plant destruction which took place on December 21st, 1917. The injury caused to the generating units on that date shows the possibility of damage to the electrical apparatus when operated in parallel with and connected with the large Hydro System. It is stated that a short circuit on the Hydro System caused the damage, but whatever the exact cause was, two generators were badly damaged. No. 2 unit had its bed plate moved on its foundation, five of the eleven lugs on the cast iron bed plate were broken where the foundation bolts pass through them. The total movement of the bed plate exceeded one inch; the armature winding was distorted; the supporting ring for the armature coils was bent and one-half of the bolts securing it to the armature frame were sheared off and several of the cast iron lugs on the supports were broken off. The thrust bearing was burnt out. This unit was out of service under repairs until January 6th, about fifteen days. It then ran on other service for nine days when it went out of commission and may not be in service again until February 24th. Unit No. 1 though apparently undamaged on December 21st was found to be

injured to such an extent when tested on Sunday, December 23rd, that its armature had to be completely rewound; this unit is almost ready for service again.

"One of the above generators and its output of 10,000 horse power will have been out of service about six weeks; the other generator (and its similar output) will have been, when repaired, withdrawn from public service nearly eight weeks.

"The position that the Company takes is that it should not be compelled to supply any power to the Hydro-Electric Commission on account of the great risks with which this service is attended. It contends at this time when power for war materials is so urgently needed its output should be delivered to essential industries at and near Niagara Falls where the above risks do not exist. The Company further contends its motives are inspired by loyalty and not by personal feelings or selfish interests.

"The Company points out that although the normal output of their generators connected with the Hydro-Electric Commission's circuits is only 10,000 H.P. each, so that if four were running there would only be 40,000 H.P. or with five running 50,000 H.P. at the same time generated; when thus connected their group of machines is running in parallel with others of much greater power and that the whole combined group has an output of over 200,000 H.P. That the normal full load current may be about 10,000 amperes but the instantaneous rush of current from all these units into a short circuit might amount to nearly 70,000 amperes which would represent an output of from one and one quarter to one and one half millions of horse power. That such a tremendous amount of energy for even one-tenth of a second can easily destroy any apparatus and that the absolute necessity of employing every possible safeguard to prevent such occurrences and limit their destructive effects is most apparent.

"There is no doubt whatever that the situation of itself acute is rendered much more so by reason of the state of tension and distrust that exists between the different organizations. Shortly, the position the Companies take is that they are forced to do business with a competitor who seeks to destroy them, and who, by reason of the fact that they are forced to do business with it can destroy their plant; on the other hand this is entirely denied by the Commission and counter accusations are lodged against the Companies that they are purposely holding back power and have delayed making necessary repairs with the sole object of injuring the Hydro-Electric Power Commission notwithstanding the resultant injury to the country's war effort. My own personal view is that the operators at each of the power plants at the Falls have been doing the very best they can under very trying circumstances although much hampered by the cloud of distrust and suspicion that unfortunately exists. Of course the competitive features of the case exist—they must be recognized. Ordinarily one competitor would not be expected to go out of his way to help the other. However, these are no ordinary times—the conditions of to-day are extraordinary. The shortage that exists is one affecting industries that are served by the Hydro-Electric lines. The Hydro-Electric Commission has ordered, and indeed now has in hand, reactors which it is prepared to attach to the generators of the Canadian Niagara Power Company and which will, to some extent, at least, protect the generators. Public interest demands that the important munition plants which are not now getting power ought to get it, and an Order will be made directing the return of the repaired units as and when ready for service.

"In justice to the Company the Commission, which is in control of operation, should take the risk attendant to the operation, and the Commission should pay the Company any losses which accrue by reason of the destruction of its property, unless it is shown that such damage arose in the Company's own plant.

"It is expected that one of these injured generators will be returned to service next week, and as the matter is most pressing both Commission and Company have been wired as follows:—

"The Hydro-Electric Commission require the use of every possible producing unit they can obtain from the Canadian Niagara. Two units have broken down as claimed by the Company owing to their being in service for and connected with the Hydro-Electric System. This the Commission deny. It is impossible in many cases to ascertain exactly what is the originating cause of electrical damage, the results are patent but not the causes. The units when supplied are directly attached to the Hydro-Electric System, a system of greater potentiality and capable therefore of sustaining shocks which the units of the Company cannot sustain, with the result that if trouble does occur the weaker units are liable to be wrecked. Public interest demands that these units be returned for service at the earliest possible moment, they ought to be returned, but provision should be made that they be kept in service, reactors supplied, and operating conditions adopted, which will as far as possible prevent trouble. The details of operation are entirely in the hands of the Hydro-Electric Commission. Under the circumstances to get the power that Commission should undertake and agree to pay for interrupted service and any damage which may result to the generators and apparatus of the Company connected with the Commission's system unless it is shown that such damage has originated in the generators or plant of the Canadian Niagara Power Company itself. In case of dispute question to be settled by a single arbitrator to be appointed by me his decision to be binding on both parties:

It is but fair to point out that difficulties arising out of the combined operation much more affected the five machines of the Canadian Niagara Power Company and the two machines of the Toronto Power Company than they did the fourteen machines of the Ontario Power Company, which are the more rugged. The latter machines were designed for much higher inherent reactance than were the machines of the other companies. The machines of the three companies, forming as they did part of an electrical whole, the machines with the lower inherent reactance were far more liable to injury by any short circuit which might occur on any of the three systems or upon the lines of the Hydro-Electric Power Commission to which they were all attached, than the machines of greater reactance of the Ontario Power Company.

In the inception of the work I was assisted by Mr. John Murphy, the Board's Electrical Engineer, who did a great deal of work at a great deal of personal inconvenience without any remuneration. It became, however, necessary that an Engineer should be placed in charge of the work, and Mr. R. A. Ross, a Consulting Engineer of eminence, and at one time Advisory Engineer to the Hydro-Electric Commission was engaged. Subsequently, on his nomination, Mr. J. Norman Smith was placed in charge at Niagara Falls.

In addition to the complaints of the Companies, complaints were also made by the Commission, having particular regard to the power factor obtaining on their system. In so far as power factor is concerned, under conditions obtaining at the Falls, the power factor is a matter determined not by conditions in the generating plants but by the conditions existing on the lines of the distributing system. Again, so far as the distributing system itself was concerned, a low power factor cannot of necessity be charged to that system itself but is chiefly caused by the thousand and one connections made to the system by the different consumers supplied.

In the production of electricity the producer places at the disposal of the consumer electrical energy which the consumer may, or may not be able to take full advantage of. The extent to which he can take advantage of the whole of the power offered depends largely upon his own apparatus, and his operating conditions.

The electrical measure of power actually produced is the Kilovolt ampere, while the measure of power consumed is the Kilowatt.

If the consumer's plant be in perfect condition the resultant kilowatts recorded in his watt meter is the amount of Kilovolt amperes produced, less transmission losses; in other words, the combined systems, that is, the producers systems on the one hand

and the consumers system on the other represents an efficiency of 100 per cent. This ideal is rarely obtained. In ordinary practice a power factor of 90 per cent is looked upon as satisfactory. If the power factor falls below 90 per cent computations for purposes of payment are frequently made on the basis of 90 per cent of the kilovolt amperes.

The Commission complained that the power supplied to them in part by the Toronto Power Company produced an insufficient supply of electricity for commercial purposes owing to the low power factor. The Commission's complaint was by no means confined to the question of power factor alone, but was also directed to a more intensive use of the electrical units supplying them with power.

After requesting that the basis of their complaint be reduced to writing the Commission covered their complaint as follows:—

"In compliance with your request, I have pleasure in giving you below the following information on horse power equivalent continuous heating ratings of the generators installed in the plant of the Toronto Power Company.

"We have carefully checked the guaranteed specifications of the generators installed in the plant for heating, and have found the maximum continuous guaranteed temperatures very conservative for similar types and constructions of machines, at the present day.

"Machines Nos. 1 to 7, on continuous output, at 45° C. temperature rise, will give 12,000 K.W. or 16,000 H.P., at 80° power-factor, or 20,100 H.P. at 100° power-factor; or an equivalent horse-power heating rating of 20,100 H.P.

"On the basis of similar continuous temperature ratings as in the case of the above machines—which may be conservatively assumed, since they have the same type of insulation as machines 1 to 7—machines Nos. 8, 9, 10, and 11, have 9,600 K.W. or 12,800 H.P., capacity at 80° power-factor, and 16,000 H.P. at 100° power-factor; or an equivalent horse-power heating rating of 16,000 H.P.

"The total equivalent rating of the plant is, therefore, 204,700 H.P., although the name-plate ratings of the machines are stated as 8,000 K.W. at 100° power-factor. Upon the wiring diagrams submitted by the Toronto Power Company the above generators are rated as follows, viz:—

"1904 installation—units Nos. 8, 9, 10, 11.

"8,000 kv. a	384 amperes	8,000 k.w.	1.0 p.f.
	576 "	12,000 "	1.0 "
	660 "	11,000 "	0.8 "

"1910 and 1912 installations—units 1 to 7 (inc.).

"10,000 kv. a	480 amperes	10,000 k.w.	1.0 p.f.
	720 "	15,000 "	1.0 p.f.
	720 "	12,000 "	0.8 "

"From this you will note that the second figure in the first set of machines corresponds with that given above, and the last figure of the second set corresponds with the figures I have given you for machines 1 to 7, inclusive.

"As I stated, yesterday, previously to November 1st, the Toronto Power Company was delivering to the Ontario Power Company, the output of two machines of 10,000 K.W., which it permitted the company to operate at 80 per cent power-factor, or on a horse-power rating, approximately 27,000 H.P. at 80 per cent power-factor; or an equivalent horse-power heating rating of 34,000 H.P., whereas the company, since November, has been delivering to the Commission only 27,000 H.P. on the equivalent heating rating—a loss to the Commission of approximately 7,000 equivalent horse-power from the action of the company in restricting the operation at lower power-factor."

The answer of the Toronto Power Company is as follows:—

"With reference to the attached communication from the Power Controller, and attached copy of letter to him from F. A. Gaby, I beg to advise.

"Mr. Gaby's discussion of the guarantees relating to our eleven generators is irrelevant in so far as it relates to H.P. or K.W. as the capacity of our units have reference to the capacities of the water wheels and the number of them there may be in operation at any one time, together with the effective head of water.

"The discussion relating to wattless current is another matter, and whatever the manufacturers' specifications may be in this regard the safety of operation depends upon other limitations, although we do not agree that it is safe to operate under the power factor conditions set forth in the specifications.

"We have attached reactors in circuit with the generators which are limited to a lower current carrying capacity than the generators, and there are other limitations which have to do with the connections between the generators and the buses and between the Generating Station and the Transforming Station.

"Our experience with the Hydro-Electric Power Commission absolutely confirms the following statement.

"The danger to the apparatus of a Generating Company supplying power from the connecting together of large generating capacity subject to the numerous short circuits occurring on the Hydro system is no concern of theirs. They also seem to have no concern regarding the danger of current overloads upon apparatus which does not belong to them.

"The Toronto Power Company has by diligence and care in arranging its contracts, secured a power factor which is normally above 90 per cent, and this, coupled with such other precautions as good practice and experience have impelled us to take, has enabled us to deliver to our customers a service which is without a peer in the realm of hydro electric power generation and distribution.

"We can well appreciate the motive behind Mr. Gaby's suggestion that we be loaded with a part of the idle current of the Hydro system, and if it is the desire of the Power Controller that our well-nigh perfect operation be hazarded thereby, we will of necessity have to submit.

"I believe, however, that all of our other answers to the insinuations and proposals of the Hydro have been found to be justified and that this one also will be found to be justified upon investigation.

"Adverting now to Mr. Gaby's statement that previous to November 1st. we allowed the Ontario Power Co., to operate at 80 per cent power factor, I would advise that this statement is incorrect. The load of the Ontario Power Co. never reached 80 per cent power factor except for an unavoidable momentary fluctuation. 2nd, The contract specified 90 per cent power factor and we always exacted the penalty for power factor below 90 per cent, and when it persisted below 90 per cent for a sufficient length of time, called the attention of the Ontario operators to the fact and they always corrected it.

"If the Ontario Power Co., was allowed to exceed the contracted quantity of power it was because conditions at that time made it possible for us to allow it.

"Since November 1st, our hydraulic plant has been operating to capacity and we have had no power to spare for such courtesies as were formerly extended to the Ontario Power Co.

"I presume that in view of Mr. Gaby's letter, Sir Henry is not suggesting that we increase the load on our machines but that we increase the current so that the load taken by the Ontario Power Co. can be taken at a lower power factor.

"We can only increase the current on the machines by hazarding our operation or by lowering the power factor of our Toronto load by an amount corresponding with the lower power factor imposed by the Ontario Power Co. To do

this would entail running our steam turbines as synchronous condensers, and while this is not as expensive as using them for power output, it will probably cost more than the Hydro would care to pay. I would not care to make a prediction as to what this cost would be. We have tried it out and found that it can be satisfactorily done but we have also found that it cost much more than any benefit we can obtain from it.

"In conclusion I would advise as the Engineer of the Power Company that any arrangement enabling current overload on our generators should be coupled with a guarantee that the cost of armature repairs should be borne by the Power Controller or by the Ontario Power Commission, if he makes the arrangement in their behalf, and I wish to advise that the overheating which would occur might not be evidenced as an armature short circuit for a good while after the damage had been done, and that any armatures which had been overheated by the lower power factor condition should be included in the arrangement for a period of at least one year after the arrangement ceased."

The power factor of the Commission was low, and this low power factor materially contributed to trouble on the system and shortages the Commission was suffering from.

It was my duty beyond all doubt to assist that condition if possible. This condition would be assisted if the wattless current obtaining on the Commission's lines could be carried into the machines of the Toronto Power Company so that they could carry part of the burden and at the same time the amount of measurable electricity, that is, watts, being delivered to the Commission, maintained. It has to be borne in mind that to produce a given supply of material electricity at a power factor of 75 per cent the producing plant is obliged to carry additional wattless current circulating in its machines to the extent of 25 per cent of the total power delivered. This wattless current in the producing generators increases the total of heating results and of the possibility of destruction.

The nice question for the consideration was as to whether or not the generators of the Toronto Power Company could safely be subjected to this danger, or whether the desired increase of wattless current would result in their burning out and a still greater reduction in the munition output caused.

The question was, of course, technical and required consideration by electrical experts.—Mr. Ross, after going over the plants on the ground, and going into the question carefully, reported on March 28th., as follows:—

"As an engineer I cannot recommend to you that any drastic order be given to the Toronto Power Company at the moment to change their methods of operation; the risks with the knowledge we have at present of their plant being entirely too great."

The whole operation of the plants was thereafter very closely watched by Mr. Smith, who has a very large experience in the operation of power houses, and who visited the different plants daily.

Mr. Smith advised me that his observations of the operations of the Toronto Power Company's equipment showed that the generators supplying power to the Ontario Power Company were operated to their maximum capacity. He states that the machines of the Toronto Power Company were operating at high temperatures, especially during the hot summer months. He also reported that the temperatures were so high that it was necessary to erect special auxiliary air ducts to supply cold air direct to the generators in order to reduce their temperatures—a matter not only of expense but also of inconvenience resulting from blocking free access to the generators. He reported that he was decidedly of the opinion that it would be fatal to order the Toronto Power Company to operate on lower power factors or higher temperatures than they were then operating. In confirmation of his conclusions he pointed out that there were no spare units in the plant, but every unit that could be in service was being operated to the maximum capacity that conditions per-

mitted, and that the operating conditions were onerous. He also pointed out that with the production as it was in addition to the temperature of the generators the feeder cables in conduits running from the plant were so hot that it was necessary to cool them by running cold water over them. Mr. Smith also advised that the Toronto Power Company's machines had but an old type of insulation; that is, varnished cambric, pressed board, mica, and tape; that the machines had been in use for a considerable length of time, had been subjected to severe strains from time to time and that the amount of destruction already worked thereby in the insulation—which is the important factor in overheating—was impossible to arrive at.

As illustrating the effects of intensive operation, the fact may be pointed out that the Ontario Power Company's generator 6 burnt out in November, 1918, and its generators 5 and 7 burned out in January, 1919. Although the necessary repairs were made with all possible despatch approximately 4,835,125 horse power hours were lost. The constant overloading of a generator, notwithstanding any question of original specifications, gradually breaks down the insulation.

For the above reasons the method of the operation of the Toronto Power Company's plant was not ordered to be changed. It was a matter of regret that this could not be done as the Ontario Power Company suffered greatly on account of low power factor on its system. The low power factor had the effect of lowering the efficiency of the power as supplied to the customers, and also limited the output, as the company's generators had to be operated on the capacity of the generators reduced as it necessarily was by a low power factor and at times less than their kilowatt capacity. In other words at times the power factor was such that the company was unable to make use of the maximum capacity of their plant.

The Imperial Munitions Board, who were very much concerned by the shortage of power, employed as electrical engineer, Mr. F. W. Pennock, for the purpose of checking up the operations of munition plants, effecting economies in the use of electricity, and ascertaining the actual electrical power each munition manufacturer required.

Mr. Pennock also took up questions of production from time to time with the different companies. Anxious as he was to increase the output, Mr. Pennock agreed in the conclusions arrived at by Mr. Ross and Mr. Smith.

In order to improve the power factor the Commission installed two synchronous condensers in Toronto. These condensers had the effect of reducing wattless current, improving the voltage, and of increasing the power factor.

The systems had much difficulty in getting any machines, but on December 5th, the Ontario Power Company placed one of its new generators in service temporarily on its lines, utilizing it also as a synchronous condenser, which would have the same effect in making improvements on the immediate lines of that Company.

As indicating the manner in which the customers of the producing systems controlled the power factor, particulars of the test taken on October 12th, 1918, of the local feeders of the Ontario Power Company may be of interest.

Feeder	Power Factor
"A".....	74.3
"B".....	79.5
"G" and "H" (Welland Load).....	78
"J".....	82
"K".....	72

It will be observed that these power factors vary from 72 to 82; that they differ in their variations, although each feeder is fed off the main bus bar, severed only by reactances, as already noted.

The difficulties of plant operation are set out in the Judgment above referred to down to its date, but the difficulties did not by any manner of means then cease.

The Ontario Power Company through Mr. Gaby reported ice troubles and power shortages as follows:—

Feb. 4, 1918.	Average power shortage to noon 17,400 H.P. account ice troubles.
Feb. 5, "	Average shortage noon to midnight Feb. 4th. 10,700 H.P., midnight to noon February 6, 14,700 account ice troubles.
Feb. 6, "	Average shortage noon 5th to midnight 9,300 H.P. and midnight to noon Feb. 6, 12,000 ice troubles.
Feb. 7, "	Average shortage noon to midnight 6th, 12,400 H.P. midnight to noon 7th, 14,700 H.P. ice troubles.
Feb. 8, "	Average shortage noon 7th to noon 8th, 10,700 H.P. due damage to runners, plant repairs, low water and ice troubles. One unit off 1.56 p.m. to 3.17 p.m.
Feb. 13, "	Output from 12 noon Feb. 12th to noon Feb. 13th, reduced average 5,500 H.P. due to damaged runner No. 9. 12,000 H.P. off from 1.05 a.m. to 4.02 a.m. Feb. 13th, output at present 150,000 to 151,000 H.P.
Feb. 14, "	One generator off, average shortage 5,000 H.P. due to temporarily reduced output damaged runners, etc.
Feb. 15, "	No. 8 unit off 12.06 a.m. to 1.27 a.m. cleaning wheel, average shortage noon 14th to noon 15th 5,400 H.P. damaged runners.
Feb. 16, "	Noon 15th to noon 16th output reduced, average 5,400 H.P., damaged runners.
Feb. 18, "	Output reduced noon 16th to noon 17th, 5,400 H.P. damaged runner No. 11, machine off 12.28 a.m. to 1.45 a.m. cleaning wheel.
Feb. 19, "	Output reduced average 4,000 H.P., noon 13th to noon 19th, damaged runners, etc., No. 8, 11,000 H.P., off 12.45 a.m. to 1.45 a.m. cleaning wheel.
Feb. 21, "	Output reduced average 4,000 H.P. from noon 19th to noon 20th, damaged runners, etc.
Feb. 25, "	Output reduced—average 5,400 H.P. noon 22nd to midnight 23rd, also from midnight 24th to noon 25th, damaged runners, etc. Ability to supply power to restricted customers on Sunday somewhat reduced on account of generators Nos. 10, 12, 6, and 1, being off for repairs and inspection at different times. Toronto Power off one hour account line changed.
Feb. 26, "	Output reduced noon 25th to noon 26th, average 4,000 H.P., damaged runners. No generators off.
Feb. 27, "	Output reduced noon 25th to noon 27th, average 5,400 H.P. No. 8 generator off 4 hours 45 minutes for inspection, repairs to one Toronto Power Co. generator, 13,400 H. P. off 37 minutes testing.
Feb. 28, "	Output reduced noon 27th to noon 28th, average 4,500 H.P. account damaged runners.

The complaints of the private owned companies related to troubles of operation. The complaints of the Canadian Niagara Company were as follows:—

Mar. 3, 1918.	16 minutes interruption of all load, Hydro trouble
Mar. 6, "	2 " " " " "
Mar. 14, "	15 " " " " " "
May 4, "	14 " " " " " "
May 10, "	23 " " " " " "
May 22, "	7 mins. interruption trouble on O. P. Co.'s cables.
May 28, "	49 " " " No. 10 unit burned out and will be down for extensive repairs, trouble caused by short circuit in Hydro Sub-Station.
May 31, "	38 mins. interruption part system, bal. 3 hr. 50 min.
June 11, "	17 mins interruptions entire load, followed by 5 partial interruptions during evening account Hydro trouble.
June 25, "	Total interruption for 9 and 16 minutes Hydro short circuits.
July 3, "	Short circuit on Hydro lost load 8 mins., and injured thrust bearing.
July 4, "	Short circuit on Hydro, 6 minutes interruption.
July 7, "	Lost entire load 16 minutes, thrust bearing burned out.
July 23, "	No. 8 thrust bearing burned out, 24 hours delay.
July 25, "	Entire load lost for 3 mins., account short circuit on Hydro.
July 27, "	Entire load lost for 3 mins., account short circuit on Hydro.
July 28, "	" " " 5 " " " "
Sept. 30, "	Trouble on bus tie cables caused by Toronto power high tension lines crossing low tension 12,000 volt lines.
Sept. 7, "	9 minutes interruption due to short circuit on Hydro.
Oct. 21, "	Total loss of Hydro load, 11 minutes due Hydro trouble.
Oct. 22, "	Total interruption for 11 minutes due to Hydro trouble.
Oct. 23, "	" " " 7 " " " "
Nov. 7, "	" " " 6 " " " "
Nov. 17, "	" " " 6 " " " "
Nov. 26, "	" " " 7 " " " "

The complaints of the Toronto Power Company were as follows:—

Jan. 29, 1918.	Trouble on line feeding Ontario Power Company, dropping 19,900 k.w., 15 minutes delay.
Feb. 6, "	Trouble on line feeding Ontario Power Company, dropping 11,000 k.w., causing 16 minutes delay

Feb. 9, 1918,	Trouble on line feeding Ontario Power Company, dropping 11,000 k.w., causing 4 minutes delay.
Feb. 11, "	Trouble on line feeding Ontario Power Company, dropping 11,000 k.w., causing 6 minutes delay.
The Toronto Power Company reports:—	
The several short circuits which have occurred lately and the one of February 11, particularly increased leakage of the penstocks in No. 5 and 6 units. No. 6 is now leaking so badly that we have difficulty in keeping the water removed from the pit."	
Feb. 26, "	Seven disturbances on lines of Hydro Electric Company from 12.30 a.m. to 6.16 a.m. No load lost.
Feb. 28, "	Short circuit on Ontario Power Lines, 11,200 k.w. dropped, 4 minutes delay.
Mar. 1, "	Trouble on Ontario Power lines. No load lost.
Mar. 6, "	" " " " dropping 7,000 k.w. 6 minutes delay.
Mar. 10, "	" " " " No load lost.
Mar. 16, "	" " " " Unit No. 5 dropping 5,000 k.w. to Ontario Power Company.
Mar. 24, "	" " " " Ontario Power lines, 11,000 k.w. dropped, 12 minutes delay.
Apr. 20, "	" " " " No load lost.
May 22, "	" " " " In cable at Ontario Power Company, load off 20 minutes.
June 10, "	" " " " Ontario Power line. No load lost.
June 11, "	Lightning trouble from 10.15 p.m. to midnight, also Ontario Power short circuits.
June 14, "	Trouble on Ontario Power lines. No load lost.
June 21, "	" " " " " " " "
June 25, "	" " " " " " " "
July 25, "	" " " " " " " "
July 28, "	Short interruption of 11,000 k.w. to Ontario Power, load due to short circuit Short circuit on Cyanamid Ontario Power lines, 10,200 k.w. dropped for short time.
July 29, "	Short circuit on Ontario Power Company's line. No load lost.
July 30, "	" " " " " " " "
Aug. 7, "	" " " " " " " "
Aug. 8, "	Two short circuits on Ontario Power line. No load lost.
Aug. 11, "	Short circuit on Ontario Power line. No load lost.
Aug. 14, "	" " " " " " " "
Aug. 26, "	Lightning trouble on lines between Ontario Power and Toronto Power Company's causing delay.
Sept. 10, "	Two short circuits on Ontario Power Company, dropping load for short time.
Sept. 12, "	Short circuit on Ontario Power Company. No load lost.
Oct. 5, "	" " " " " " " " 32 minutes delay losing 22,000 k.w.
Oct. 6, "	Four short circuits on Ontario Power Company. No load lost.
Nov. 8, "	Short circuit on Ontario Power Company, causing more or less interruption of Ontario Power load from 4.32 p.m. to 7.10 p.m.
Dec. 4, "	Short circuit on Ontario Power Company. No load lost.
Dec. 20, "	Disturbances on Ontario Power lines. No load lost.
Dec. 24, "	Short circuit on the Ontario Power lines. All load off for 6 minutes.
Dec. 24, "	" " " " " " " " All load off for 30 minutes.
Jan. 14, "	" " " " " " " " No load lost

It will be observed that many of the complaints relate to disturbances of but a trifling character, those that are more serious relate to results which had to be expected under the operating conditions prevalent. Much was done in the direction of relieving these difficulties by the installation of reactances on the bus bars of the Ontario Power Company and the Hydro Electric Commission. These reactances act as buffers and appreciably protected the different generators from short circuits which might occur on other parts of the electrical whole. As a result, when these reactances were all installed and running, the five generators of the Canadian Niagara Power Company were fed to a bus bar common to them, but connected through reactances with the main bus.

As to the Toronto Power Company, the reactances in that case were supplied on the machines themselves and would serve a similar purpose. Similar reactances were also placed on the machines of the Canadian Niagara Power Company and the bus bar at that plant, as well as on the bus at the Hydro sub-station.

As a result of the reactances supplied and the work of Mr. Smith at Niagara in obtaining a better co-ordination between plants the situation became much improved.

The average of the weekly maxima produced by the Ontario power plant and plussed by the power supplied by the Canadian Niagara and the Toronto Power Company rose in a weekly average from a minimum of some 143,500 kilowatts to some 184,000 kilowatts, or a maximum increase of some 54,280 horse power.

V. DOMINION POWER AND TRANSMISSION COMPANY'S LINES.

In addition to the three companies above considered, the Dominion Power & Transmission Company produced power hydraulically developed from the waters of Lake Erie at Decew. This company not only sells electrical energy in Hamilton, but also at Burlington Beach, Welland, Brantford, and other points.

The position of the company was that while under its contracts it was delivering power practically to its capacity, it was not subject to any shortage on its lines. It had no accepted contracts over and above the amount that it was able regularly to supply, and its customers were being fully protected.

My desire was to have all new loads placed on this system in the districts served by it, with a view of improving conditions on the Hydro. Difficulties arose, however, largely owing to the fact that while the Hydro operates on a frequency of 25 cycles, the machinery of the Dominion Power & Transmission Company operates at a frequency of 60½ cycles. Machines designed for operation of 25 cycles cannot be operated with current delivered at 60½ cycles. As a result, none of the customers of the Hydro-Electric Power Commission of the Ontario Power Company could change their load to the Dominion Power & Transmission Company without changing their motors and other electrical apparatus.

This question Mr. Pennock took up in particular, endeavouring to have all new munition loads, and if possible old loads which were not being fully served, transferred to the Dominion Power & Transmission Company. No really satisfactory progress was made. Speaking generally, the manufacturers refused to make the change.

The new machinery which they were installing had been ordered for 25 cycles, and there was great difficulty in filling orders for any new machinery with any promptness. The best offer that was received which would have enabled any part of the load to be changed was one which Mr. Gaby was able to obtain. This offer was made in May, 1918. The machinery consisted of a second-hand 4,000 k.w. frequency changer set. This frequency changer set at that time was in San Francisco. Mr. Gaby's estimate was that it would take five months to bring it from San Francisco and erect it in Hamilton. He estimated the cost of doing the work and obtaining the machinery at \$96,200. It was concluded that this was extravagant and impracticable.

I think that, apart entirely from the difficulty in obtaining 60½ cycle machinery, the manufacturers would have been very loathe to change if they had been able to, owing to the fact that when conditions became normal, with 60½ cycle machinery installed they would be unable to use the Hydro-Electric Power Commission's electricity.

The result of what actually happened largely bore out the position taken by the Honourable Sir Adam Beck as far back as November 23, 1917, when he stated that he did not place much reliance on any greater supply from Decew Falls.

VI. INCREASED USE OF THE WATER OF THE NIAGARA RIVER.

The plant of the Toronto Power Company was designed for operation with a spare unit. This is but a proper and necessary precaution. At the time the question of water was first brought to my attention, the Commissioners of the Queen Victoria-Niagara Falls Park had taken the position that the Toronto Power Company could utilize water only to the extent necessary for the generation of 125,000 h.p., and that the Power Company had no right to exceed this limit.

A special Commission appointed by the Ontario Government has since so found. A similar finding has also been made by Mr. Justice Middleton in the case of Ontario and Commissioners Queen Victoria-Niagara Falls Park v. the Electrical Development and Toronto Power Companies.

The Order in Council provided that "all companies generating or distributing electrical energy in the said province shall, to the fullest extent of their plant and equipment, supply such energy", etc. Disputes had arisen between the Company and the Park Commissioners as to the amount of water then used. It was entirely in the public interest that as much power should be produced as possible, and with the use of as little coal as possible. Under the understanding arrived at with the Commissioners of the United States Government, all machines installed and capable of producing were to be run to their full capacity, irrespective of the amount of water consumed. It was also necessary to enable as much of the power delivered to the Ontario Power Company to be produced by water as possible, owing not only to the shortage of coal, but also to the extra expenses and cost attendant on the production of steam power.

At the inception of the period of control the Toronto Power Company was, therefore, directed, irrespective of all questions of contract, to operate all their machines to the fullest capacity, and irrespective of the amount of water required to fully operate them. This action was taken without the slightest prejudice to the contractual rights of the parties just so soon as the period of emergency passed. The result was to utilize water which was at the time running to waste, as and when it could be utilized in the production of much needed electrical energy.

At the time the direction was given, the Toronto Power Company were unable to take advantage of the excess water, owing to the fact that some of their machines were undergoing repairs. This question was brought to my attention from time to time by complaints of municipalities and the Hydro-Electric Power Commission.

The matter of the repairs was followed up, however, locally at the Falls, night and day shifts were employed, and at one time as many as eighty-two men were at work on the job. There was no unnecessary delay in getting the whole plant into proper running order. As a matter of fact, however, the full eleven machines of the Toronto Power Company were not in operation until January 9th, 1918. Even then the full amount of water the machines themselves could have theoretically taken could not be taken advantage of owing to the fact that as the plant had been constructed for operation with one spare unit, the tunnel conveying the water from the plant was not large enough to accommodate the whole amount of water to be used had all the gates been open to their full capacity.

As a matter of fact, the largest quantity of horse-power which the plant, running to its full capacity, was able to produce owing to the limitations worked by the tunnel, was approximately 150,000 horse-power. The normal rating of the eleven machines is some 13,333 horse-power less than this amount. The extra amount was obtained by carrying an over-load approximating 10 per cent of the machines' rated capacity. In view of the amount of heating which was found to exist in the machines, it is doubtful, however, whether it would have been possible to have increased the output, apart altogether from the question of tunnel limitation.

The right given the Toronto Power Company to use extra water ceased just as soon as the Hydro no longer required power, and therefore ceased entirely on the first of March.

I should also point out that owing to mechanical troubles arising from time to time in different units the full hydraulic output was not always maintained. Mr. Smith advised all generator repairs and work on water wheels and governors was done with all dispatch and the plant used to the fullest extent possible.

VII. STEAM PLANTS.

The question of operating steam plants wherever available was one of the first matters taken up. The difficulties here were two-fold. The operation of steam plants required coal. The country was on coal rations. The districts concerned were subjected to coal shortages. Many of the steam electric plants were old and could not

turn out anything like a proper amount of electricity for a given quantity of coal; and any coal which was obtained for any of these old electrical plants would not only have been used extravagantly, but would have to be deducted from the amount of coal apportioned to the locality in which the plant was situated, would have materially reduced the amount of coal available for domestic and other necessary heating purposes, and would have accentuated hardships, with possible grave results in the health of many a family. Under all the circumstances I felt that, notwithstanding the electrical shortage, in view of the coal shortage the greater public interest and greater public good would be obtained by leaving as much coal as possible available for the people.

The issue practically came to a head in connection with the shutting down of the London Electric Company's plant. This was an old plant operated at a large loss. In view of the obligations already resting on them, the London Hydro-Electric Commission were desirous that the plant should not be closed. On an application made by the city the following judgment, dated April 4, 1918, was delivered:—

"An application was made by the Board of Control of the City of London for an Order compelling the London Electric Company to continue operation of their plant for a period of five or six months in order to enable the City of London to supply the former customers of that company with power and light.

"This application was made as a result of a notice given by the London Electric Company to its customers that it would cease operation in thirty days, the notice being given at the beginning of March.

"There is no doubt whatever that the action of the company in shutting down seriously interferes with the comfort and convenience of its customers, which the city's Board of Control places at 1,800. Ordinarily, the increased business and the increased load which these customers would create would be welcomed by the local Hydro-Electric Commission.

"The company's sole and only reason for going out of business is that it can only carry on business at a loss. With an investment of between five and six hundred thousand dollars already made, the company now intends to scrap its plant. This action will result in two financial advantages to the company—first, the losses of operation cease; and, second, the scrap value of its metals is much higher at the present time than when normal conditions prevail.

"The position of the company would seem to be inevitable. It was impossible for the company to successfully compete with the municipal plant, supplied as it was by hydraulic power; while the company's power was produced by steam.

"During normal periods and with the lower freight rates, the company's position was always difficult, but at the present time with the coal market as it is and with advanced costs it has become impossible for the company to carry on its operation.

"The whole jurisdiction conferred upon me as power controller for the Dominion of Canada is under "The War Measures Act." The action by the Dominion was one taken entirely and only owing to the shortage of power, the needs of munition plants, and the necessity to do everything possible to assist in the country's war effort.

"Any interference by me as a matter of right would depend entirely upon the question as to whether or not the London Electric Company was or was not supplying munition plants.

"Knowing myself of no munition plants on the system, Mr Baker, the city clerk of London, was written to, and by his letter received on the 25th ult., he advises as follows:—

"I am instructed by the Special Committee on the London Electric matters to acknowledge receipt of your favour of the 19th inst., and to state

that the London Electric Company is not supplying any munition plants, but that the Public Utilities Commission are, and have been asked for an increased supply of power; that the sudden closing of the plant was very objectionable and injurious to industries here; that the Council do not wish to purchase the London Electric plant and would not contribute to the company's alleged losses by continued operation of the plant for some months; further that no public utility should be permitted to cease operations upon thirty days' notice."

"The Public Utilities Commission claim they must have an increased supply of power in order to meet the requirements of the London Electric customers."

"The city had already asked the company to put a price on its plant; and I had, therefore, also written the city as follows:—

"I notice that you asked in your letter to the company at what price it would sell the plant out as a going concern. I would like to know whether the city had any price in mind which it was prepared to pay. If so, please let me know what that price is."

"Please let me know generally and as specifically as possible just what London's attitude is and just what London is prepared to do."

"Under the circumstances, no order can be made; and the city has been so wired.

"By yesterday's mail, the following letter has been received from Mr. Jeffery, a London ratepayer:—

"As one of the citizens of London and as such one of the owners of the Ontario Hydro-Electric System supplied from Niagara, I wish to draw your attention to the fact that the 1,800 citizens, customers of the London Electric Company will, after to-day, be unable to obtain any power or lighting although as our properties were mortgaged or pledged to procure the funds for the building of the transmission lines, power stations, etc., of the Ontario Hydro-Electric System we consider that now we need to make use of the system we should be allowed to do so, but the request is refused by the London Utilities Commission on the ground that the Hydro-Electric Commission of Ontario refuses to supply the additional current required, and that commission state that their action is forced on them by your orders to supply current for munition factories. Of course, as loyal citizens we are prepared to accept any reasonable restrictions in order to assist the Allies but do not think we should be entirely cut off from what in ordinary times would be deemed our right to be supplied with electricity by the system built with funds obtained on security of our property."

"We, therefore, ask you to notify the Ontario Hydro-Electric Commission and the London Utilities Commission that they have misunderstood your orders and that you did not mean that they are not to supply the customers of the London Electric Company to the extent same have been supplied by that company with reasonable restrictions as to hours, etc., and that they are at liberty to do so. Possibly it might be as well to avoid any misunderstanding, to put it in the form of an order that the customers of the London Electric Company be supplied by the Hydro System, fixing a reasonable time within which same are to be connected up on signing proper application and making any suitable limitations as to hours during which lighting should be allowed."

"Your early attention is requested; the matter is urgent, as many of the 1,800 will have to depend on lamps and candles until electric light is supplied."

"Under the circumstances it appears that a formal statement of the position should be made."

"In so far as the company's operations are concerned, its production is small, amounting, as I understand it, to some 1,000 horse-power. Its continued operation is, therefore, not of much importance in connection with the large shortage which exists. It is of importance in so far as the convenience and comfort of its customers are concerned. It, however, supplies no munition plants and no public utilities, and no order can be made by me against it under the terms of the Order in Council appointing me power controller."

"In so far as its continued operation is concerned, having regard to the convenience of its customers, although that matter is entirely one of local concern and something absolutely within the provincial rather than the Dominion jurisdiction, I would have been glad to have assisted in every way possible for the continued operation of the plant, whether by assisting in its purchase by the city on a basis of scrap value, or for its continued operation on the undertaking of the city to make good the losses resulting therefrom."

"The city, however, does not desire to commit itself in either of these directions."

"In so far as Mr. Jeffrey's application is concerned, the Dominion has taken no jurisdiction whatever over either the Hydro-Electric Power Commission or the London Public Utilities Commission. The Hydro-Electric Power Commission is a statutory body, created by the province, discharging a public function which is provincial in its character, and its operations have not been made subject to Dominion control."

"The matter of the distribution for domestic and commercial purposes, apart from the war, of electricity available for such purposes, insufficient as it is, is a question entirely for the Provincial Commission, and no order can be made as asked by Mr. Jeffrey. In view of the shortage of power for important munition plants that still exists the request made on the Hydro System that full priority be given these plants on whose activities the nation's war efforts and those of the Allies depend so much must still stand. On the other hand, there would seem to be no valid reason why the former customers of the London Company should not get the same consideration as the domestic customers of the Hydro, but that question is entirely one for the local authority."

"Since writing the above the following telegram has been received from the Hon. Sir Adam Beck:—

"In accordance with telephone conversation advised Mr. McDougall that commission was prepared to transmit and deliver power to London Electric to drive the companies' generators at prices equivalent to city of London plus cost of delivery to companies' station. He replied that the Power Company did not have power available, which I think incorrect. Believe commission could secure necessary motors in a few days. Company could continue operations by steam until motors installed and connected. McDougall says he will see you in the morning. Please wire if my suggestions are favourable."

"The position taken by the Toronto Power Company is set out in the following letter from Mr. McDougall, assistant to the general manager of the company:

OTTAWA, April 4, 1918.

"SIR HENRY DRAYTON,
Power Controller,
Ottawa.

"DEAR SIR,—As already advised in conversation in answer to Sir Adam Beck's request that we supply him with an additional block of 1,000 horse-power at Niagara, for transmission by him to London, for the benefit of our former London customers, we have no power available at Niagara for this

or any other purpose. Our load curves supplied daily illustrate our actual load there.

"To obtain this 1,000 horse-power, if ordered we would be obliged to cut off existing contracts at Toronto, and as we have already been obliged to supply Sir Adam with 13,500 horse-power daily since November 1, and are now ordered to cut off present contracts to supply his shortage under contract to the Norton Company of 2,000 horse-power, we are not willing to further cut off Toronto customers for the benefit of London users. My engineers report that it would take at least three months to install motors to operate the London plant in the manner suggested by Sir Adam Beck.

Yours truly,

(Sgd.) D. H. McDougall."

For the reasons already set out no further action can be taken by me.

The question of forcing the operation of this steam plant for the purpose of taking up munition loads, not only on the London Electric system, but on the system of the Hydro, was subsequently discussed with the Hydro-Electric Power Commission. Such action was not contemplated by the first Order in Council, but in order to render such action possible whenever proper, a further Order in Council, P.C. No. 939, was passed on the 17th April, 1918.

Under this Order in Council power was given to compel companies to give priority in the supply of electrical energy to be used in munition plants requiring such energy, although not situate on the lines of such company; to oblige companies to operate any steam plants that they might possess, or which might be under their control, to meet the requirements of munition manufacturers, whether such manufacturers are or are not, in the ordinary course, customers of the company owning such steam plant, or on its lines.

Mr. Smith made an examination of the company's plant with a view of determining on its efficiency. He made a thorough inspection of the plant, and reported that it was capable of producing in all 1,000 horse-power; that this power was not suitable for munition loads, as it was a direct current, while the local munition plants required 25 cycles. The company had no munition loads on its lines. Mr. Smith found, however, that the power could be used by coupling the company's two generators in series, thus producing 500 volts on the street railway lines in London, and the question as to whether or not this ought to be done was very carefully considered.

Mr. Smith also found that the plant was in very bad condition; that repairs of necessity would have to be made to the steam engine; and that after these repairs were made the plant was of such an obsolete and inefficient character that it would require 6½ to 7 pounds of coal to produce one kilowatt hour. In order to appreciate what this means I ought to point out that in large producing steam units the equivalent kilowatt hour can be produced for approximately 1½ pounds of coal, and that in the case of the smaller but efficient plants the kilowatt hour can be produced for approximately 2½ pounds of coal.

In order to produce the 750 kilowatts for but an 18-hour day, the result was that 43 tons of coal, or more, would be required per day. If this plant had been run this large amount of coal would have had to be deducted from the already insufficient supply available to the people of London, and great hardship created.

It is perhaps unnecessary to add that the plant was not operated, and has since been scrapped. Advantage was, however, taken of the Order in Council in ordering the Toronto Power Company to generate steam power for use by a customer of the Ontario Power Company.

VIII. CONTRACT OF THE AMERICAN CYANAMID CO.

This matter was one that proved to be a particular and constant trouble, and requires a separate report upon it.

During the earlier period of operation by the Ontario Power Company, and when that company was desirous of working up its load, it made a contract, in 1907, with the American Cyanamid Company. Under this contract the company obtained power at a very low rate, the contract price being only \$10.50 per horse-power. The company had the right, under the contract, to call for power to the extent of 27,000 firm horse-power. The Cyanamid Company, in the first instance, as a matter of fact, did not require power and were compelled to pay under the contract a stated minimum amount. When the shortage of power arose, the Hydro, in operating the Ontario Power Company, very materially reduced the Cyanamid load. As, in the first instance, the company's output was used as a chemical fertilizer, this action was entirely in accord with the essential policy that war production must have priority over non-essentials.

About the end of 1917 this situation, however, was entirely changed, owing to the fact that the Ordnance Department of the United States Government had given a contract to the American Cyanamid Company for the production of chemical explosives. The American Government adopted amatol as its standard explosive, and the only plant from which the essential chemicals for its production could be procured at the time was the American Cyanamid Company's plant at Niagara Falls, entitled to a supply, under its contract, of 27,000 horse-power.

Under these circumstances great difficulty arose. The load was a heavy one; the power shortage in Ontario was very marked. Over and above this, the commission were obliged to have regard to the essential output of ferro-silicon for the British Admiralty produced by the Electro Metals plant at Welland. The commission increased the supply to the Electro Metals from 11,000 horse-power firm and 15,500 off peak to 14,725 horse-power firm. Not only was this supply urgently required but a further supply of 19,500 horse-power firm and 4,000 horse-power off peak had to be maintained for the same concern by the Toronto Power Company. The only load for the American Cyanamid that the commission were able to supply was some 16,000 horse-power, approximating 11,000 horse-power short of the contractual requirements during ordinary factory hours. On off-peak hours the commission were able to and did supply the full 27,000 horse-power.

Under these circumstances serious difficulty naturally arose with the Ordnance Department of the United States, who were most anxious not only that the plant should be operated to the extent of 27,000 horse-power, but to its full operating capacity, and very naturally expected the closest and most hearty co-operation from the Hydro-Electric Power Commission and myself.

The only manner in which it was at all possible to give this essential service without at the same time injuring and unduly restricting other operations in Ontario, was by using the steam plant of the Toronto Power Company in Toronto. This arrangement was finally made under the powers conferred by the amending Order in Council already referred to. The American authorities co-operated in seeing that it was possible for the Toronto Power Company to purchase the necessary coal. Over and above this it was arranged that the amount of coal imported into Canada for the purpose of operating this steam plant, in view of the fact that the coal was being used to manufacture a product that the United States Government was most vitally interested in, was not charged against Toronto's fuel allotment, or against coal imports into Ontario from the United States.

I have pleasure in testifying that the American authorities scrupulously lived up to the arrangement, and I desire to express my acknowledgment and appreciation of the activities of the Honourable Robert J. Bulkley and General Kellar in bringing about this working arrangement.

As a result, the Toronto Power Company generated by their steam plant sufficient horse-power to enable it to supply the Hydro-Electric Power Commission with an additional block of power amounting to 11,000 horse-power (during business hours (approximately between 7 a.m. and 5.30 p.m.)).

This power the Cyanamid Company, under its contract was entitled to at the contract price, without extra charge. In other words, the Ontario Power Company were under obligations to supply it, and were under certain circumstances liable to damages if default was made in delivery.

Under the contract the Power Company was excused in case delivery was prevented by strike, riot, fire, lightning, invasion, explosion, act of God or the Kings' enemies, or any other cause reasonably beyond its or his control. The contract provided, however, that in case the Power Company was prevented from delivering power from any cause other than those specified above, the deduction of the power should be equal to the pro rata value of the power for twice the period of such interruption.

The effect of this, of course, would be to penalize the company in an amount double the contract price, to the extent that power was not delivered under such circumstances. It is claimed, however, on behalf of the Cyanamid that this provision did not apply, and that the Ontario Power Company was liable to the full extent of the damages suffered by the Cyanamid, as the shortage was caused by contracts which the company had taken on subsequent to the contract with the Cyanamid and that by the increase of its load to the Hydro-Electric Power Commission and to other purchasers, it had itself created the shortage and had not in any legal sense been prevented from delivering the power. And further that the third pipe line contemplated when the load had been increased was not proceeded with.

The question is one upon which, as I see it, it is not necessary for me to report, but beyond all question, not only in the interest of the country, but in the interests of the Ontario Power Company itself, it was necessary that the full load required by the contract should be delivered at the earliest possible moment.

A further direction was also made under which the Toronto Power Company had to generate sufficient electricity to enable the Cyanamid Company to operate to full capacity, just as soon as it could be taken, and which the Cyanamid Company was to pay for at the high cost of steam power. The excess that could be taken proved to be 5,000 horse-power, and this was supplied.

Delivery of the 11,000 horse-power was commenced in the week of April 20, 1918, and of the 5,000 horse-power, in the week of September 7, 1918. The block of 5,000 horse-power was discontinued in the week of November 9, when the American Cyanamid Company no longer required it. The supply of 11,000 horse-power was discontinued in the week of December 28, when the Hydro-Electric Power Commission no longer required it.

IX. EXPORT POWER TO NIAGARA, LOCKPORT & ONTARIO POWER CO.

This is another matter which from time to time, on complaints as to shortage by the power controllers of the United States Government, had to be dealt with.

The Niagara, Lockport & Ontario Power Company is an American corporation engaged in the business of producing and supplying electricity in the state of New York. Under its contract with the Ontario Power Company, the Ontario Power Company was obligated to deliver 60,000 firm horse-power. Under a special arrangement made by the Hydro-Electric Power Commission, this amount was reduced to 50,000 horse-power during the period of the war.

At the time the investigation was made into the export of electricity it was found then, as a matter of fact, the supply the company was then receiving was 36,000 horse-power on the peak and an average of 50,000 horse-power, made up by off-peak deliveries. Under the report then made the Ontario Power Company were permitted to continue to export 36,000 horse-power on the peak and 50,000 horse-power on the average.

Much of the Niagara, Lockport and Ontario Power Company's power was used in American territory for the production of munitions and other Government contracts. The complaints which were received were complaints that the delivery of this power, limited as it was to a peak of 30,000 horse-power, and an average of 50,000 horse-power, was not being made but that shortages obtained.

The complaints of shortages commenced on or about December 19, 1917, and were continued from time to time into November, 1918. The shortages complained of resulted from troubles of operation already referred to. They were due to difficulties resulting from ice, from station trouble, and from the burning out of generators, etc.

I was able to convince the American representatives that an honest effort was being made by the Ontario Power Company to supply power to the full extent authorized, namely, 30,000 horse-power on peak and 50,000 horse-power off. The shortages while in some instances grave were unavoidable, and were adjusted with the smallest possible delay.

X. DISTRIBUTION AND ECONOMIES.

Many complaints were made from time to time by munition and other manufacturers and by municipalities as to the difficulties they were suffering from in their operations.

In so far as the municipalities were concerned, and in so far as the Hydro-Electric Power Commission itself was concerned, they were not in any way interfered with. The jurisdiction exercised was over the incorporated companies. No jurisdiction was taken over the Hydro-Electric Power Commission. That Commission is a Government commission entrusted with the discharge of an important public duty and having a very intimate knowledge and control, not only over its own large system, but over the operations of the local municipal electrical commissions.

I may add that in my view it would have been entirely improper to have taken any jurisdiction over them. Any real interference with their operations could have produced no useful result.

Owing to its inability to meet the requirements of its customers the Commission were obliged to cut down the allotment of electrical energy to the municipalities by 25 per cent. Over and above this, further reductions were made by the Commission from time to time as and when the necessities of its load demanded, and advertisements were made in the public press from time to time drawing the attention of the users of electricity to the exigencies of the situation and the necessity of economy in the use of electricity.

Very material reductions were of necessity made in street lighting and in the electricity used by municipal waterworks, which in some instances the Commission practically stopped altogether.

In order that consumers of electricity might become fully seized of the gravity of the situation, concurrent orders were made by the Commission and myself prohibiting entirely the use of electricity for advertising purposes, and restricting the use of lights in shop windows. The orders made by the Commission covered the use of electricity on the municipal systems for such purposes, while the orders made by me covered electricity sold by private companies for such uses.

In order to assist in obtaining results from the orders, the firm of Messrs. Ewart & Jacob, representing both the Hydro Commission and myself, was employed for the purpose of seeing that the orders, in so far as they related to Toronto, where by far the largest amount of electricity for these purposes was consumed, were obeyed. At other points, in the main, they were well observed by the different local Commissions and by the distributing companies, the different companies involved issuing appropriate advertisements and notices to their customers, the local police at the different centres also enforcing the orders.

Further particulars of the steps taken by the Commission are covered by its advice of February 23, 1918, a period of great power shortage, the more material parts of which are as follows:—

"You will understand the difficulties of obtaining specific information and details as to the actual manufacturers reduced and shut down in the 116 municipalities supplied in the Niagara district, with probably 165,000 customers. However, I can give you information as to the load supplied to each municipality and in more or less detail, as to the reductions to customers of that municipality. Tabulated sheets are attached which give this information and show the present loads of the municipalities, required to meet the demands of customers, and the reductions that have been effected by these municipalities. It is practically impossible to give you information as to where all reductions have taken place, owing to the voluntary efforts of individuals in conserving their loads, as a result of the propaganda of the municipalities and the Commission to bring to the attention of individuals the necessity for conserving the supply of power to supply manufacturers of munitions.

"Owing to the heavy demands for power for the manufacturer of war materials, the power situation in western Ontario—in the district supplied from Niagara falls—has been very acute since December, 1916, and since that date the Commission has been using every means to supply these demands.

"In view of the entry of the United States into the war, no further limitations of exported power have been expedient, and the situation became so acute by December, 1917, that the Commission was forced to limit the power supplied to various customers and municipalities in the district, and they were notified that there could be no further increase in the amounts of power supplied from that date. Owing to further reductions in the supply, resulting from ice troubles, and damage to equipment of the companies at Niagara, it became necessary for the Commission further to reduce the amounts of power supplied to companies and municipalities in the district, to an extent of from 10 per cent to 30 per cent below the limit set in December.

"The reductions in the amounts of power supplied made it necessary for many municipalities entirely to discontinue the supplying of power to manufacturers not directly engaged on war supplies. All municipalities carefully surveyed their power consumers for essential and non-essential industries; they called their manufacturers together in conference, discussed the situation, and arranged for economies in use through taking full advantage of the amounts of power permitted to be used, and by diversifying the loads, to obtain the maximum efficiency therefrom. Manufacturers begin at 6 o'clock in the morning and quit at 4 p.m., so that the power they use may be used again for domestic and street lighting, and other manufacturers start in the evening after the peak is reduced and operate until morning. In the case of Chatham, as you will note, the municipality has arranged that half of the manufacturers of essentials and non-essentials shall operate during the day and the other half during the night, to enable the municipality, with the limited amount of power at its disposal, to give additional power for the purpose of producing flour for war purposes. The municipality has discontinued street lighting entirely until 11 o'clock p.m., or until such time as the power is available for the purpose.

"In Hamilton, non-essentials, using power for other than war purposes, are cut off one day per week; as a result hundreds of persons are thrown out of work. With a population of over 100,000 domestic consumers are cut off in many sections of the city during the day.

"In the case of the small municipality of New Hamburg, non-essentials are cut off two days per week, to enable the municipality to supply essentials. Street lighting is reduced to a minimum. Every means of obtaining auxiliary

power from other sources has been tried and manufacturers are co-operating in every way to reduce the amount of power used for non-essential industries.

"In the municipality of Tillsonburg, power consumers have arranged the operation of their factories, so that they shall obtain the maximum benefit from the power used; in one case, that of a manufacturer of agricultural implements who has to supply fifty thousand implements for use in the West during the coming summer, he works one-half of his factory from 6 o'clock a.m. until 4 o'clock p.m. and the other half after the lighting peak and until 6 a.m. This is done to make more twenty-four-hour power available for flour mills and other munition plants.

"Chopping-mills in smaller municipalities have been required to operate at night.

"The illustrations cited are indicative of what is being done in all of the municipalities connected to the Niagara system, and of the co-operation the Commission is securing on the part of municipalities to the end that manufacturing industries in western Ontario shall suffer as little as possible. Over 30,000 H.P. have been reduced from the limitations set by the Commission, in addition to voluntary reductions by customers of the municipalities and diversifying of loads, which I estimate at up to 20,000 H.P. additional. There are also the limitations of non-essentials on the Ontario Power Company's system, such as the Ontario Paper Co., Beaver Board companies, Canada Cement Company, glass companies, reduction companies, cork manufacturers, Standard Steel Corporation, Canada steel foundries, Page-Hersey Company, on firm contracts approximating some 28,000 H.P., amounting to some 19,000 H.P., or a supply of only 8,700 H.P. on contracts of 27,768 H.P.

"I am attaching a copy of the order of the Commission, of December 15, which limits the loads of the municipalities, with such other limitations as the Commission may put on. You will note that the Cement Company is reduced from 2,300-2,000 H.P. down to 550 H.P. Attached also is a statement of the munitions plants supplied by the Commission, from which you will note that there is only 16,000 H.P. estimated for the Union Carbide Company."

The following statement, then furnished by the Commission, gives the names of a large number of municipalities and shows the then present load in horse-power, the horse-power required to supply the demand, and the methods adopted to reduce the demand in each Municipality.

Municipality.	Present Load in H.P.	H.P. required to supply demand.	Methods used to reduce demand.
Brampton.....	720	970	Power loads reduced during peak hours and day loads operated between 6 a.m. and 4 p.m. Chopping mills operate at night to leave day power for war munition plants—40 per cent of street lights off.
Bolton.....	60	120	Power loads reduced to 67 per cent of normal. Street lighting out 40 per cent.
Georgetown.....	183	350	Principal power load reduced 50 per cent. Other loads cut off during peak hours.
Guelph.....	2,740	3,800	Power customers co-operate to keep load at minimum. Cutting off at peak hours and part of them operate at night to leave power to be used for munitions. 10 per cent of street lighting cut off. Voltage of lighting circuits cut down to reduce load on system.
Milton.....	240	330	Power loads reduced on non-essential loads and twenty per cent of street lights cut off during peak hours.

Municipality.	Present load in H.P.	H.P. required to supply demand.	Methods used to reduce demand.
New Toronto	1,250	1,700	All power loads greatly reduced and plants operating at part capacity only. No street lighting excepting at street intersections.
Toronto	36,000	75,000	Load reduced 20,000 H.P. Street lighting cut to minimum. Waterworks pumps 4,000 H.P. operating on steam but Deputy Fuel Controller R. C. Harris states that electric power must be supplied as coal supply is almost exhausted. Voltage of all feeders is cut to reduce load on system and a number of feeders supplying domestic customers and certain power customers are cut off part of each day.
Weston	585	790	Power customers arrange to operate a portion of their loads at night instead of day to reduce load for war munitions. Waterworks pump run during off peak hours. Street lighting reduced 20 per cent.
Tilbury	50	120	Street lights reduced to lights at intersections only; customers using gas engines for which gas has been cut off by order of Ry. Board. Not being supplied.
Walkerville	1,437	3,000	Street lights reduced 40 per cent. All power customers loads, including munition plants greatly reduced, and at times entirely shut down. No additions to present loads and no new loads being supplied.
Wallaceburg	375	750	Street lights reduced to intersections only. Present customers loads not allowed to increase. Power not available for important township drainage scheme, and electric railway partly out of operation as no power available to operate railway equipment now installed.
Welland	1,753	3,200	Street lights cut 40 per cent and remainder not turned on until late each evening. No new customers or additions to present loads being made. Munition plants unable to extend plants.
Windsor	1,437	2,600	40 per cent of street lights off. Not able to supply power for municipal water pumping, now on steam.
Niagara Falls	1,892	2,600	Street lights cut 50 per cent and not on until 8 to 9 p.m. Power customers loads cut down or cut off entirely for part of day. No new customers or additions to present customers loads.
Oil Springs	40	200	Flour mill anxious to obtain power as gas supply cut off and oil pumping outfits wanting to come on. No power available.
Petrolia	450	750	Oil pumping outfits closed down part of day. Also flour mill on war orders operates part of day only. New customers wanting to come on, also. Town pumping held on steam and steam pumps worn out. Street lights cut 30 per cent and not on till late in evening.
Sarnia	953	2,525	Street lights cut 40 per cent and not on until late in evening. Power customers' loads greatly reduced and new customers not taken on. Not able to supply customers who have equipment installed and badly in need of power as gas supply cut off by order of Board (Ry.).
Simcoe	108	175	Street lights cut off 25 per cent. Water pump on gas engine no power for electric pump installed.
St. Catharines	3,475	5,000	Street lights cut 40 per cent. Power customers' including munition loads cut 25 per cent. No extensions allowed to present customers' loads and no new customers taken on. Customers' loads cut off peak to leave power for munitions.

Municipality.	Present load in H.P.	H.P. required to supply demand.	Methods used to reduce demand.
Fergus.....	75	110	Chopping mill operate from 10 p.m. to 7 a.m. to allow flour mill to operate continuously on war orders. All non-essential industries demands reduced. Street lighting reduced to minimum.
Kitchener.....	3,561	4,750	All power customers loads reduced. Some motors cut off entirely. Hours of operation of some power customers changed to reduce peak on system. Street lighting cut 40 per cent.
New Hamburg.....	120	160.2	All industries cut off two days each week in rotation to leave power to operate mill which is working on war orders. Street lighting cut to minimum.
Blenheim.....	61.9	240	40 per cent reduction in street lighting. No new customers being taken on.
Bothwell.....	42.4	72	Street lighting reduced to intersections only. Not able to supply power for essential additional oil pumping outfit.
Brantford.....	2,020	3,800	Street lights reduced 40 per cent. Present power customers reduced to 25 per cent in daytime. Waterworks pumps all day on steam reserve. Not able to supply demands of 1,500 H.P. additional to Steel Co. of Canada and Dominion Steel Products for manufacturing of munitions.
Brigden.....	25	155	Flour mill on war orders shut down due to failure of gas supply. No power available to supply this load.
Chatham.....	740	3,700	Street lights reduced 60 per cent and off entirely until 11 p.m. Waterworks and steam reserve. Part of power customers running from 10 p.m. to 8 a.m. Power customers loads reduced including munition plants. House lighting circuits off during day. Part of power customers operate at night to leave power to operate mill running on war orders.
Dresden.....	56.8	207	Street lighting reduced to intersections only. No power available for flour mill now idle due to gas shortage.
Forest.....	75	100	40 per cent reduction in street lighting; until 12 p.m. The street lights cut off entirely. Mill allowed to operate only from 12 p.m. until 7 a.m.
Hamilton.....	9,250	16,500	Street lights reduced 50 per cent. Waterworks pumps on steam reserve. Part of house lighting customers cut off during day. Power customers load reduced and at times closed down including munition loads. Important extensions to munition plants not taken on.
Stratford.....	1,388	1,850	Street lighting reduced to minimum and all customers loads reduced to leave sufficient power for war munition plants.
St. Marys Cement Co.....	550	1,622	Cement Co's load cut out to an absolute minimum leaving just sufficient power to keep this plant operating at part capacity.
Waterloo.....	800	1,200	Street lighting cut 50 per cent. Part of customers operating at night to reduce peak on system. Part of load cut off entirely, part of each day.
J. Bertram & Sons.....	523	1,300	This company require 600 H.P. additional for manufacture of munitions, but power is not available.
McFarlane Eng'g Co., Paris..	750	1,250	McFarlane Eng'g Co. on shell work entirely have curtailed their use to a min. Require 2,500 H.P. additional for munition work. 200 H.P. obtained elsewhere.

Municipality.	Present load in H.P.	H.P. required to supply demand.	Methods used to reduce demand.
Hespeler.....	266	504	Reduced allowance to R. Forbes Co. Ltd. for their textile plants; Jardine's munition plant want more power but none available; cut off street lighting at times to hold load down; commercial lighting load reduced.
Strathroy.....	206	350	Reduced flour and chopping mill allowance; where steam-engine available had them used; commercial lighting greatly reduced; street lighting reduced; wood-working plant would take a block of power but none available.
Lucan.....	100	150	Chopping done by one mill only and at night, instead of daytime.
Preston.....	861	1,200	Cut off a certain amount from all power users wherever possible by having customers use steam plants. Power customers had meeting at which they mutually agreed to operate so as to reduce load on municipality.
Galt.....	2,011	3,000	Goldie & McCullough require 275 H.P. additional for war munitions but none available. Street lighting reduced by over 60 h.p. by cutting out half of ornamental lighting. Waterworks use steam part of the time also.
Exeter.....	100	160	Cut off part of street lighting and do chopping when flour mill shut down. Cannot run both in daytime.
Acton.....	157	250	All power customers off during peak hours, 25 per cent of street lights cut off.
St. Thomas.....	1,650	2,370	Street lighting 40 H.P. cut off. Power customers in general all reduced to prevent being entirely cut off. Some cut off their whole load at time; Waterworks off peak also.
London.....	6,857	10,000	London and Pt. Stanley Ry. reduced; Helena Costume Co. 200 H.P. cut off; large power customer cut off about one-half their load. In general all power customers reduced, commercial lighting greatly reduced.
Tavistock.....	200	250	Cut off all street lighting after 11 p.m.; only one chopping mill in village allowed to run from 11 p.m. until 6 p.m.
Ailsa Craig.....	80	100	Keep chopping load to a minimum or run chopping mill when flour mill not operating.
Ingersoll.....	684.6	850	Cut off at times practically everything except munition plants and flour and textile mills. Street lighting reduced 25 per cent.
Woodstock.....	1,086	1,600	Street lighting 25 H.P. Use 500 H.P. municipal steam-engine during part of the 24 hours; cut off several power customers, wood-working plants.
Tillsonburg.....	531	860	Maple Leaf Harvester Tool Plant take power for forge dept., at night; curtail power customers' load to minimum; cut off one woodworking plant entirely. Mill operates part of mill during day and part at night, and require 200 H.P. more to operate mill to capacity. Plants operate 6 a.m. to 4 p.m. to conserve power for flour mills and munition plants.
Paris.....	286	550	Two-thirds lighting cut off; 125 H.P. Pennans, Ltd., cut off; Brantford Municipal Ry. Paris-Brantford have allowance cut down.

As will be plainly seen by the foregoing statement, municipalities connected with the hydro system and their customers doubtless at great inconvenience and, in many instances, at actual loss, co-operated most loyally in the effort to overcome the shortage of electrical power.

In like manner mention is made of the fact that the private companies loyally co-operated in refusing much remunerative business and in maintaining proper conditions on their lines.

Mr. Pennock, the electrical engineer of the Imperial Munitions Board, dealt with the question of the requirements of munition and Governmental contractors, whose activities were absolutely necessary to the proper conduct of the war. That Board had first-hand information not only of contracts but of the order of essentiality of different war materials, not only in the case of Great Britain, but also of the country's allies.

This formed a safe and efficient method by which the demands for electric power for the manufacture of munitions and other war essentials could be weighed and their importance determined.

The demands varied from time to time. Mr. Pennock was continually engaged in the work and had a very intelligent grasp of the situation. The producing companies were ordered, and the Ontario Hydro-Electric Power Commission was requested, to give priority in the distribution of their supply of electricity to those manufacturers who were found entitled to it.

The requirements for power thus arrived at, in July, 1918, worked out as follows:—

	Horse-power.
Hydro-Electric Power Commission (Including the Welland Lines of the Ontario Power Company, but excluding power supplied to the American Cyanamid Company, which is separately dealt with).	74,664
Toronto Power Company.	34,682
Dominion Power and Transmission Company.	13,259

Some increases were made in these figures, the excess required from the Hydro-Electric Power Commission amounting to some 4,750 horse-power.

The complete programme was not always carried out. In view of the shortage, it was impossible that this could be done. The full amount of power allotted could not always be utilized by the manufacturers themselves. A statement compiled by Mr. Pennock shows the following results:—

Power Company or Commission.	Maximum Horse-power consumed for any 10-minute period during the months of August, September, and October.		
Hydro-Electric (Niagara System).....	64,103	64,407	53,176
Toronto Power.....	36,065	37,358	34,819
Dominion Power and Transmission.....	12,275	12,706	12,480

As a result of proper co-ordination and scientific adjustment of loads, the load factor on the different systems was most satisfactorily increased. The electricity available was very intensively used for the full twenty-four hour period. Peaks were largely reduced, and apart from a shutting down of some of the units at Niagara at night in order to make small and necessary repairs and other necessary light work—a condition absolutely unavoidable when plants are operated at full capacity and without spare units—practically the whole night load was used.

XI. DETAILS OF POWER PRODUCED BY THE ONTARIO POWER COMPANY AND SUPPLIED BY THE TORONTO POWER COMPANY AND THE CANADIAN NIAGARA POWER COMPANY TO THE COMBINED H.E.P. AND O.P. SYSTEMS.

Graphic Chart No. 1, which is submitted with this report, covers the period of operation from December 15, 1917, to February 1, 1919. The results are shown in the factor of the K.W. This factor can readily be turned into horse-power by the addition of one-third, as for example, 30,000 K.W. represents 40,000 horse-power. The chart shows the weekly averages and the weekly maxima of the power produced or supplied in factory hours.

The lowest dotted line is that showing the weekly average of power supplied by the Toronto Power Company to the Ontario Power Company. It will be observed that during the period of ice the Toronto Power Company were free from ice troubles and were able to maintain a good service, fulfilling not only their obligations under the unexpired contract, but also the Order of the Committee of the Privy Council. The increase in the power delivered, which commences in the week of April 20, is attributable to the order made requiring the Toronto Power Company to generate power sufficient to enable the Ontario Power Company to make good the shortage on the Cyanamid contract. This shortage was made good and the Cyanamid supplied. A further increase will be noted commencing in the week of September 7, and which resulted from the order requiring the generation of an additional 5,000 horse-power for the purposes of the Cyanamid Company. The load is reduced as shown owing to the Cyanamid Company in the first instance not requiring the 5,000 horse-power, and in the second instance, the Ontario Power Company not requiring the 11,000 horse-power necessary to enable it to fulfil the Cyanamid contract. The power supplied under the order of Sub-committee was required until the end of February, when that supply was stopped. After the cessation of hostilities the Toronto Power Company applied for permission to discontinue the service, but I required its continuance until the Hydro-Electric no longer required it. The third pipe line of the Ontario Power Company has been constructed.

The second dotted line gives similar information of power supplied by the Canadian Niagara Power Company, who were ordered to supply power under the judgment set out. The chart graphically shows the very grave shortage resulting from ice conditions on this system, which obtained as late as the week of April 13. The chart also shows the shortages resulting from damage to the Canadian Niagara Power Company's units.

The third dotted line gives the total of the power produced by the Ontario Power Company, and again graphically indicates the result of ice troubles, which however, ceased sooner and were not nearly so grave as in the case of the Canadian Niagara. The chart also shows losses resulting from mechanical injury and disturbance.

The fourth dotted line gives the weekly average of the combined whole, that is, the weekly average produced by the Ontario Power Company and plussed by the Canadian Niagara and the Toronto Power Companies' supply. It, therefore, shows the total amount of power which was available for the combined systems of the Hydro and the Ontario Power Company.

The solid lines give the weekly maximum production of the Ontario Power Company, that being the first or lowest solid line; the second, the results of the Ontario Power Company plussed by the supply of the Canadian Niagara Power Company; and the third, this result plussed by the power furnished by the Toronto Power Company.

It may be of interest to note that the power in the low week of January 26, 1918, was increased, in September, by some 54,280 horse-power.

Graphic Chart No. 2 is for the purpose of illustrating the effect of improved conditions day by day, comparing the month of January, 1918, with the month of October, 1918.

For each month the source and totals of the power available for the combined systems are shown. The line of the Ontario Power Company is first shown, then that of the Ontario Power Company plus the Canadian Niagara Power Company, and then again the Ontario Power Company plus the Canadian Niagara, plus the Toronto Power Company.

The chart again deals with factory hours. The British Forgings is a very important munition plant situated in Toronto, and the chart also shows the service this concern received from the Hydro in both months.

The October results not only show a very substantial increase of power, but they also show a far better sustained service, free from the sudden interruptions and grave load dislocations indicated for January. These disturbances and interruptions of business greatly affect the efficiency of factories. The service the British Forgings received for January, poor as it was, I have no doubt was the very best that the Hydro could give; its output was of the greatest importance. The irregularity and insufficiency of the load speaks for itself, and the improved conditions of October are in turn illustrated. The efficiency of the plant was more than doubled. It is hard to apply any general approximate amount of power to a load so varying, but in January about 5,300 horse-power was supplied the company, while the approximate October average was 12,500 horse-power.

XII. LINE CONSTRUCTION.

The only case in which any action was taken by me as Power Controller ordering the construction of lines was the case of the power line constructed by the Leaside Munitions Company, Limited.

The construction of this line was necessary for the purpose of conveying electricity from the Davenport Road sub-station of the Toronto Power Company in Toronto to the Leaside Munitions Company's plant at Leaside. The line is built, for the greater part, along the rights of way of the Canadian Pacific and Canadian Northern Railway Companies. In its course it has to cross some seven city streets. It was necessary, also, to carry the line for some 750 feet along the south side of Shaftsbury avenue and immediately next to the railway tracks, as the railway right of way at this point was not wide enough to accommodate the line.

It was essential that the line should be built. The Leaside Munitions Company had a large contract with the American Government for war munitions urgently required. In order to carry out this contract, which was for the production of 12-inch shells, large manufacturing premises were erected at Leaside. The contract necessitated the delivery of an increased load of 3,000 horse-power to the munitions plant. The question of the supply of this load was, in the first instance, taken up by the munitions company with the Hydro-Electric Power Commission. That commission, in view of the shortage of electricity it suffered from, very properly refused to take on this additional burden, and advised the munitions company to obtain power from the Toronto Electric Light Company.

Owing to the fact that the existing lines of the Toronto Electric Light Company could not accommodate this large load, and also that the electric company, irrespective of the limitations of its line construction, did not desire the business, the munitions company appealed to me.

On representing to the railway companies the urgency of the situation, the railway companies, although usually much opposed to the erection of high tension power lines on their rights of way, consented to the erection of the line along their rights of way, without the necessity of any order being issued.

The application, however, which the munitions company made to the corporation of the city of Toronto to cross the number of streets and run along Shaftsbury avenue to the extent mentioned, was refused owing to existing difficulties and disputes as to the franchise rights of the Toronto Company. In view of the fact that it was essential for the proper conduct of the war that the 12-inch shells should be manufactured, an order was made. Under its terms the munitions company is authorized to construct, maintain, and use this necessary power line over and upon the necessary streets. The city, under the order, is fully protected; no franchise rights are given. On the other hand, all rights of operating under the order cease on the completion or cancellation of the munitions contracts with the Government of the United States, and all poles and wires have to be removed within a period of six months thereafter. If the company defaults in removing the poles, the Commissioner of Works of the city is given the right to remove them, and if he is obliged to remove them as a result of this default, the material removed from the city streets becomes the property of the city.

The order protects the city from all claims of any kind, either directly or indirectly, resulting from the construction of the line, and prohibits the munitions company from using power transmitted over the line for any purpose other than the manufacture of munitions for the United States Government, and prohibits any sale of such power to any other person or company.

The Munitions Company's contract was cancelled on November 26, 1918.

XIII. LOAD REDUCTION.

With the signing of the Armistice the consumption soon fell off. British contracts terminated entirely on December 11. Contracts for the supply of munitions for the Government of the United States were not all cancelled at the same time. Some cancellations were in effect on November 26, while a small amount of work was going on on some other contracts as late as December 27.

All orders restricting the use of electricity for advertizing purposes or ornamental lighting and the illumination of shop windows were rescinded on November 25, and all orders and requests for priorities under which priority was extended to munition plants or plants engaged on Government contracts were set aside on December 23, 1918.

The following statement illustrates the manner in which the load came down, as returned by Mr. Pennock:—

Power Company or Commission.	Maximum Horse-Power Consumed for any 10-minute period of the following days:				
	Friday, Nov. 29.	Friday, Dec. 6.	Friday, Dec. 13.	Friday, Dec. 20.	Friday, Dec. 27.
Hydro-Electric (Niagara System).....	44,071	40,208	31,594	23,209	21,815
Toronto Power.....	34,419	33,940	30,344	26,653	27,640
Dominion Power and Transmission.....	11,593	9,461	8,686	8,361	8,271

These returns relate only to concerns of whose activities the Imperial Munitions Board had official cognizance. Both the Commission and the companies claimed that they were supplying power to other essential users. The Hydro Electric Power Commission claimed to be supplying very essential work to a much greater extent. I have no doubt this is true. The figures given above, to my knowledge, do not include the heavy load of the American Cyanamid Company.

In October the Toronto Power Company put in a detailed statement showing that the combined total of loads for munition plants, including under that caption the electricity sold to the Ontario Power Company, amounted to 130,000 horse-power.

and that the munition loads of the Toronto Electric Light Company totalled about 17,500 horse-power. The street railway loads of the company during September was put in as 35,200 horse-power, and the company also claimed to have taken on additional munition loads since May, 1918, which would total about 30,550 horse-power.

I do not pass upon the claims of either of the systems as to munition loads supplied over and above the amount I have direct knowledge of. The amount supplied by the Hydro, treating it in this way, should be plussed by the Cyanamid load, and the load of the Toronto Power Company, which was fixed in the priority list of July, 1918, at 34,682 horse-power, was certainly increased as shown by Mr. Pennock's returns.

Over and above this the Toronto Power, had the war continued, would have been obliged to supply 3,000 horse power to the Leaside Munitions plant.

Shortage of power for munition purposes was not permitted on the lines of the companies. Mr. Pennock's returns show, on the 10-minute peak which the Hydro were able to give on a requirement, under the July list of 74,664 horse-power, a shortage of 10,561 horse-power for August, 10,257 horse-power for September, and 21,488 horse-power for October. Mr. Pennock's figures are based upon information obtained from the plants. They may or may not be correct. My own personal view is that, in view of the output obtained, the plants were getting a somewhat better service than these figures would indicate.

Mr. Gaby's figures of October show that, under instructions given to municipalities and, as he understood it, supplied by municipalities, there was, on the whole load of 74,644 horse-power, a shortage of but 5,313 horse-power. The whole fact of the matter is that the situation was most complicated and the shortage most real; but as I see it the final results show that conditions were very materially improved and the complaints of munition manufacturers reduced to a minimum.

It must be borne in mind that over and above munition plants, cardinal essentials had to be supplied. It was impossible for the Commission to reduce municipal activities beyond a certain degree. The ordinary civic life, if checked in order to obtain power for munition plants, would have resulted in the plants themselves not being able to operate. Street cars had to be run, and it was entirely impossible for the Commission to police a great deal of its load.

XIV. CLAIMS FOR DAMAGES.

In some few instances claims have been advanced by the purchasers of power for damages for non-delivery resulting from the exigencies of the war situation. For example, the Company owning and operating the Stamp Vending Pillar Boxes in Toronto were directly affected by the orders which prevented the waste of electric light for advertising purposes. This Company, like all other advertising companies, consumed relatively but a small amount of electricity. As a matter of fact, I do not suppose that, for advertising purposes, altogether more than 1,500 horse-power was used.

The orders were made only after the matter was carefully studied and after conference between Sir Adam Beck and myself. We felt that it was absolutely necessary at a time when everybody was being asked to economize in the use of electric light, that the consumer who was asked to sacrifice in some degree his personal comfort should not be confronted with a wasteful electrical display every time he went out of doors.

The psychological effect was marked, and far greater benefits were obtained from the orders prohibiting advertising than could be represented by the amount of current saved.

A claim of a different character is that of Mr. James Battle, a distributor of electricity, who had a contract with the Ontario Power Company for 950 horse-power.

This power he was unable to obtain owing to the shortage which the Ontario Power Company was suffering and the fact that that company was called upon to increase its munition loads.

None of these claims have been recognized. The position in which the customers of the Ontario Power Company found themselves as a result of the power shortage differs only in degree from the position of manufacturers who were unable, owing to the scarcity of coal and coke, to carry on their proper activities, to the position of shippers who desired to transport non-essentials but who found their transportation necessities subordinated to the all-important matter of maintaining proper food supplies for the Canadian Army, for Great Britain, and for the Allies, and the transportation of essential munitions.

No compensation was ever made in any of these cases, nor indeed were any claims for compensation ever advanced. As a matter of fact, not only were individuals, but the activities of the whole country generally were subordinated to the prosecution of the essential business of winning the war. Inconvenience and, doubtless, actual loss resulted. The position of disappointed power users producing non-essentials, or for essentials of a character which were not so great as those who obtained power, does not in any way differ in principle from the situation brought about in the country generally as a result of war conditions.

The Order in Council itself clearly contemplates that no compensation ought to be granted, as the Order in Council directly relieves the vendors of electrical energy from all liability resulting from the non-supply of power when owing to the fact that the power has been applied to an essential purpose. The material clause of the Order reads:—

“To the extent that any company, commission, municipality, or other vendor of electrical energy, by reason of any action, direction, or request of such Controller, is rendered unable to supply electrical energy under any contract or obligation for the time being existing, such company, commission, municipality, or other vendor of electrical energy shall be, and the same is hereby, relieved from all liability in respect of such failure.”

As a result, any shortages occasioned by power being supplied to essential manufacturers on the request or order of the Controller of Power are excused. In case the shortage is not the result of essential requests or orders, and cannot be attributed at all to Dominion intervention, the issue then is one entirely apart from Dominion action, and is not a question which ought to be determined by Dominion authority, but is a question for the appropriate civil court.

XV. PRICE OF POWER DIVERTED TO THE USE OF THE ONTARIO POWER COMPANY AND THE HYDRO-ELECTRIC POWER COMMISSION.

The power which the Commission directly retained as the result of Dominion action was the 50,000 horse-power, that the Canadian Niagara Power Company were obliged to continue. No question of cost here arises. The Commission had arranged to get this power from the Canadian Niagara. The cost price, namely, \$12 per horse-power, was fixed between the parties. The only action taken under Dominion authority was to force the Company, as had already been set out, to continue the supply.

The other power supplied was that supplied by the Toronto Power Company to the Ontario Power Company. The first block of power was that ordered by the Subcommittee of the Privy Council. The second block was delivered to the Ontario Power Company to enable it to perform its contract with the American Cyanamid Company. The third block consisted of the additional power supplied the Ontario Power Company for the purpose of enabling the American Cyanamid to be operated to its full capacity.

The circumstances under which the two later directions were made have already been referred to. The parties were at arm's length on the question of price. A very unfortunate, although perhaps unavoidable, delay has arisen in fixing it.

I now deal in greater detail with the circumstances relating to the first block of power, the order for which was made necessary by the fact that the contract under which some 13,500 horse-power, had been delivered by the Toronto Power Company to the Ontario Power Company was expiring.

While the price paid by the Ontario Power Company under the expiring contract was but \$13 per horse-power per year, the Union Carbide Company, who appear to have been parties to the negotiations resulting in this contract, were paying, under an arrangement made between them and the Toronto Power Company, an additional \$3 per horse-power to the latter company, resulting in an actual price of \$16 per horse-power per year for the power supplied.

The contractual obligation of the Toronto Power Company to supply this power terminated on the 1st of November, 1917. The Ontario Power Company were very anxious to retain the supply, and the Union Carbide Company were extremely anxious that the power should not be taken from them. The Union Carbide Company expressed itself as willing to pay an advanced rate of \$20 a year.

As a result of representations made by the Ontario Power Company and the Union Carbide Company, the Sub-committee of the Cabinet appointed to deal with the power question directed that the supply of this electricity should be continued; and, on October 26, 1917, the following wire was sent to the Toronto Power Company:—

"At a meeting of the Sub-Committee of the Cabinet appointed to deal with the power question I was to-day directed to wire your company that the thirteen thousand five hundred horse power supplied by your company to the Ontario Power Company and used by the Union Carbide Company must be continued until further notice. Union Carbide Company willing to pay at rate of twenty dollars per horse power as against present rate of sixteen. Committee has not considered price but supply must be maintained."

And a telegram advising this action was also sent to the Hon. Sir Adam Beck.

The power had been actually delivered to the Union Carbide Company by the Niagara, Lockport & Ontario Power Company; but the Union Carbide Company, on November 1, advised that the Niagara, Lockport and Ontario Power Company had discontinued the supply.

Mr. Gaby, the Chief Engineer of the Hydro-Electric Power Commission, was thereupon wired as follows,—

"Order was made requiring Toronto Power to continue the thirteen thousand five hundred contract expiring November first so as to insure supply to Union Carbide. Union Carbide wire this amount now withdrawn from them. Has Toronto Power Company defaulted in continuing to supply this power? If not, what has become of power?"

In reply, Mr. Gaby wired on November 1, as follows,—

"Toronto Power have not defaulted since Commission acquired Ontario Power Company no change in quantity of power supplied to Niagara Lockport via the Lockport Company since September first."

The Niagara, Lockport and Ontario Power Company was also wired as follows:—

"Union Carbide Company complain your Company has shut off thirteen thousand five hundred horse-power which the Cabinet have ordered the Toronto Power Company to supply the Ontario Power Company, to enable you to continue supply to the Carbide Company. Has the Toronto Power Company, not supplied this power to you, or are you diverting it to purposes other than those for which the Toronto Power Company, was ordered to continue the delivery. Wire."

In reply the following wire was received:—

"Your telegram received. Evidently the facts have not been correctly stated to you. This Company has not been and is not now receiving the output of the unit of the Toronto Power Company which you refer to, nor is it receiving anything like the amount of power it is entitled to receive under its contract with the Ontario Power Company. In order to carry out its contract with the Union Carbide Company it has for two months last past been making good its supply to the Carbide Company with steam produced power at a cost more than double the price paid by the Carbide Company therefor.

"Notwithstanding that our contract with Union Carbide Company expired this morning, and no steps had been taken by them for renewal thereof, we continued to supply and made a proposition for continued supply at a price approximately the same as the power is costing the Company under present circumstances, namely, five mills per kilowatt hour. This offer was accepted. About noon to-day the General Manager of the Carbide Company notified this Company by 'phone that he had been instructed to cancel the arrangement. Under these circumstances there was nothing for us to do but discontinue. Letter with further particulars follows."

Other submissions were also made, but the position taken by the Niagara, Lockport & Ontario Company was, in short, that it did not distinguish between the 13,500 horse-power in question and other power received from the Ontario Power Company, and that it was receiving nothing like the amount of power it was entitled to receive under its contract with the Ontario Power Company; so that, as a result, in order to continue delivery to the Union Carbide, it (the Niagara, Lockport and Ontario Power Company) would be obliged to furnish the supply with steam power produced at a cost more than double the price paid by the Carbide Company, whose contract expired on November 1. The Union Carbide Company, who were customers of the Niagara, Lockport and Ontario Power Company in the United States, as a consequence, did not get the power.

Under these circumstances the Toronto Power Company submitted that the order should be set aside, and that they should be relieved of the liability to supply the power.

The Honourable Sir Adam Beck then wired me as follows:—

"November 3, 1917.

"Toronto Power Company, after giving Ontario Power Company's operators five minutes' notification, cut off thirteen thousand five hundred horse-power, which you and the Government informed Commission would be continued. Situation most serious and critical."

The situation was such that, without the continuance of this supply of 13,500 horse-power, the Ontario Power Company could not possibly properly carry on business, furnish the Commission with necessary power, and continue the exportation of power to the Niagara, Lockport and Ontario Power Company for distribution in the United States, which had not only been agreed to by the Ontario Power Company, but by the Ontario Hydro-Electric Commission itself.

While the original object in making the order, namely, the supplying of power to the Union Carbide Company, had failed, the shortage on the Hydro and Ontario combined systems was so great that it was necessary that the supply should be continued, and it was continued.

Shortly after the delivery of power commenced the question of price was raised by both interests. The first account of power rendered by the Toronto Power Company was received on December 10, 1917, and the following letter was written by me to Sir Adam Beck on December 11:—

"Toronto Power Company write me as follows:—

"We hereby make application to you for an order instructing us who to bill for 10,000 kilowatts of power delivered by us to the Ontario Power Company

for the Union Carbide Company, by order of the Committee of the Federal Cabinet, from midnight, October 31, to November 3, at 1.15 p.m., and then discontinued, and by your order restored at 12.45 noon, November 8, up to and including the balance of the month of November.

"To comply with these orders we have been compelled to operate our Toronto steam and battery plants, which you instructed us to do.

"We now beg to submit our account, which is made up in accordance with the enclosed sheets, the summary of which is:—

1,938,289 k.w. hours, steam and battery power.. . . .	\$61,511 60
4,066,711 k.w. hours, Niagara hydraulic power.. . . .	12,444 14
6,005,000 k.w. hours.	
Total.. . . .	\$73,955 74

"The detailed sheets attached hereto fully explain how these figures are arrived at, and the net result is that this particular month's price is at a rate of \$66.20 per horse-power year. The rental charge of the steam and battery plants amounts to about 8 per cent of the book values to cover interest and depreciation.

"As we have large interest payments to meet on January first, and as it is customary to pay for power delivered not later than the 20th of the month following the service, we respectfully urge that this matter be given your earliest convenient attention.

"Please let me have your comment and views on above at your early convenience, and much oblige. I enclose 5 sheets of accounts."

Sir Adam Beck's answer was received on December 28, the material portion of which reads as follows:—

"I am in receipt of your letter of the 11th instant, with accompanying statement from the Toronto Power Company, in which it makes claim for \$73,953.74, for the 10,000 K.W. of power delivered to the Ontario Power Company during the month of November, upon which you request my views.

"I cannot conceive that you will consider, for one moment, the claim made by the Company for the service rendered, in view of the fact that the Company had been under contract to supply this amount of power up to and until November 1, which contract was made when the Company was using the full capacity of its steam and battery plants as auxiliaries in the same manner as at the time that the power in question was being delivered.

"I am surprised that a bill should be rendered including any service from the steam plant, as this plant was in operation previous to the entering into the contract for the above stated amount of power by the Ontario Power Company, and the investment in this plant and the battery plant was made by the Toronto Power Company to protect its service; and not for the purpose of delivering power under the contract referred to; the operation of the auxiliaries was more likely to have resulted from the limited capacity of the transforming equipment used in delivering hydro-electric energy.

"In my opinion the operation of the auxiliaries in Toronto should not enter into the cost of delivering power from the Electrical Development Company's plant."

Other correspondence took place and further submissions were made, but the above extracts are probably sufficient to indicate the position taken by the different parties and the wide divergence between them.

On June 3, 1918, specific authority was given me to fix the price of the power, although delivered under the Order of the Sub-committee of the Privy Council, by the following Order in Council:—

P.C. 1356.

"The Committee of the Privy Council have had before them a report, dated 30th May, 1918, from the Acting Prime Minister, stating that in November, 1917, a contract for the supply of 13,333 horse-power by the Toronto Power Company to the Ontario Power Company lapsed. The parties to the contract had been unable to arrive at any agreement for its renewal. The amount of the power supply was urgently required by the Ontario Power Company in view of the heavy demands for power to which that company was subject, a large part of which represented power required for war purposes. The sub-committee of the Cabinet made an order that the Toronto Power Company should continue the supply of this power, but the question of the cost of the power was reserved to be settled by the sub-committee.

"Although the sub-committee has had several meetings, yet, owing to the difficulties with which the question is surrounded and the pressure of other work, the cost of this power has never yet been settled. The company is now pressing for immediate settlement, representing that it urgently requires the money.

"In view of the circumstances and the intricacies surrounding the question, and the further fact that ever since this power was ordered to be supplied by the Cabinet other power has been ordered to be supplied by the Power Controller, the Acting Prime Minister recommends that the whole question should be left in the hands of the Power Controller, and that he be required to fix the compensation to be paid the Toronto Power Company for power supplied under the order of the sub-committee.

"The Committee concur in the foregoing recommendation and submit the same for approval.

RODOLPHE BOUDREAU,

Clerk of the Privy Council.

The parties were advised of the situation thus arising, and opportunity was given them to complete their submissions on the whole issue. On July 3, a written argument was received from the Ontario Power Company which supported the following submissions:—

"For the above reasons the Ontario Power Company submits:—

"(a) That the price of the electric energy delivered under the Order of the Sub-Committee of Council should not in any case be fixed at a higher rate than \$13 per horse-power per annum.

"(b) That if upon inquiry it is found that the Toronto Power Company were dealing with the electric energy in excess of the limits of the license of the Electric Development Company, with the addition of any steam generated power, that the Ontario Power Company should not be required to pay more than a fair cost of developing the same, which has been ascertained by the Commission of Inquiry under the Water Powers Regulation Act at \$9 per horse-power, per annum."

The reply of the Toronto Power Company was much delayed owing to the absence and illness of counsel, and after repeated requests a reply was received only on October 28 in support of the following submissions:—

"For the foregoing reasons the Toronto Power Company submits that the accounts as rendered, with interest at 6 per cent, should be paid forthwith by the Ontario Power Company.

These accounts are divided between hydraulic power and steam power.
Hydraulic Power.

"Every possible kilowatt hour of the power ordered to be supplied has been generated hydraulically, and this power has been charged for at the rate of \$20 per horse-power year. The Company could have marketed this power without difficulty to private consumers at \$25 per horse-power year, or probably at

a considerably higher rate, but owing to the offer of the Union Carbide as contained in the telegram of October 26, have charged but \$20 rate. As stated above, the prevailing rates at Niagara Falls, N.Y., are from \$30 to \$47.

Steam Power.

"The Company has charged for its steam power a rate made up of two parts, first, for its readiness to serve, which includes interest, depreciation, taxes, and insurance on its steam plant kept available for the service. Second, for coal and labour.

"The readiness to serve charge amounts to about \$1.15 per horse-power per month, whereas this part of the rate charged by several American power companies is generally a great deal higher. In the case of St. Paul, Minn., it is as high as \$5.23 per horse-power per month. The New York Edison Company charge for readiness to serve \$3.35 per horse-power per month. The Brooklyn Edison Company charge under this head \$3.21 for first 67 horse-power and \$2.68 per horse-power per month for the balance. Louisville, Ky., charge \$4.02 for first 67 horse-power, plus \$2.01 per horse-power per month for balance. Denver, Colorado, charge \$2 per horse-power of connected load per month, which is equivalent to about \$3.33 per horse-power of demand. Newark, N.J., charge \$1.50 per horse-power per month for first 200 horse-power, plus \$1.35 for second 200 horse-power, plus \$1.20 per horse-power for balance. Milwaukee, Wis., charge \$4.02 for first 13 horse-power of demand per month; \$3.35 for next 67 horse-power of demand per month; \$2.68 for next 188 horse-power of demand per month; \$2.01 for balance. Pittsburgh, Penn., charge \$1.39 for first 134 horse-power per month, \$0.67 for balance. Yonkers, N.Y., \$3.35 per horse-power per month.

"We submit that this is the usual method of making rates for steam power, and that a charge of \$1.15 per horse-power for purposes of depreciation, interest, taxes, and insurance, plus other overhead, is so abnormally low that no one familiar with rates prevailing in the United States under Public Service Commission regulations and rules would question it.

The other part of our charge for steam power for coal and labour has been put in at cost without any percentage added for time-keeping, accounting, or general overhead, although it is usual to add a charge of from 10 per cent to 15 per cent for accounting, etc.

The whole account for steam and hydraulic power, as submitted to August 31, 1918, under this order, is considerably lower than the rate prevailing in Niagara Falls, N.Y., of \$47, and should, we submit, be favourably received and accepted and paid forthwith."

I was unable to adopt the submission of either party for the reasons hereafter set forth. There was no difficulty, of course, on the question of liability. That issue indeed was not raised. On the other hand, cheques, to the amount admitted, were forwarded from time to time by the Ontario Power Company, although the Toronto Power refused to accept any such cheques as they were marked as in full payment. The power was delivered by the Toronto Power Company to the Ontario Power Company. The initial liability was entirely that of the Ontario Power Company.

Although the Commission were directly interested in the delivery of this power, not only in that it enabled its subsidiary company to discharge local obligations, but also because it thereby got more power for its own purposes from its subsidiary, nevertheless I treated the Ontario Power Company throughout as primarily liable, and this position was indeed common to all parties. Undoubtedly the Toronto Power Company ought to be paid. The difficulty lay entirely in quantities and price.

The matter required formal hearings, at which both interests were represented, and the substantiation of the issues made by sworn testimony.

It well may be that one of the parties is entirely right in its conclusions, and that the investigation by the Exchequer Court will so determine. *Prima facie*, however, I regarded the claim of the Toronto Power Company as excessive.

In the case of a company's ordinary rates, beyond all question both interest on the investment as well as sinking fund or depreciation have to be considered. If the rate secured is not high enough not only to cover other expenses, but also to cover overhead charges, it is obviously insufficient and too low.

As against the claim for overhead charges in this case, it must be remembered that the plant was merely an auxiliary plant—it was a standby plant. It may be termed one for insurance purposes, or one maintained for the purpose of more economically regulating peak loads when necessary. With normal hydraulic operation it is but little used.

The Toronto Power Company charged the Ontario Power Company with the burden of maintaining the standby investment of the Toronto Power Company, simply because the Ontario Power Company was getting the benefit of power which, in view of other obligations of the Toronto Power Company, might entail in part the use of steam power. (This remark applies more particularly before the Cyanamid load was increased.) To the extent the plant was used and did not continue idle, merely for use in the case of emergency, and to the extent that the Company obtains a fair remuneration for this partial use, the result is just so much found business for the Company. *Prima facie*, no justification existed for charging against what at one period was a very small duty thrown on the plant, practically a full return on the whole investment and over and above the cost of coal and labour.

Again, my *prima facie* impression on the claim for payment for power or plant as necessarily held available under the Orders, was also against the Company. The amount to be delivered under the orders was fixed and definite. The real claim is not for power facilities held available, but for power actually delivered. In so far as the steam plant is concerned, payment for the power produced by the plant on a fair basis, I would have thought, answered all claims. If, however, the suggestion is that the steam and battery plants of the Company were commandeered as a whole, the claim is not well founded. The Company was simply subject to the burden of operating its steam plant to the extent necessary to add to its hydraulic power available to enable it to supply the Ontario Power Company with the use of power required by the three orders.

In so far as the last order was concerned, and which represents the additional power supplied the Cyanamid, this power would undoubtedly be supplied practically, if not altogether, by the steam plant. In so far as the second order of 11,000 H.P. is concerned, while undoubtedly the steam plant had to be used, it was the duty of the Toronto Power Company to use it only to the extent made necessary by the limitations of the hydraulic production.

It must also be borne in mind that under ordinary circumstances the steam plant could have been of very little practical value to the company for any sustained production, owing to the scarcity and shortage of coal and the impossibility of the company's obtaining coal in sufficient quantity to maintain any regular steam output. The arrangement that was made under which coal was supplied could not have been made for the general purposes of the company's business.

Evidence was also required as to the price of hydraulic power. It is true that the Toronto Power Company quoted rates showing that certain manufacturers paid, as far back as 1916, higher prices than those charged for the hydraulic power.

There is, of course, no doubt that during the period of control manufacturers were willing to pay a high price for electrical energy when that electrical energy was firm and could be relied upon. The resultant cost to the manufacturer, of power on the one hand, and of wages wasted and resultant inefficiency in output that an inter-

mittent supply of electricity entails, on the other, is not at all comparable. Manufacturers of war essentials, during this period, would undoubtedly sooner pay for power at perhaps \$35 or \$40 per H.P. year and get it regularly, than have a contract for power at 30 per cent of this rate and on which they could not rely.

My view, however, was that the companies producing power ought not to be allowed to take advantage of the war emergency. While the cost of steam power must advance in proportion to the increased cost of coal, the rent paid for the water privilege remain constant.

The company's position also did not take into consideration the fact that the water it was enabled to use under my order in excess of its contract carried no rent or payment to the Park Commissioners. I provided no payment for this water, and did not contemplate doing so. The water was running to waste—was doing no good to anyone—its use did not entail any greater use of the park property, and while hurting no one, was of national benefit. I saw no reason why the obligations of the Ontario Power Company should be increased by adding to the cost of the hydraulic power. On the other hand, I was of the opinion that the saving thus secured to the Toronto Power Company by the use of this free water should be taken into consideration in fixing the price the provincial company should pay for the power it got.

After all, what the Ontario Power Company is interested in was the resultant total of the whole liability for all the power, whether steam or hydraulic, and the claim in the end had to be considered as a whole.

On the other hand, and again speaking with the same reserve, my prima facie impression was that the amount the Ontario Power Company were willing to pay was insufficient. Undoubtedly in the past, and when the lapsed contract was in effect, the Toronto Power Company used its steam plant. A direct reason, however, for that company's refusal to continue its contract with the Ontario Power Company lay in the fact that as a result of that contract it had been necessary to operate the steam plant.

It is again perfectly obvious, having regard to the cost of coal and labour, that the cost of steam production was increased, the uncertainty of coal deliveries, if indeed at all obtainable, was very great, and the operation of the steam plant at Toronto had become onerous. The Toronto Power Company naturally desired to save money and to operate its steam plant as little as possible in competition with hydraulic power.

The effect of the order of the Sub-Committee was to add to the load of the Toronto Power Company some 13,500 H.P., which, but for that order, the company would not have been obliged to supply. The question was not what was done in the past, but was what the conditions then were. In view of the fact that the hydraulic machines of the company were out of order and had to be repaired, unquestionably, having regard to conditions as they then were, the order entailed the production of some power by the use of steam. As a matter of ordinary justice, the actual conditions of production have to be considered.

Conditions have certainly changed; the purchasing power of the dollar has greatly decreased, while, on the other hand, the dollar's interest rate has greatly increased. The company was here forced to sell power to a competitor, and the element of compulsory taking is present. My view was that a fair and just consideration should be given these considerations. While the high prices in the United States prima facie ought not to be adopted, in like manner the prices paid on old contracts were not a controlling factor.

My view was that the Toronto Power Company ought not to get any excessive profits as a result of a condition of scarcity brought about by war conditions, but should be awarded such sum as would give them a fair and reasonable profit on their activities. Conversely, the Ontario Power Company ought not, as a result of war conditions and a governmental intervention, which otherwise would not have been possible, to get power from a competitor at less than a fair and reasonable price.

The above considerations perhaps afford sufficient reasons why no action was taken on the written submissions but hearings held. A further delay again occurs.

Appointments, owing to the engagements of the parties, were difficult to arrange and when arranged, on the reasonable request of parties and for proper cause, had to be adjourned. The hearings, however, commenced on December 17, and the taking of evidence was concluded on December 30.

Owing to the challenge of quantities and records and the extremely mixed condition in which the evidence of the parties left the issues, it became necessary that the quantities should be taken under the different bases open to adoption and records verified by an independent expert engineer; and I consequently employed Mr. F. R. Ewart, of the firm of Ewart & Jacob, electrical engineers, to make the necessary investigation and report on the exact facts.

Under the provisions of Order in Council, P.C. No. 519, dated March 7, 1919, the determination of all questions of the price of power furnished under any of the orders was referred to the Exchequer Court. This Order in Council, however, provides that the Exchequer Court shall have "power to receive and act upon all and any evidence already taken and data compiled or obtained by the said Controller, together with such data and information as may be furnished by the Engineers or Experts heretofore employed by the said Controller."

The report of Mr. Ewart has since been received and has, with other data been forwarded to the Exchequer Court. Being thus relieved of the duty to fix the cost or price of the power, I do not report further upon this question.

XVI. RECOMMENDATIONS.

No direct obligation is cast upon me, under the Order in Council, to make recommendations, nor do I deem it my duty to do so. There are two questions, however, which arise demanding serious consideration: First, the policy that ought to be adopted as to the export of electricity, a question only dealt with in my report of October, 1917, during the war period. Secondly, the use of water for power purposes and the treaty limitations which confine Canadian use to 36,000 cubic feet seconds.

While, with the exception of the Ontario Power Company, which is a Dominion incorporation, water is diverted and used by provincial concerns, the proper observance of the limitations worked by the existing treaties and the consideration of a utilization of a greater quantity of the river waters are international questions, and therefore Dominion in their scope.

Notwithstanding the great increase of available electricity which the great undertaking of the Hydro-Electric Power Commission at Chippawa will produce, my personal view is that the question of an increased utilization of the river waters ought to be considered. Upon the completion of the Chippawa scheme the Ontario Power Company's plant will largely become a stand-by plant. The ever increasing demand for electricity in Ontario might well require the continued operation of both plants.

The situation is common on both sides of the river. Shortages have existed in both territories. Large works are proceeding on both sides which will have the effect of utilizing with greater efficiency the water now taken from the river. The situation is perhaps accentuated on the American side, as a great amount of electricity is now being produced by steam in the very efficient plant of the Buffalo General Electric. The ever increasing cost of coal and its transportation, however, will inevitably tell in favour of modern hydraulic plants.

As I see it, the question of a larger use of the waters of the river is one in which both countries are equally concerned, and the use of an increased quantity of the water for the purposes of electrical development is in the interest of both. I understand, however, that both questions are already engaging the attention of the Power Board, which is well qualified to deal with them. For this reason any detailed recommendations from me are entirely unnecessary.

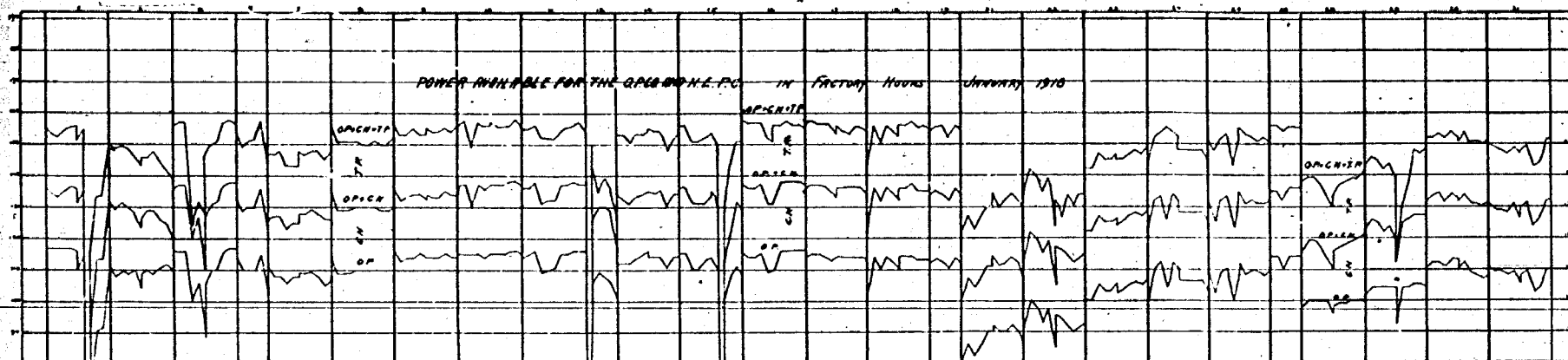
OTTAWA, May, 1919.

Respectfully submitted,

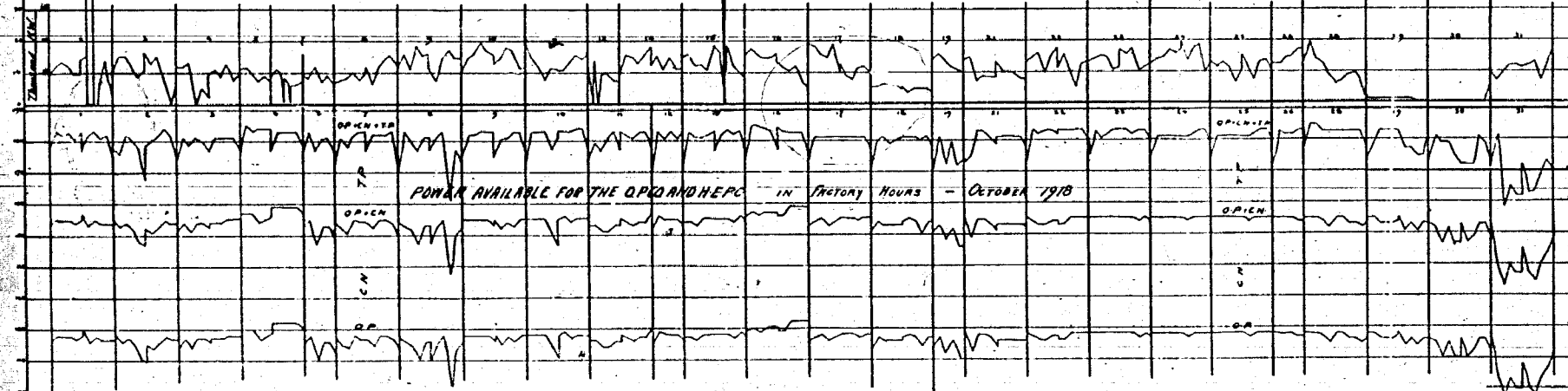
H. L. DRAYTON.

JANUARY 1918

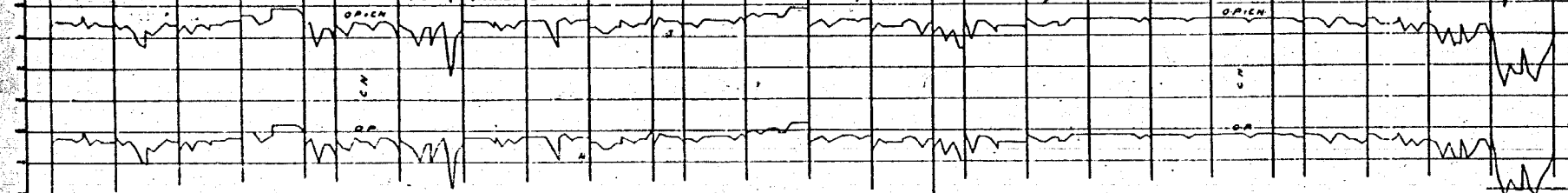
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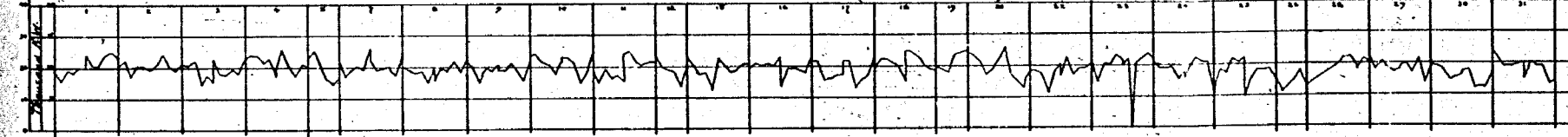
POWER AVAILABLE FOR THE QPES AND HEPG IN FACTORY HOURS - OCTOBER 1918



CURVES SHOWING COMPARISON OF
GENERATION & MUNITION SUPPLY
Minimum Month - January 1918 - Maximum Month - October 1918
Based on General Factory Working Hours

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OCTOBER 1918

