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Dominion Statistician, R.H. Coots, B.A., F.S.S., (Hon.), F.R.S.C. Ohief, Trangortation and Fublic Utilities Brench, G.S. Trong, B.Sc.

## MONTHIT OUTPUT OF CINTRAL RIECTRIC STATIONS <br> 1924-1934

The outnut of central electric atations in Caneda havine an amual production of million or more k110watt hours reached a new high record in samipry $1934 \pi 1$ th. E production of $1,723,607,000 \mathrm{k} 11$ owatt hours and a new hich dally averace in February 1034 of $57,595,000 \mathrm{kllowatt}$ hours. Because the activity of th.e central electric station industry is so closely linked with the activities of other manufacturing industriee, mines, and the mhole industrial life of the country. Which as a whole is conslderably belom the levels reached in 1023,1929 and 1030 , some analyois of the output is necessary to understand the remarkable increases made during the pest aine monthe.

The output of central electric stations is, of course, consumed as procuced. In Canede the consumption may be divided into five clesses, (1) lighting, incluaing all domestic services and commercial lighting, (2) power, (2) exports, (4) Dlectric boller consumption, and (5) loses. The losses are more or less proportional to the output. The domestic service or consumption for house 11 ghtin, etc. and comvercisl lighting fluctuate $w$ th the varying hours of daylight and increase new customers are added and with expansions of use by old customers, such as installations of electric stoves, electric refrigerators and furnace blowers for coal and oil. Comercial lighting also ia affected by industrial activity. Yower is the largest class and iluctuates directly wit: the activity in manuracturine, minine, etc. Some industriea, notably the pulp and poper industry, use mere power than others; consequently a large increase In electric power consumption doe not necessarily mean a generel increase in manufacturinf. but might be caused by improvements in a fow industries. Fxports to the United States have iltile relationship to conditions in Canada except those of the central electric stations themselves. Instead of using coal to produce stem trere has been a growing practice, orincipally in pulo and paper milis, of usine electricity In electric boilers. This electricity is produced surplus to demand for general commercial purposes and for export. The exports to the United Statee also include some surpius, or off peak power, delivered as avallable.

The attached tables inolude monthly data from January 1924 to date on (1) total output, (2) exports, (3) electric boiler conmumtion, and (4) output with exports and boller consumption deducted, which for the sake of brevity and convenience will be referred to as "firm power." Index numbers have been computed for the total output and for the firm power wich were adjusted for seasonal variations, the unequal mamber of dayk in the months ansiangeterment as indicated by the $1924-1933$ data, the base being the 1026 average as equal to 100 . The total output and the firm power have been plotted and the difference between the two curves, which is the exports and boller consumption, has been divided to show the magnitude of each part. The sero point of the exports for each month is the top of the firm power curve and the zero polut of the botler consumption tis the top of the export curve.

One of the factors in the repld rige in the consumption of firm power has been the improvement in the pulp and paper industry which uses enornous quantities of hydro-electric power. In 1932 these mills purchased 5,695,478,000 kllowatt hours from central electric stations including 2,695,076,000 k1 lowatt houre for lectric bollers and $3,000,402,000 \mathrm{hll}$ watt hours of f1rm power which was 23 per cent of the total firm power produced, as defined above. In March 1933 the output of newsprint paper was 137.078 tons and rose to 194,262 tons in Ausust. The production for the last eight months of 1933 was 17 per cent larger than for the same period in 1932. The nickel-copper mining, smelting and refining industry, another large customer for electric power, purchased. $160,000,000$ kilowatt hours in 1932 and the monthly production reports for 1933 show an increase in nickel of 175 per cent over 2932, rising from 1,781,000 pounds in January 1933 to $10,827,000$ pound in November. Other metal refineries using large blocks of power also showed substantial increased production in 1933. Automoiile plants producela 135 per cent more automoblles durine January and February 1934 than in 1933 , steel ingot production increased by 128 per cont. Dteel castings by 223 per cent, pig iron by 21 per cent and rigid insulating boare by 91 per cent. Such increases in power consurpotion by industries, with a domestic service load which has been growing steadily even during the years of industrial depression, have all combined to ratse the firm power consumption to almost the $1329-1930$ levels. The index for February was 150.76 which was the highest reached In the last four years and was only 5 potnts below the peak of 255.79 reached in May 1930.

The increasiag opread between the total output and the firm power is, of course, due to increased exports and increased electric boller consumption. The exports to the United States reached a peak at $162,443,000$ klowatt hours in January 1931, made up of $55,035,000 \mathrm{kil}$ watt hours of surplus power and 107,408,000 kilowatt hours delivered on firm contracts. With the slump in industries in the United States In 1931 the market for this surplus declined until in January 1932 no surplus power eas exported. This power, which anounted to $402,318,000 \mathrm{kllowatt}$ hours in 1930 , was exported across the Niagara frontier only
as it was evallable and required. During 1032 practically none was oxported, but in June 1933 exporte were resumed and they grem to $30,916,000 \mathrm{kllowst}$ hours in February 1934 . Frports on demand, or firm contracts, also increased from $35,023,000 \mathrm{kllowatt}$ hours in November 1932 and $35,272,000 \mathrm{kllowatt}$ houre
 over $100,000,000$ kilowatt hours each subsequent month.

The pulp and paper mills have been using increasing quantities of elsctricity in electric bollers for cooking pulp. Thece electric bollers, Nith a few in other industries, consumed only $5,936,000 \mathrm{kllowatt}$ hours in Jamary 1924 , but the consumption increased to $43,148,000 \mathrm{kllowatt}$ hours by December and averaged $21,707,000 \mathrm{kilowatt}$ hours per month for tho year. It grew teadily and during 1929 the total consumption mounted to $2,162,460,000 \mathrm{kllowat}$ hours. It declined slightly during 1930 and 1931. but in 1932 rose to $2,836,339,000$ kilowatt hours and 101933 to $3,608,400,000$ kilowatt hours, the December 1933 consumtion reaching the high monthly record of 401,752,000 kilowatt hourt. The majority of these boilers use electric power more or lese continwously throughout the year, but on occasions of water ehortage coal is substituted. Such a shift was made last Autumn when the levele of the Ottawa river were extremely low. A mill usine surplis power from the Gatineal river trancierred to coal fired bollers for about two montine.

The output of these large stations is between 98 and 99 per cont of the total coatral electric station output in Canada, as show in the annual reports. The exoses of the total monthly outputs for 1931 over the output in the annual renort is due to a deduction in the annusl reoort of power produced while teating equiment in a large tation.

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|  | 1.24 | 1.25 | 1928 | 1989 | 181 | 1 ミ1 | 1930 | 1.11 | 1.1: | 1931 | $1 * 34$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| deavery | 605,800 | 583,030 | 951.451 | 1,131,987 | 1,318,54 | 1,507,873 | 1,554,812 | 1,484, 711 | 1,419,018 | 1,396, 612 | 1, Pe8, $00 \%$ |
| Februery | 685,687 | T17,455 | 870,529 | 1,086,571 | 1,204,050 | 1,346,481 | 1,308,004 | 1,328,908 | 1,885,481 | 2,209,500 | 2,628,680 |
| Herah | 663,933 | 804,512 | 958,277 | 1,150,581 | 1,541,551 | 1,470,580 | 1,515,465 | 1,427,554 | 2,888, 497 | 1,371,040 |  |
| April | 636,088 | 795,389 | 902,047 | 1,110,336 | 1,271,939 | 1,409,088 | 1,502,338 | 1,412,000 | 1,385,464 | 1,246,805 |  |
| Mey | 672,681 | 826,084 | 960,938 | 1,116,232 | 1,280,812 | 1,456,687 | 1,544,687 | 1,363,784 | 1,871,028 | 1,349,948 |  |
| Sune | 636,700 | 788,876 | 971,776 | 1,110,098 | 1,242,324 | 1,378,124 | 1,434,611 | 1,284,888 | 1,198,288 | 2,370,901 |  |
| July | 660,351 | 795,970 | 966,469 | 1,107,409 | 1,248,365 | 1.410,709 | 1,425,680 | 1,251,323 | 1,255,581 | 1,442,657 |  |
| August | 660,146 | 784,620 | 982,466 | 1,232,834 | 1,313,556 | 1,444,936 | 1,411,861 | 1,256,148 | 2,230,220 | 1,508,216 |  |
| Septembar | 673,747 | 822,814 | 1,008,468 | 1,200,805 | 1,280,432 | 1,477,117 | 1,442,982 | 1,288,413 | 1,879,130 | 1,489,322 |  |
| Dotober | 730,989 | 918,883 | 1,100,973 | 1,326,363 | 1,460,449 | 1,594,283 | 1,574,580 | 1,428,342 | 1,390,244 | 1,617,608 |  |
| Novembar | 729,568 | 900, 181 | 1,112,542 | 1,317,637 | 1,441,520 | 1,501,726 | 1,515,403 | 1,415,020 | 1,448,287 | 1,702,363 |  |
| December | 760,034 | 960, 398 | 1,146,284 | 1,370,349 | 1,440,989 | 1,535,333 | 1,542,308 | 1,432,182 | 1,433,192 | 1,707,886 |  |
| Total | 8,135,804 | 9,892,212 | 11,926,221 | 14,231,201 | 15,931,450 | 17,632,879 | 17,862,733 | 16,383,400 | 15,862,987 | 17,553,001 |  |

TEble 2. - MONTHY OUTPUT LESS EXPORTS AND ROILISR CONSUNPTION

| Jonuery | 546,265 | 660,685 | 757,287 | 874,477 | 1,044,025 | 1,212,324 | 1,273,491 | 1,179,856 | 1,130,430 | 1,062,447 | 2,224,305 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| rebruary | 520, 854 | 599, 114 | 705,123 | 811,256 | 1,004,91? | 1,074,265 | 1,122,302 | 1,052,887 | 1,056,607 | 960,342 | 1,125,920 |
| Marah | 540,849 | 680,094 | 779,401 | 878,903 | 1,064,178 | 1,149,703 | 1,212,901 | 1,143,625 | 1,094,779 | 1,024,147 |  |
| April | 534,533 | 640,325 | 730,886 | 827,904 | 1,000,987 | 1,111,558 | 1,181,750 | 1,122,294 | 1,016,348 | 970,017 |  |
| Mey | 548,106 | 662,222 | 749,103 | 851,113 | 1,013,786 | 1,157,850 | 1,213,472 | 1,125,041 | 999,749 | 1,023,979 |  |
| June | 517,142 | 646,646 | 750,449 | 838,425 | 987,296 | 1,087,352 | 1,126,485 | 1,072,893 | 932,648 | 1,019,082 |  |
| July | 531,155 | 647,736 | 753,053 | 853,624 | 991,502 | 1,113,186 | 1,129,110 | 1,039,037 | 902,740 | 1,056,634 |  |
| August | 527,167 | 640,187 | 762,645 | 952,119 | 1,025,425 | 1,149,312 | 2,109,551 | 1,036,736 | 950,994 | 1,211,397 |  |
| Soptambar | 534,352 | 686,872 | 784, B19 $^{\text {8 }}$ | 914,033 | 1,014,029 | 1,151,964 | 1,134,245 | 1,068,277 | 990,920 | 2,117,383 |  |
| October | 584,534 | 745,615 | 869,370 | 992,051 | 1,135,038 | 1,268,403 | 1,228,479 | 1,148,387 | 1,060,554 | 1,197,720 |  |
| Novanber | 575,458 | 738,925 | 890,932 | 1,018,727 | 2,116,461 | 1,282,978 | 1,190,704 | 1,132,312 | 1,123,982 | 1,204,309 |  |
| Decrabar | 612,563 | 803,687 | 919,405 | 1,072,193 | 1,187,524 | 1,267,315 | 1,215,794 | 1,154,705 | 1,099,017 | 1,206,780 |  |
| Total | 8,572,798 | 8,112,108 | 9,440,473 | 10,884,885 | 12,535,147 | 14,026,210 | 14,138,284 | 23,276,050 | 12,358,768 | 12,955,237 |  |

Table 3.- EXPORTE (THOUSANDS OF KILOWATT HOURS)

| January | 113,399 | 91,300 | 211,704 | 130,894 | 124,023 | 114,267 | 112,625 | 162,443 | 61,767 | 48,028 | 100,485 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Yebruery | 101,936 | 79,260 | 97,005 | 121,829 | 122,911 | 110,645 | 117,178 | 145,498 | 52,422 | 46,440 | 108,150 |
| Harch | 118,429 | 100,180 | 119,911 | 133,702 | 135,961 | 126,447 | 126,895 | 127,985 | 55,414 | 45,343 |  |
| April | 108,822 | 105,109 | 115,696 | 129,709 | 122,153 | 110,692 | 117,504 | 97,677 | 54,982 | 35,272 |  |
| May | 113,960 | 104,872 | 119,398 | 124,749 | 134,830 | 122,302 | 129,138 | B6,884 | 51,354 | 42,874 |  |
| June | 100,498 | 106,046 | 127.351 | 139,439 | 127,409 | 119,394 | 136,016 | 88,602 | 64,863 | 86,673 |  |
| July | 104,953 | 109,630 | 132,225 | 138,085 | 130,123 | 128,601 | 131,817 | 95,085 | 59,015 | 119,192 |  |
| Auguet | 105,653 | 109,270 | 142,857 | 157,199 | 145,678 | 133,159 | 142,571 | 99,781 | 69,192 | 109,592 |  |
| Soptenbor | 106,508 | 114,548 | 146,679 | 154,047 | 129,501 | 136,301 | 253,65? | 93,288 | 71,500 | 122,907 |  |
| October | 110,466 | 124,377 | 144,161 | 142,991 | 154,627 | 126,360 | 161,323 | 95,423 | 50,738 | 127, 243 |  |
| Sovoubor | 113,270 | 112,987 | 128,041 | 129,414 | 137,811 | 124,036 | 141,586 | 73,357 | 35,023 | 106,457 |  |
| Decarber | 104,323 | 115,545 | 127,568 | 130,558 | 122,734 | 102,004 | 149,295 | 69,302 | 41,610 | 99,353 |  |
| Totel | 1,302,317 | 1,273,104 | 1,503,596 | 1,632,614 | 1,587,761 | 1,444,208 | 1,619,603 | 1,235,325 | 867,880 | 989,364 |  |

Thble 4.- BOILIER CONSUUPTIO (THOUSANDS OF KILOWATT HOURS)

| sonuery | 5,936 | 31,045 | 82,460 | 128,616 | 158,495 | 181,282 | 168,695 | 146,422 | 221,782 | 286, 196 | 398,817 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| February | 3,038 | 39,081 | 68,401 | 133,486 | 154,203 | 161,579 | 158,619 | 140,603 | 216,103 | 292,797 | 384,610 |
| Urch | 4,655 | 44,258 | 63,965 | 137,976 | 142,412 | 194,371 | 175,689 | 145,948 | 238,503 | 302,571 |  |
| April | 12,712 | 49,955 | 53,464 | 152,723 | 148,798 | 186,831 | 203,084 | 191,119 | 258,160 | 291,516 |  |
| Mey | 10,555 | 48,990 | 92,438 | 140,370 | 132,215 | 186,536 | 202,017 | 153,920 | 219,912 | 283,089 |  |
| Junc | 19,080 | 34,184 | 93,975 | 132,235 | 127,619 | 171,379 | 172,109 | 128,333 | 200,720 | 265,146 |  |
| July | 24,243 | 38,605 | 81,191 | 115,700 | 126,741 | 168,921 | 164,763 | 127,200 | 193,82? | 266,831 |  |
| August | 27,326 | 35,263 | 76,964 | 123,518 | 1+2,453 | 162,464 | 159,739 | 119,6.33 | 210,034 | 287,227 |  |
| Soptembar | 32,888 | 41,394 | 76,972 | 132,726 | 136,901 | 188,852 | 155,060 | 126,949 | 215,719 | 249,033 |  |
| October | 35,989 | 48,891 | 87,443 | 181,319 | 170,794 | 199,520 | 184,758 | 184,531 | 278,852 | 291,645 |  |
| Novomber | 40,941 | 48,269 | 203,569 | 169,495 | 187,249 | 194,712 | 183,113 | 209,351 | 289,223 | 391,597 |  |
| Decembar | 43,148 | 47,165 | 99,310 | 167,598 | 180,672 | 166,013 | 177,220 | 208,118 | 292,584 | 401,752 |  |
| Totel | 260,489 | 507,000 | 988,152 | 1,713,762 | 1,808,542 | 2,162,460 | 2,104,846 | 2,872,025 | 2,836,339 | 3,608,400 |  |

INDEX NMAEPS (AVERACE, $1986=100$ )
(Majuated for Sessonal Variations 1924-1936.)

| Jenuary | 63.37 | 74.53 | 90.56 | 107.74 | 126.26 | 143.52 | 147.98 | 241.69 | 134.57 | 132.93 | 164.05 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Pobruary | 64.84 | 74.35 | 90.22 | 110.53 | 132.86 | 139.54 | 144.89 | 238.76 | 137.38 | 234.68 | 167.13 |
| March | 64.61 | 78.29 | 92.67 | 111.97 | 130.65 | 143.10 | 247.47 | 137.95 | 135.14 | 133.42 |  |
| April | 66.77 | 80.94 | 91.80 | 112.99 | 129.44 | 143.40 | 158.89 | 143.60 | 135.30 | 231.97 |  |
| y | 67.06 | 81.37 | 95.81 | 111.29 | 127.70 | 145.24 | 154.01 | 186.19 | 128.73 | 144.59 |  |
| June | 66.88 | 82.65 | 202.07 | 116.60 | 130.49 | 144.75 | $\underline{150.69}$ | $\underline{235.68}$ | 125.88 | 143.99 |  |
| July | 69.66 | 83.96 | 201.95 | 136.81 | 131.68 | 148.80 | 250.38 | 131.98 | 121.80 | 158.27 |  |
| August | 68.57 | 81.50 | 102.05 | 128.08 | 136.44 | 150.09 | 146.65 | 130.48 | 187.79 | 256.68 |  |
| sepe omber | 68,78 | 83.98 | 102.94 | 122,58 | 130.72 | 250.78 | 147.30 | 131.52 | 130.57 | 152.03 |  |
| Ootober | 68.47 | 88.06 | 103.12 | 123.28 | 136.79 | 149.32 | 147.48 | 133.78 | 130.20 | 151.52 |  |
| November | 68.70 | 84.77 | 104.77 | 124.08 | 135.75 | 150.83 | 142.70 | 233.25 | 136.38 | 160.31 |  |
| December | 70.82 | 90.03 | 206.78 | 127.66 | 234.24 | 143.08 | 143.68 | 133.42 | 133.52 | 159.11 |  |


| Jenuary | 66.75 | 80.74 | 92.54 | 106.88 | 127.58 | 148.15 | 155.62 | 144.18 | 138.14 | 129.83 | 149.61 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| February | 69.72 | 80.22 | 94.48 | 108.63 | 134.56 | 143.65 | 150.28 | 140.98 | 141.48 | 128.59 | 250.78 |
| March | 67.63 | 62.54 | 97.21 | 109.91 | 133.07 | 143.77 | 151.67 | 143.01 | 136.90 | 128.07 |  |
| Aprid | 70.10 | 83.97 | 95,85 | 108.57 | 131.27 | 145.77 | 154.97 | 147.18 | 233.28 | 127.21 |  |
| Hey | 70.37 | 85.02 | 96.17 | 109.27 | 130.15 | 148.65 | 155.79 | 144.46 | 128.35 | 131.46 |  |
| Sume | 69.29 | 86.64 | 100. 55 | 112.34 | 132.28 | 145.69 | 150.99 | 143.75 | 124.96 | 136.54 |  |
| July | 71.25 | 86.89 | 101.01 | 114.51 | 133.00 | 149.32 | 151.46 | 139.38 | 121.09 | 141.74 |  |
| Auguat | 69.45 | 84.34 | 200.48 | 125.44 | 135.10 | 151.42 | 146.18 | 138.59 | 130.55 | 147.22 |  |
| September | 69.46 | 86.68 | 102.01 | 118.81 | 131.81 | 149.74 | 147.43 | 138.86 | 128.80 | 145.24 |  |
| Oetober | 69.83 | 89.07 | 103.85 | 118.52 | 135.59 | 151.58 | 146.75 | 237.18 | 186.69 | 243.29 |  |
| Movonbor | 69.21 | 88.87 | 105.95 | 122.52 | 134.28 | 154.30 | 143.20 | 236.28 | 235.18 | 144.94 |  |
| December | 72.45 | 95.08 | 106.74 | 128.88 | 234.54 | 149.89 | 143.00 | 136.58 | 189,99 | 142.73 |  |

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