BEFORE THE
STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

In the Matter of

Niagara Mohawk Power Corporation d/b/a National Grid

Cases 24-E-0322 & 24-G-0323

September 26, 2024

Prepared REDACTED Exhibits of:
Staff Forecasting Panel (SFP)

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List of Exhibits

Relied Upon Responses to Interrogatories (IR)
Index of Exhibit___(SFP-1)

Date of Request: June 17, 2024 | Request No. DPS-333
Due Date: June 27, 2024 | NG Request No. NG-353

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: NYPSC - Caitlyn Edmundson

TO: National Grid

SUBJECT: Electric Forecasting – Weather, Modeling and Variables Used

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. Identify the software used in the development of the Company's forecasts, including the name, version, and any specific modules or add-ons utilized.

2. NMPC Electric Load Forecasting Panel Testimony page 17 of 51, line 10 to 12 states, "Specifically, the monthly normal CDDs and normal HDDs are calculated from taking the average of the degree days by month from the past 30 years ranging from 1993 to 2022." Regarding "DPS-091 Attachment 1.xlsx, Sheet Attachment_1_hist_weather":

    a. Confirm if the monthly date range for calculating the Normal HDD and CDD is January 1993 to December 2023? If yes, explain why the Company did not calculate monthly Normal HDD and CDD with actual ending date August 2023 instead of December 2022 to align with actual sales delivery (GWh) in the delivery volume models.

    b. Provide the percentage share of each weather station - in calculating the HDD and CDD - listed on page 16 of 51, line 6 & 7 of the Company's Electric Forecasting Panel Testimony. Confirm the year of energy delivery these shares were based on.

    c. In the response to DPS-092, the Company defines normal weather as the average weather on the past 20-years' peak days. Explain why the company used 30-years in calculating normal weather for energy delivery volumes versus 20-years in calculating weather normalization of historical peak loads?

    d. Provide HDDs and CDDs based on a 10-year weather normal.

3. Provide the Python scripts used to develop the Customer and Use-Per-Customer (UPC)

Volume models in Appendix B1, Exhibit__(ELF-24) of the Electric Forecasting Panel's (EFP) Testimony.

4. Confirm whether the historical volume and UPC data provided by the Company in response to DPS-091 is pre-adjusted for DER/DSM programs?

5. Confirm the Date Range of each model in Q3. For example, Residential Customer Counts historical data from Month-Year to Month-Year.

6. Clarify the difference between the economic variable and the index variable? For example, "GDP" and "idx_GDP"

   a. Provide the rationale for using the index variables in the models outlined in the Appendix B1 of the EFP Testimony

   b. Provide the rational for using Covid_Omicron variable in Total Industrial UPC Model but not in Commercial or Residential Models?

   c. Provide further clarification of the "Trend, s(0)" variable in the Industrial Customer Model

   d. Confirm whether the Company developed binary and trend variables such as dates, covid_omicron, trend, s(0), etc. within Python or imported them via Excel file? Provide the Excel file with all the variables if Excel was used to develop these binary variables.

<u>Response</u>:

1. The software that was used in building the forecasting models was Python 3.9.16 (64 bit) with Jupyter Notebook client version 7.4.9. The Python packages used are listed in the scripts submitted in response to part 3 of this request.

2. a. In the direct testimony of the Electric Load Forecasting Panel, the Company used the January 1993 to December 2022 as the monthly date range for calculating the Normal HDD and CDD. As part of its Corrections and Updates filing, the Company will update the monthly date range for calculating the Normal HDD and CDD to January 1994 to December 2023. The Company used full years of most recent weather history to calculate the Normal HDD and CDD to capture the whole weather condition over a year. If the actual ending in August 2023 were used, the September to December data from 1993 would need to be used to get to a full history of 30 years, which would adversely impact the continuity of the data.

   b. The Company identified the need to correct the weather station list to replace Watertown with Rochester. Thus, the six weather stations are: Albany, Buffalo, Syracuse, Rochester, Fort Drum, and Massena. The same six weather stations were used in the direct filing and will be used in the Company's Corrections and Updates filing. Please see Attachment 1 for the percentage share of each weather station. The weights are from analyzing the 2013 energy share.

c. The Company's weather-adjustment process for historical peak load used 20 years of weather on the peak days. The Company's peak load history only went back to 2003; thus, only these many peak days can be identified to retrieve the peak day weather. It is worth noting that when conducting the peak load forecasts, the Company used 28 years of hourly weather history, as discussed in Attachment_1 to DPS-093, page 9. The Company used 28 years instead of 30 years because the historical weather at the hourly resolution was only available starting from 1995 when the Company developed the peak forecasts. The Company plans to use 30 years of weather history for peak load forecasting when more recent years' data becomes available.

d. Please see Attachment 2 for the HDDs and CDDs based on a 10-year (January 2014 to December 2023) weather normal.

3. Per discussions with Department of Public Service Staff, Attachment 3 provides the input data file and scripts used for developing the updated load forecast that will be filed in Corrections and Updates. The same scripts but shorter history were used for the load forecast in the direct filing. Attachment 3 contains confidential, protected information. The Company is providing Attachment 3 in accordance with the Protective Order issued in these proceedings.

4. The data provided in the Company's response to DPS-091 is pre-adjusted for DER/DSM programs. The Company is providing updated input data that was used for developing the Corrections and Updates forecasts in Attachment 3.

5.

Model	**Original Filing**	**C&U Filing**
Residential customer count	01-2005 to 08-2023	01-2005 to 05-2024
Commercial customer count	01-2007 to 08-2023	01-2007 to 05-2024
Industrial customer count	01-2006 to 08-2023	01-2006 to 05-2024
Residential usage per customer	01-2004 to 08-2023	01-2004 to 05-2024
Commercial usage per customer	01-2005 to 08-2023	01-2005 to 05-2024
Industrial total energy	01-2005 to 08-2023	01-2005 to 05-2024

6. a. The economic variables in their original format can range from hundreds (*e.g.*, Gross Product) to ten thousands (*e.g.*, Per Capita Income). The index of each variable uses one point (usually the January of the first forecast year, *i.e.* January 2023 in the direct filing and January 2024 in Corrections and Updates) as the baseline to calculate the relative change. This way, the economic variables all fall into a similar relative scale. The benefits of keeping a similar scale include but are not limited to: (i) avoiding potential issues from algorithms that may be sensitive to the scale of the independent variable(s); and (ii) avoiding extremely small or

large coefficient estimations resulting from using independent variables that present big differences in scale compared to the dependent variable.

b. Note, for the industrial revenue class, total energy is forecast rather than UPC. The Omicron variant led to noticeable disruptions in the industrial sector. According to the New York Federal Reserve's "Empire State" index on current business conditions, there was significant dip that coincides with the Omicron variant disrupting business activity. The Company's total energy usage and the statistical significance of the Covid_Omicron variable offered further support to that hypothesis. Manufacturers also reported declines in orders and shipments during the wave of infections. The inclusion of Covid binary variables was considered for other revenue classes but the results were never significant. The commercial sector was the next most probable candidate for inclusion of an Omicron binary variable, but the Company's usage data and the lack of statistical significance led to dropping the variable. Alternative Covid binary variables were tested and similarly removed.

c. The "Trend, s(0)" feature in the Industrial customer count model is a spline term that allows for modeling of non-linear trends over time. The inclusion of the spline term allowed the model to capture the declining trend the Company has experienced in Industrial customer counts. In this case, the base "Trend" variable was defined by assigning sequential integer values, t= 1,2,3,...,n, to each observation.

d. The Company developed binary and trend variables within Python scripts.

Name of Respondent: Electric Load Forecast Panel

Date of Reply: June 27, 2024

Station	Weight
Albany	32%
Buffalo	33%
Syracuse	24%
Rochester	5%
Fort Drum	5%
Massena	3%
Total	100%

Month	CDDs	HDDs
1	0	1171
2	0	1175
3	0	1045
4	1	765
5	12	405
6	77	113
7	197	12
8	223	2
9	150	29
10	37	184
11	3	507
12	0	882

DPS-333 Attachment 3 has been redacted

(this page corresponds to PDF pages 10-570 of the confidential version of exhibits)

Date of Request: June 17, 2024 | Request No. DPS-334
Due Date: June 27, 2024 | NG Request No. NG-354

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: NYPSC - Caitlyn Edmundson

TO: National Grid

SUBJECT: Gas Forecasting – Modeling and Variables Used

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. Provide all historical data for the dependent variables, and all historical data, as well as forecasts, for all the independent variables of the forecasting models, as described in the Company's Gas Load Forecasting Panel testimony and detailed in Exhibit__(GLF-10A & 10B).

2. Provide all workpapers associated with exhibits GLF-1 to GLF-14 of the Gas Forecasting Panel's Testimony.

3. Provide all R-scripts and other programming scripts used to generate and manipulate these data files for the development of the Companies' sales forecasts. Include, as applicable, the scripts used for data cleaning and pre-processing, model development, model testing, and any post-model adjustments.

4. Identify any additional software used in the development of the Companies' sales forecasts. Include the name, version, and any specific modules or add-ons utilized.

Response:

1. Please see the following attachments:

   - **Attachment 1a** – A compressed zip file containing folders for the input data files used in development of the Company's Corrections and Updates ("C&U") retail forecasts excluding its economic input variables. Per discussions with Department of Public Service Staff, the Company is providing the C&U inputs, which reflect the updated load forecast the Company will file as part of C&U.

   - **Attachment 1b** – The Company's economic input variables.

In Attachments 1a and 1b, the Company included one folder for East Gate (Eastern area) and one folder for West Gate (Central area). Together, the folders contain the following files:

Filename	Description
BDD	monthly actual billing degree days, normal forecast billing degree days
DUMMY	potential dummies tested by the Companies
ECON	base case, high and low cases of economic variables as provided by Moody's
EE	the Companies' energy efficiency assumptions
ELEC	the Companies' electrification assumptions
MC	historical meter count data by internal rate code and by rate group
MC_ALLOCATORS	percentages for each rate code as a portion of its rate group's meter count
PRC	historical and forecast natural gas, heating oil, electricity prices
UPC	historical use-per-customer data by internal rate code and by rate group
VOL_ALLOCATORS	percentages for each rate code as a portion of its rate group's volume

In addition, Attachment 1a contains the input dependent variable (meter count and use per customer) raw data and the normal and design weather scenarios. The normal and design weather scenarios file also serves as an input to the post-model adjustment code.

2. The Company is in the process of preparing its C&U filing and has not yet completed the associated exhibits. In Attachment 2, the Company is providing the workpapers for Exhibits__(GLF-1) through (GLF-14). The corresponding C&U exhibits will be provided when the Company makes its C&U filing.

3. Please refer to Attachment 3a for the requested R code files.

To produce its retail customer (meter count) and sales (volume) forecasts for the Company's East Gate (Eastern area) and West Gate (Central area), the Company created forecast modeling code files for meter count and use-per-customer ("UPC") for five rate groups:

- RN – Residential Non-heating
- RH – Residential Heating
- COM – Commercial
- IND - Industrial
- OTH – Other

The Company's gas sales (volume) forecasts are the product of its meter count and its UPC forecasts.

Each code file is an interactive script used by the Company to read in and review the input data (*e.g.,* meter count or UPC, economic, price, weather data) and their correlations, develop a series of potential models, select the best candidate model, address outliers, test for homoscedasticity of the residuals, test for the stability of the forecast, test for and address any detected autocorrelation of the residuals, and perform an ex-post analysis to produce the most supportable forecast model. Each of these scripts produces a self-documenting pdf file of the process and results, as well as output of the model results. The results of these scripts are further processed for any post-model adjustments (*e.g.,* impacts of energy efficiency programs, electrification of heat, relevant policies and local laws). The R scripts for performing the post-model adjustments for East Gate and for West Gate are provided in Attachment 3b.

4. In addition to Microsoft Excel, the Company's retail forecasts were developed using R programming language (current version 4.3.0) and its integrated development environment RStudio (current version 2023.03.1+446). Attachment 3 is an input file to the Company's code for its retail forecasts that lists the additional R code modules ('packages') used by the Company's source code.

Please note that Attachments 1a through 4 contain confidential, protected information. The Company is submitting the attachments along with a request for protected status in accordance with the Protective Order issued in these proceedings.

<u>Name of Respondent</u>: Theodore Poe

<u>Date of Reply</u>: June 27, 2024

DPS-334 Attachment 1a has been redacted

(this page corresponds to PDF pages 574-788 of the confidential version of exhibits)

Variables	Description
EMPLOYC	Employment Construction, (Ths. #, SA)
EMPLOYM	Employment Manufacturing, (Ths. #, SA)
EMPLONP	Employment Total nonfarm payroll, (Ths. #, SA)
GROSSDP	Gross domestic product Total, (Mil. Ch. 2012 USD)
NUMBEOH	Number of Households Total, (Ths.)
POPULAT	Total Population, (Ths.)
RETAILS	Total Retail Sales (Mil 2009 USD)
INCOMEP	Income, Total Personal (Mil 2009 USD)
INCOMPC	Income, Per Capita (2009 USD)
HOUSINS	Housing Stock Total, (Ths., SA)
HOUSISM	Housing Stock Multifamily, (Ths., SA)
NONMAFG	Non-Manufacturing, Employment, (Ths. #)
Base_Case	March 2024
Service_Area	EG

Date	EMPLOYC	INCOMPC	EMPLOYM	EMPLONP	GROSSDP	NUMBEOH	POPULAT	RETAILS	INCOMEP	HOUSINS	HOUSISM	NONMAFG	TREND	POP2	PPERHH	INCHH	OUSINS INC	EMPLOYC L1	NCOMPC L	EMPLOYM L	EMPLONP L	GROSSDP L	NUMBEOH L	POPULAT L	RETAILS L1	INCOMEP L	HOUSINS L	HOUSISM L	NONMAFG L	EMPLOYC L	NCOMPC L	EMPLOYM L	EMPLONP L	GROSSDP L	NUMBEOH L	POPULAT L	RETAILS L2	INCOMEP L	HOUSINS L	HOUSISM L	NONMAFG L
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Variables	Description
EMPLOYC	Employment Construction, (Ths. #, SA)
EMPLOYM	Employment Manufacturing, (Ths. #, SA)
EMPLONP	Employment Total nonfarm payroll, (Ths. #, SA)
GROSSDP	Gross domestic product Total, (Mil. Ch. 2012 USD)
NUMBEOH	Number of Households Total, (Ths.)
POPULAT	Total Population, (Ths.)
RETAILS	Total Retail Sales (Mil 2009 USD)
INCOMEP	Income, Total Personal (Mil 2009 USD)
INCOMPC	Income, Per Capita (2009 USD)
HOUSINS	Housing Stock Total, (Ths., SA)
HOUSISM	Housing Stock Multifamily, (Ths., SA)
NONMAFG	Non-Manufacturing, Employment, (Ths. #)
Base_Case	March 2024
Service_Area	EG

Date	EMPLOYC	INCOMPC	EMPLOYM	EMPLONP	GROSSDP	NUMBEOH	POPULAT	RETAILS	INCOMEP	HOUSINS	HOUSISM	NONMAFG	TREND	POP2	PPERHH	INCHH	OUSINS IN	EMPLOYC L1	NCOMPC L	EMPLOYM L	EMPLONP L	GROSSDP L	JUMBEOH L	POPULAT L	RETAILS L1	INCOMEP L	HOUSINS L	HOUSISM L	JONMAFG L	EMPLOYC L	NCOMPC L	EMPLOYM L	EMPLONP L	GROSSDP L	JUMBEOH L	POPULAT L	RETAILS L2	INCOMEP L	HOUSINS L	HOUSISM L	JONMAFG L
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DPS-334 Attachments 2, 3a, 3b, 3c, & 4 have been redacted

(this page corresponds to PDF pages 809-1407 of the confidential version of exhibits)

Date of Request: July 11, 2024 | Request No. DPS-565
Due Date: July 22, 2024 | NG Request No. NG-610

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: NYPSC - Arslan Gohir, James Creaser, Caitlyn Edmundson

TO: National Grid

SUBJECT: Gas Forecasting

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. Referring to NMPC Gas Load Forecasting Panel Testimony page 14, line 18 to 21 through page 15, line 2, provide the monthly historical and incremental Forecast of Energy Efficiency (broken into persistent and behavioral savings), all Electrification, Off-System Market Saturation, and the AEB Impacts by customer groups in an Excel tabular format.

2. In Exhibit__(GLF-4CU), the Total FY2024 volumes are the same as Total Apr-2023 to Mar-2024, i.e. non-weather normalized actual sales. Confirm if FY2025 to FY2029 volumes in Exhibit__(GLF-4CU) include weather impacts.

3. Explain why RY2026 volumes in Exhibit__(GLF-4CU) versus weather normalized RY2024 volumes in Exhibit__(GLF-8CU) decrease significantly for all Customer Groups such as Residential Non-Heat, Commercial, and Industrial but increase for Residential Heating and Other?

4. Describe each binary (dummy) and trend variables in each econometric model, and the reasoning behind adding such variables.

    a. For those variables with values other than 0 and 1, such as "D_IND_MC_1", clarify what those values represent.

5. Provide the 10-year weather normal Billing Degree Days (BDD).

6. For all models estimated using NAIVE, explain what sigma^2 represents. Provide the mathematical calculation and all relevant workpapers used to arrive at the sigma^2 value.

7. Provide the following statistics for all Gas forecasting models: R^2, adjusted R^2, Durbin-Watson statistic.

Response:

1. Refer to Attachment 1, which contains the Company's assumptions on Historical and Incremental Forecast of Energy Efficiency (broken into persistent and behavioral savings).

   The Company considers three different forms of electrification in its current forecast: full electrification of a gas customer with subsequent disconnection from the gas distribution system, full space heating of a gas customer with non-space heating applications still using natural gas (hence, not disconnecting), and partial space heating of a gas customer (also not disconnecting).

   The Company forecasts AEB Act-related Electrification and non-AEB Act-related Electrification in its correction and updates forecast. AEB Act-related Electrification can be categorized as DSM electrification as the Company assumes customers impacted by the gas ban would take advantage of incentive offerings. AEB Act-related Electrification represents only the impact of any full meter loss electrification, and its impact is shown in Table 1 below.

Summary of AEB Act-Related Electrification Impact on NMPC						
Case 24-G-0323: Corrections and Updates forecast						
	NMPC	NMPC	NMPC	NMPC	NMPC	NMPC
End of FY	RN	RH	COM	IND	OTH	Total
Date	Meter Count	Meter Count	Meter Count	Meter Count	Meter Count	Meter Count
FY2024	0	0	0	0	0	0
FY2025	0	0	0	0	0	0
FY2026	0	-211	-15	0	0	-226
FY2027	0	-1,096	-76	0	0	-1,172
FY2028	0	-1,992	-139	0	0	-2,131
FY2029	0	-2,880	-201	0	0	-3,081
	NMPC	NMPC	NMPC	NMPC	NMPC	NMPC
End of FY	RN	RH	COM	IND	OTH	Total
Date	Vol (therms)	Vol (therms)	Vol (therms)	Vol (therms)	Vol (therms)	Vol (therms)
FY2024	0	0	0	0	0	0
FY2025	0	0	0	0	0	0
FY2026	0	-64,864	-27,163	0	0	-92,027
FY2027	0	-780,709	-341,197	0	0	-1,121,906
FY2028	0	-1,645,844	-735,058	0	0	-2,380,902
FY2029	0	-2,488,565	-1,125,892	0	0	-3,614,457

Table 1

The non-AEB Act-related Electrification would include the impact of any DSM full meter loss electrification (net of the AEB Act), full space heating electrification, and partial space heating electrification, and its impact is shown in Table 2 below.

Summary of Non-AEB Act-Related Electrification Impact on NMPC						
Case 24-G-0323: Corrections and Updates forecast						
	NMPC	NMPC	NMPC	NMPC	NMPC	NMPC
End of FY	RN	RH	COM	IND	OTH	Total
Date	Meter Count	Meter Count	Meter Count	Meter Count	Meter Count	Meter Count
FY2024	0	-101	-4	0	0	-105
FY2025	0	-291	-10	0	0	-301
FY2026	0	-290	-9	0	0	-299
FY2027	0	-290	-10	0	0	-300
FY2028	0	-291	-10	0	0	-301
FY2029	0	-290	-10	0	0	-300
	NMPC	NMPC	NMPC	NMPC	NMPC	NMPC
End of FY	RN	RH	COM	IND	OTH	Total
Date	Vol (therms)	Vol (therms)	Vol (therms)	Vol (therms)	Vol (therms)	Vol (therms)
FY2024	0	-205,484	-47,474	0	0	-252,958
FY2025	0	-1,885,935	-411,083	0	0	-2,297,018
FY2026	0	-3,645,730	-796,156	0	0	-4,441,886
FY2027	0	-5,195,949	-1,246,381	0	0	-6,442,330
FY2028	0	-6,844,937	-1,788,070	0	0	-8,633,007
FY2029	0	-8,431,766	-2,392,084	0	0	-10,823,850

Table 2

While the meter count reductions in Tables 1 and 2 represent the customer disconnections due to full heat pump installations, the volume reductions also include the impact of customers who do not disconnect and yet reduce their loads with full space heating electrification (but keeping gas service for other applications; Table 3) and customers who adopt partial heat pumps (Table 4).

Summary of Number of Full Space Heating Customers						
Case 24-G-0323: Corrections and Updates forecast						
	NMPC	NMPC	NMPC	NMPC	NMPC	NMPC
End of FY	RN	RH	COM	IND	OTH	Total
Date	Meters	Meters	Meters	Meters	Meters	Meters
FY2024	0	92	4	0	0	0
FY2025	0	298	10	0	0	0
FY2026	0	524	20	0	0	0
FY2027	0	806	34	0	0	0
FY2028	0	1,143	54	0	0	0
FY2029	0	1,537	79	0	0	0

Table 3

Summary of Number of Partial Space Heating Customers						
Case 24-G-0323: Corrections and Updates forecast						
	NMPC	NMPC	NMPC	NMPC	NMPC	NMPC
End of FY	RN	RH	COM	IND	OTH	Total
Date	Meters	Meters	Meters	Meters	Meters	Meters
FY2024	0	2,159	85	0	0	2,244
FY2025	0	5,665	195	0	0	5,860
FY2026	0	8,647	323	0	0	8,970
FY2027	0	11,649	471	0	0	12,119
FY2028	0	14,640	636	0	0	15,275
FY2029	0	17,618	818	0	0	18,436

Table 4

Regarding Off-System Market Saturation, there is no impact by this market saturation forecast to occur in the Rate Year nor in any of the Data Years.

2. In the Company's Gas Load Forecasting exhibits of its corrections and updates submission, FY2024 has actual (not normalized) volume data through Feb 2024. March 2024 is a forecast normalized volume. Hence, FY2024 is provided in both the historical data exhibits as well as the forecast data exhibits.

   Subsequent years, FY2025 through FY2029, are all normalized volumes based on Exhibit GLF-11 of the Company's Initial Filing.

3. In Exhibit-GLF-4CU, the Company presents its Fiscal Year Deliveries by Service and Revenue Class for the period FY2024 - FY2029, where FY2024 is partially actual volumes and partially normalized volumes.

   In Exhibit-GLF-8CU, the Company presents its Historical Weather Normalized Billed Sales Data by Month and by Class for the period April 2018 – March 2024, where FY2024 is partially actual volumes and partially normalized volumes.

   In Table 5 below, the Company summarizes the changes between FY2024 and Rate Year FY 2026.

	Volumes		Meter Counts		Avg Use Per Customer		Differences (FY2026-FY2024)		
	4CU	8CU	5CU	5CU	5CU	5CU			
	WN FY2026	WN FY2024	WN FY2026	WN FY2024	WN FY2026	WN FY2024	Customers	Volumes	Use Per Customer
SC1 Residential Heat - EAP	58,238,563	58,152,499	61,403	60,504	948	961	899	86,064	-13
SC1 MB Residential Heat - EAP	1,040,861	765,066	560	551	1,859	1,389	9	275,795	470
SC1 Residential Non Heat - EAP	345,530	354,117	2,226	2,401	155	147	-175	-8,587	8
SC1 MB Residential Non-Heat - EAP	6,536	4,684	23	25	284	187	-2	1,852	97
SC1 Residential Non Heat	2,771,801	3,013,214	19,566	20,947	142	144	-1,381	-241,413	-2
SC1 Residential Heat	442,852,328	448,792,509	487,891	480,237	908	935	7,654	-5,940,181	-27
SC1 MB Residential Non-Heat	181,810	153,646	655	704	278	218	-49	28,164	59
SC1 MB Residential Heat	45,609,971	38,589,393	26,102	25,702	1,747	1,501	400	7,020,578	246
Total SC1	551,047,400	549,825,128	598,425	591,071	921	930	7,354	1,222,272	-9
SC2 Residential Non Heat	24,621	28,712	48	52	513	552	-4	-4,091	-39
SC2 Residential Heat	2,048,375	2,020,835	772	759	2,653	2,662	13	27,540	-9
SC2 Commercial Non Heat	2,799,875	2,663,976	1,434	1,422	1,953	1,873	12	135,899	79
SC2 Commercial Heat	113,796,049	125,045,439	34,875	34,563	3,263	3,618	311	-11,249,390	-355
SC2 Industrial	1,212,422	1,308,252	117	117	10,363	11,182	0	-95,830	-819
SC2 MB Residential Non Heat	9,017	8,178	12	13	751	629	-1	839	122
SC2 MB Residential Heat	1,109,908	1,098,550	200	197	5,550	5,577	3	11,358	-27
SC2 MB Commercial Non Heat	3,325,573	3,333,610	497	492	6,691	6,776	5	-8,037	-84
SC2 MB Commercial Heat	87,358,768	87,830,114	10,453	10,360	8,357	8,478	93	-471,346	-120
SC2 MB Industrial	896,472	980,056	58	57	15,456	17,194	1	-83,584	-1,738
Total SC2	212,581,080	224,317,720	48,466	48,033	4,386	4,670	433	-11,736,640	-284
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	63,751,250	60,490,625	126	126	505,819	479,948	0	3,260,625	25,871
SC6 Interruptible	47,677,174	40,975,363	15	15	3,178,478	2,731,691	0	6,701,811	446,787
SC7 Small Volume Firm Sales	88,055,865	83,526,368	803	794	109,701	105,208	9	4,529,497	4,494
SC8 Firm Sales and Transportation	192,356,333	186,614,502	69	69	2,787,773	2,704,558	0	5,741,831	83,215
SC9 Negotiated Transportation Service	82,486,662	73,613,539	4	4	20,621,666	18,403,385	0	8,873,123	2,218,281
SC9 NYSEG Transportation	2,409,554	3,053,599	1	1	2,409,554	3,053,599	0	-644,045	-644,045
SC10 Natural Gas Vehicles	24,936	15,465	3	3	8,312	5,155	0	9,471	3,157
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	15,686,086	17,123,487	18	18	871,449	951,305	0	-1,437,401	-79,856
SC13 Residential Distributed Generation	3,955	4,540	4	4	989	1,135	0	-585	-146
Total SC5 - SC13	492,451,815	465,417,488	1,043	1,034	472,275	450,133	9	27,034,327	22,141
							0	0	0
SC14 Dual Fuel Electric Generators	371,598,654	388,899,648	6	6	61,933,109	64,816,608	0	-17,300,994	-2,883,499
TOTAL	1,627,678,949	1,628,459,985	647,940	640,143	2,512	2,544	7,796	-781,036	-32
SC1 Residential Non-Heating	3,305,677	3,525,661	22,470	24,077	147	146	-1,607	-219,984	1
SC1 Residential Heating	547,741,723	546,299,467	575,955	566,994	951	964	8,961	1,442,256	-12
SC2 Commercial	207,280,265	218,873,138	47,259	46,838	4,386	4,673	421	-11,592,873	-287
SC2 Industrial	2,108,894	2,288,308	175	174	12,051	13,151	1	-179,414	-1,100
SC5-SC13 (Other)	492,451,815	465,417,488	1,043	1,034	472,275	450,133	9	27,034,327	22,141

Table 5

At the bottom-right of Table 5, the Company's data shows:

- SC1 Residential Non-Heating volumes decrease with a drop in customer count. The increase in its average use-per-customer ("UPC") does not offset the drop in number of customers and, hence, their volume decreases.

- SC1 Residential Heating volumes increase with a growth in customer count. The decrease in its average UPC does not offset the increase in number of customers and, hence, their volume increases.

- SC2 Commercial volumes decrease with a drop in UPC. The increase in its number of customers does not offset the decrease in UPC and, hence, their volume decreases.

- SC2 Industrial volumes decrease with a drop in UPC. The increase in its number of customers does not offset the decrease in UPC and, hence, their volume decreases.

- SC5 – SC13 Other volumes increase with an increase in both customer count and UPC.

4. While performing its econometric modeling of meter count and average UPC for its Residential Non-Heating, Residential Heating, Commercial, Industrial, and Other rate

groups, the Company will often test indicator (dummy) variables to account for outliers in its historical meter count or UPC data. Such indicator variables may or may not be used in the Company's final models.

Indicator variables that were used in the Company's models include:

- East Gate Commercial UPC - D_COM_UPC_4 and D_COM_UPC_5;
- East Gate Industrial UPC - D_COM_UPC_4 and D_COM_UPC_5, also;
- East Gate Other UPC - D_UPC_OTH_1; and,
- West Gate Commercial UPC - D_COM_UPC_1.

The East Gate D_COM_UPC_4 is a binary indicator variable in the Commercial UPC model with value 1 for the months of March 2016 and January 2020 used to account for outliers in the Commercial rate group when using billing degree days and regional gross domestic product as the other independent variables.

The East Gate D_COM_UPC_5 is a binary indicator variable in the Commercial UPC model with value 1 for the months of February 2021 and May 2021 used to account for outliers in the Commercial rate group when using billing degree days and regional gross domestic product as the other independent variables.

The East Gate D_OTH_UPC_1 is a binary indicator variable in the Other UPC model with value 1 for the historical months of August and September 2019, 2020, 2021, 2022, 2023 and into the forecast years of 2024 – 2029 used to better represent the month-to-month pattern of usage in the Other rate group when using billing degree days as the other independent variable.

The West Gate D_COM_UPC_1 is a binary indicator variable in the Commercial UPC model with value 1 for the month of May 2023 used to account for an outlier in the Commercial rate group when using billing degree days and regional gross domestic product as the other independent variables.

5. As noted in Exhibit GLF-11, the normal weather used in the Company's gas load forecasts for its Eastern Division (East Gate) and Central Division (West Gate) were based on the thirty-year period of calendar years 1993 – 2022. Table 6 below lists, for East Gate and West Gate:

   - Normal heating degree days (non-leap year) for the 30 calendar years 1993 – 2022 from Exhibit 11;
   - Normal billing degree days (non-leap year) for the 30 calendar years 1993 – 2022;
   - Normal billing degree days (leap year) for the 30 calendar years 1993 – 2022;

- Normal billing degree days (non-leap year) for the 10 calendar years 2013 – 2022;
- Normal billing degree days (leap year) for the 10 calendar years 2013 – 2022.

NMPC Heating and Billing Degree Days										
Thirty-Year and Ten-Year Mean Monthly Values										
	Exhibit GLF-11 Thirty-Year Mean HDD CY 1993 - 2022 Non-Leap Year		Equivalent Thirty-Year Mean BDD CY 1993 - 2022 Non-Leap Year		Equivalent Thirty-Year Mean BDD CY 1993 - 2022 Leap Year		Equivalent Ten-Year Mean BDD CY 2013 - 2022 Non-Leap Year		Equivalent Ten-Year Mean BDD CY 2013 - 2022 Leap Year	
	Albany	Syracuse	Albany	Syracuse	Albany	Syracuse	Albany	Syracuse	Albany	Syracuse
Jan	1,258	1,252	1,022	1,004	1,022	1,004	986	1,003	986	1,003
Feb	1,070	1,090	1,299	1,315	1,299	1,315	1,284	1,318	1,284	1,318
Mar	905	942	959	969	994	1,005	954	987	992	1,029
Apr	513	551	737	777	737	777	745	793	745	793
May	207	232	313	363	313	363	309	362	309	362
Jun	39	49	135	147	135	147	125	140	125	140
Jul	1	2	4	5	4	5	8	7	8	7
Aug	11	14	2	3	2	3	5	1	5	1
Sep	117	120	28	28	28	28	15	27	15	27
Oct	428	417	258	243	258	243	232	216	232	216
Nov	742	725	670	677	670	677	649	660	649	660
Dec	1,061	1,052	925	915	925	915	909	902	909	902
Total	6,352	6,446	6,352	6,446	6,387	6,482	6,221	6,416	6,259	6,458

Table 6

6. A naive model assumes a historic pattern will persist into the future without adjustments or modifications. The Company will use a naive model when a suitable econometric model cannot be identified.

The sigma^2 statistic is used to measure the variance (or spread of observations around the mean) within the time series population. In this case, the sigma^2 statistic can be used to assess model strength, with a lower value indicating a tighter distribution around the mean, and thus a stronger likelihood that the historical value will continue into the future.

The reported sigma^2 values are calculated in the Company's retail meter count and use-per-customer modeling code within the fn_NaiveForecasts.R function, using the "fable" package. Table 7 below lists the sigma^2 values for the naive models used in the Company's East Gate models. Table 8 below lists the sigma^2 values for the naive models used in the Company's West Gate models.

For some models (such as West Gate Other UPC), the reported sigma^2 statistic is very large, indicating a weaker statistical model. This results from the considerable noise in the historic data used to train the econometric model. Failing to find a suitable econometric driver, the Company chose to incorporate a Seasonal Naive model (SNAIVE), where the past 12 months of historic data is repeated annually through the forecast horizon.

NAÏVE Models - EG			
	IND-MC	OTH-MC	
sigma^2	1.51	4.59	

Table 7

NAÏVE Models - WG			
	OTH-MC	OTH - UPC	
sigma^2	3.73	8630204023.93	

Table 8

7. In the Company's econometric modeling, the Company utilized linear models (LM) and linear models with ARIMA errors (LM w/ ARIMA) when identifying econometric drivers. Where linear regression models were selected, R^2/adjusted R^2 values are presented in Exhibit-GLF-10ACU-MC and Exhibit-GLF-10BCU-UPC.

When a LM w/ ARIMA errors was used, no R^2/adjusted R^2 values were calculated as R^2 values are not an appropriate measure of model fit for these models. In these cases, the addition of ARIMA errors captures non-linear relationships in seasonality and time. For those models, the Company utilizes Mean Absolute Percentage Error (MAPE) statistics, which measure the average percentage difference between the forecast values and the actual values.

Table 9 and Table 10 below present the Durban Watson and average annual MAPE values for the East Gate and West Gate econometric models that utilize LM w/ ARIMA errors.

LM/with ARIMA Errors - EG			
	RN - MC	RH - MC	COM - MC
Durbin-Watson	1.95	1.96	2.00
Average Annual MAPE	25.1%	5.8%	8.6%

Table 9

LM/with ARIMA Errors - WG			
	RN - MC	RH - MC	COM - MC
Durbin-Watson	1.99	1.94	1.94
Average Annual MAPE	36.3%	5.3%	7.4%

Table 10

Name of Respondent: Theodore Poe Jr.

Date of Reply: July 22, 2024

Table 1: These tables present actual energy efficiency savings through 2023 and forecasted energy efficiency through 2029, categorized by customer class.

Table 2: The forecasted volumes are assumed to incorporate the embedded trend of EE that is built into the historical billing data. A three-year average of actual energy efficiency achievement by customer class (cells: L22-O22) is used to considered the embedded EE savings trend. The forecasts are adjusted explicitly only for accelerated energy efficiency savings that exceed this embedded trend.

Table 3: The forecast does not explicitly model the multi-family rate group. Consequently, the accelerated energy efficiency savings are allocated between the residential and commercial sectors.

Table 4a/b: The accelerated energy efficiency savings are divided between East Gate and West Gate.

Table 1: UNY Total Savings

Base Case

Calendar Year	Forecasted	Cumulative: Residential: Non-persistent (Dth)	Cumulative: Residential: Persistent (Dth)	Cumulative: Commercial (Dth)	Cumulative: Multi-family (Dth)	Incremental: Residential: Non-persistent (Dth/year)	Incremental: Residential: Persistent (Dth/year)	Incremental: Commercial (Dth/year)	Incremental: Multi-family (Dth/year)
2008	Actuals								
2009	Actuals								
2010	Actuals								
2011	Actuals								
2012	Actuals								
2013	Actuals								
2014	Actuals								
2015	Actuals								
2016	Actuals	103,686	146,728	147,907	38,304	103,686	146,728	147,907	38,304
2017	Actuals	100,976	334,328	248,199	65,769	100,976	187,600	100,292	27,465
2018	Actuals	215,066	475,460	542,202	88,442	215,066	141,132	294,003	22,673
2019	Actuals	228,799	649,723	887,991	113,250	228,799	174,263	345,789	24,808
2020	Actuals	185,326	815,014	1,296,703	134,286	185,326	165,291	408,711	21,036
2021	Actuals	184,520	1,000,585	1,499,638	172,721	184,520	185,571	202,935	38,435
2022	Actuals	184,881	1,182,889	1,680,101	186,982	184,881	182,304	180,463	14,261
2023	Actuals	224,988	1,356,869	1,952,516	189,707	224,988	173,980	272,415	2,725
2024	Forecasted	98,584	1,457,781	2,057,563	208,037	98,584	100,913	105,047	18,330
2025	Forecasted	110,191	1,557,905	2,162,166	242,824	110,191	100,124	104,604	34,788
2026	Forecasted	0	1,595,094	2,205,693	253,135	0	37,189	43,527	10,311
2027	Forecasted	0	1,648,397	2,250,948	263,945	0	53,303	45,255	10,810
2028	Forecasted	0	1,712,614	2,299,053	277,778	0	64,217	48,105	13,833
2029	Forecasted	0	1,785,241	2,347,669	294,631	0	72,627	48,616	16,854

Table 2: Calculated Accelerated Savings from Embeddded Trend / **Table 3: Allocate Total UNY Accelerated Savings to MF to RH and COM**

Base Case — Incremental

Calendar Year	Forecasted	T2 Residential: Non-persistent (Dth/year)	T2 Residential: Persistent (Dth/year)	T2 Commercial (Dth/year)	T2 Multi-family (Dth/year)	T3 Residential: Non-persistent (Dth/year)	T3 Residential: Persistent (Dth/year)	T3 Commercial (Dth/year)	T3 Multi-family (Dth/year)
2008	Actuals								
2009	Actuals								
2010	Actuals								
2011	Actuals								
2012	Actuals								
2013	Actuals								
2014	Actuals								
2015	Actuals								
2016	Actuals								
2017	Actuals								
2018	Actuals								
2019	Actuals								
2020	Actuals								
2021	Actuals								
2022	Actuals								
2023	Actuals	198130	180618	218604	18474				
2024	Forecasted	0	0	0	0	0	0	0	0
2025	Forecasted	0	0	0	16,314	0	10,517	5,797	0
2026	Forecasted	0	0	0	0	0	0	0	0
2027	Forecasted	0	0	0	0	0	0	0	0
2028	Forecasted	0	0	0	0	0	0	0	0
2029	Forecasted	0	0	0	0	0	0	0	0

Table 4a: Accelerated Savings for EG / **Table 4b: Accelerated Savings for WG**

Base Case — Incremental

Calendar Year	Forecasted	T4a Residential: Non-persistent (Dth/year)	T4a Residential: Persistent (Dth/year)	T4a Commercial (Dth/year)	T4a Multi-family (Dth/year)	T4b Residential: Non-persistent (Dth/year)	T4b Residential: Persistent (Dth/year)	T4b Commercial (Dth/year)	T4b Multi-family (Dth/year)
2008	Actuals								
2009	Actuals								
2010	Actuals								
2011	Actuals								
2012	Actuals								
2013	Actuals								
2014	Actuals								
2015	Actuals								
2016	Actuals								
2017	Actuals								
2018	Actuals								
2019	Actuals								
2020	Actuals								
2021	Actuals								
2022	Actuals								
2023	Actuals								
2024	Forecasted	0	0	0		0	0	0	
2025	Forecasted	0	4,855	2,473		0	5,662	3,325	
2026	Forecasted	0	0	0		0	0	0	
2027	Forecasted	0	0	0		0	0	0	
2028	Forecasted	0	0	0		0	0	0	
2029	Forecasted	0	0	0		0	0	0	

Date of Request: July 15, 2024 | Request No. DPS-577
Due Date: July 25, 2024 | NG Request No. NG-622

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: NYPSC - Arslan Gohir

TO: National Grid

SUBJECT: Electric Forecasting

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel, or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. Provide the annual average temperature for each weather station identified in response to DPS 11-333, question 2, subpart (b).

2. Regarding the response to pre-filled IR DPS-091:

   a. Update Attachments 1 and 2, including the monthly data, with actual data through May 31, 2024.

   b. Confirm if the company adjusted the number of customers in the historical and/or the forecast data with the number of DERs such as Electrification of Heat Pump counts?

Response:

1. The annual average temperature for each weather station from 1994 to 2023 that is aligned with the corrections and updates forecast is included in Attachment 3. The Company's response to DPS-333 lists the weights for 1995 to 2023 for deriving Niagara Mohawk's weather. For the year 1994, the Company also used Rome with an approximate weight of ~6.7 percent, which is then given to Syracuse for the remaining years, taking the weight for Syracuse from approximately 16.8 percent (in 1994) to ~23.5 percent (from 1995 to 2023) as reflected in the response to DPS-333. The practical difference resulted from a change to a different weather data vendor. After changing to the new vendor a suitable proxy for the Rome station was not available; therefore, the Company gave that share to Syracuse.

2. Regarding the Company's response to DPS-091:

a. Attachments 1 and 2 reflect the updated nine months of extended history used in the Company's corrections and updates forecast. Attachments 1 and 2 contain confidential, protected information. The Company is submitting the confidential and redacted versions of the attachments in accordance with the Protective Order adopted in these proceedings.

b. The Company did not adjust the number of customers in the historic or forecast data with the number of distributed energy resources ("DERs"). Unlike the situation with the gas load forecast, where the Company reduces the customer count forecast for full heat pump adoption on the assumption that those customers will disconnect from the gas system, on the electric side the Company does not need to adjust the customer count, as only usage is adjusted to reflect the increase in load from additional heat pumps.

Name of Respondent:	Date of Reply:
Electric Load Forecast Panel	July 25, 2024

year	month	k_10_r	k_10_c	k_10_i	c_10_r	c_10_c	c_10_i	U_10_R	U_10_C
year	month	Residential Deliveries (GWh)	Commercial Deliveries (GWh)	Industrial Deliveries (GWh)	Residential Customer Counts	Commercial Customer Counts	Industrial Customer Counts	Residential Use per Customer (kwh/cust)	Commercial Use per Customer (kwh/cust)
2003	1	1034.0	780.0	730.8	1,361,939	142,268	1,288	759.2	5,482.8
2003	2	968.4	670.3	614.4	1,361,767	141,708	1,265	711.1	4,730.2
2003	3	925.4	682.1	690.1	1,360,651	141,510	1,257	680.1	4,820.0
2003	4	804.9	601.0	708.4	1,359,185	142,102	1,251	592.2	4,229.5
2003	5	729.8	632.6	706.2	1,358,922	142,325	1,244	537.1	4,444.7
2003	6	741.1	627.8	701.4	1,358,539	142,537	1,237	545.5	4,404.7
2003	7	867.2	745.6	691.9	1,356,121	142,054	1,211	639.5	5,248.9
2003	8	910.6	711.5	685.3	1,355,216	141,601	1,196	671.9	5,024.6
2003	9	843.4	697.9	690.2	1,354,723	141,189	1,178	622.6	4,943.1
2003	10	766.0	976.6	898.0	1,427,464	158,859	1,774	536.6	6,147.7
2003	11	807.7	939.9	882.9	1,429,149	158,641	1,768	565.1	5,924.5
2003	12	995.7	1060.9	886.3	1,431,141	158,779	1,769	695.7	6,681.4
2004	1	1122.3	977.5	686.9	1,433,230	158,802	1,759	783.0	6,155.4
2004	2	1074.1	1186.5	961.9	1,433,473	158,845	1,762	749.3	7,469.8
2004	3	950.4	1024.9	1046.6	1,433,710	158,911	1,765	662.9	6,449.5
2004	4	895.7	1029.0	855.0	1,432,900	159,329	1,767	625.1	6,458.4
2004	5	758.1	948.7	886.0	1,431,361	159,574	1,764	529.6	5,945.4
2004	6	788.2	986.0	884.1	1,430,411	159,563	1,760	551.0	6,179.1
2004	7	902.7	1117.0	991.6	1,429,938	159,562	1,756	631.3	7,000.5
2004	8	935.5	1108.4	911.8	1,430,970	159,590	1,750	653.7	6,945.2
2004	9	915.9	1123.6	847.0	1,431,090	159,537	1,648	640.0	7,042.9
2004	10	771.4	1026.2	970.3	1,431,349	159,372	1,656	539.0	6,439.1
2004	11	801.2	962.6	826.5	1,433,151	159,256	1,637	559.1	6,044.1
2004	12	1021.5	1098.1	864.5	1,435,207	159,337	1,646	711.8	6,892.0
2005	1	1147.1	1138.8	863.8	1,436,584	159,508	1,636	798.5	7,139.5
2005	2	1031.6	1081.4	821.1	1,437,689	159,592	1,644	717.5	6,776.0
2005	3	985.3	1093.5	801.6	1,437,986	159,754	1,655	685.2	6,845.1
2005	4	887.4	1098.1	911.1	1,437,417	160,127	1,621	617.4	6,857.9
2005	5	766.8	1011.5	835.8	1,436,301	160,469	1,599	533.9	6,303.4
2005	6	830.5	990.8	848.2	1,435,243	160,470	1,575	578.6	6,174.1
2005	7	1151.7	1258.2	932.3	1,434,064	160,540	1,760	803.1	7,837.4
2005	8	1098.8	1217.6	838.7	1,435,299	160,686	1,760	765.5	7,577.5
2005	9	1039.8	1198.9	887.8	1,435,252	160,734	1,755	724.5	7,458.7
2005	10	805.7	1044.2	839.1	1,435,546	160,525	1,755	561.2	6,505.0
2005	11	815.7	983.6	813.8	1,436,769	160,331	1,756	567.7	6,134.7
2005	12	1054.9	1106.4	806.6	1,439,669	160,394	1,759	732.8	6,898.1
2006	1	1120.6	1142.5	824.3	1,441,144	160,320	1,762	777.6	7,126.6
2006	2	948.9	1042.6	823.0	1,441,698	160,247	1,756	658.2	6,506.5
2006	3	980.3	1108.5	847.9	1,442,089	160,241	1,760	679.8	6,917.6
2006	4	872.4	1001.4	801.3	1,442,270	160,632	1,756	604.9	6,233.8
2006	5	740.3	983.4	795.4	1,441,260	160,753	1,757	513.7	6,117.4
2006	6	854.5	1072.5	872.3	1,439,986	160,820	1,756	593.4	6,669.0
2006	7	1021.8	1175.0	843.2	1,438,575	162,608	1,756	710.3	7,226.3
2006	8	1103.8	1204.9	892.4	1,439,931	163,037	1,752	766.5	7,390.3
2006	9	902.4	1129.0	808.1	1,439,910	163,009	1,746	626.7	6,925.8
2006	10	782.8	982.0	840.2	1,440,228	162,626	1,745	543.5	6,038.3
2006	11	850.4	1050.1	793.3	1,441,460	162,277	1,737	589.9	6,470.9
2006	12	968.0	1073.9	799.5	1,443,548	162,405	1,735	670.6	6,612.7
2007	1	1060.8	1073.3	788.5	1,445,450	162,442	1,731	733.9	6,607.4
2007	2	1044.1	1078.3	779.4	1,446,311	162,404	1,736	721.9	6,639.8
2007	3	1047.6	1116.9	822.0	1,446,201	162,451	1,732	724.4	6,875.0
2007	4	912.8	1069.3	825.0	1,446,114	162,726	1,733	631.2	6,571.3
2007	5	793.5	1011.4	833.7	1,444,783	163,042	1,732	549.2	6,203.3
2007	6	879.9	1091.8	823.7	1,443,804	162,982	1,730	609.4	6,698.9

2007	7	959.7	1150.7	828.6	1,443,341	163,023	1,728	664.9	7,058.4
2007	8	1018.4	1140.2	860.3	1,443,774	162,997	1,720	705.4	6,995.0
2007	9	959.2	1170.0	838.3	1,444,007	162,885	1,718	664.2	7,183.2
2007	10	808.6	1088.6	876.0	1,443,422	162,666	1,719	560.2	6,691.9
2007	11	847.6	1042.4	741.6	1,445,755	162,470	1,713	586.3	6,416.1
2007	12	1035.4	1102.1	875.9	1,447,852	162,660	1,711	715.1	6,775.6
2008	1	1139.4	1148.3	822.6	1,449,190	162,669	1,705	786.2	7,058.9
2008	2	1016.5	1101.7	789.2	1,450,524	162,592	1,702	700.8	6,776.1
2008	3	980.1	1019.5	801.5	1,450,583	162,615	1,698	675.6	6,269.3
2008	4	880.3	1063.3	812.0	1,450,953	162,907	1,698	606.7	6,527.0
2008	5	729.9	985.9	810.2	1,450,002	163,171	1,694	503.4	6,042.3
2008	6	834.8	1062.0	836.7	1,448,502	163,266	1,695	576.3	6,504.8
2008	7	984.3	1144.3	801.3	1,447,782	163,281	1,691	679.9	7,008.3
2008	8	1047.1	1197.9	862.2	1,448,385	163,307	1,692	722.9	7,335.5
2008	9	940.2	1145.1	842.7	1,447,888	163,261	1,690	649.4	7,013.7
2008	10	770.5	1027.7	853.5	1,447,965	163,156	1,690	532.1	6,299.0
2008	11	853.8	1015.8	710.8	1,449,045	162,851	1,693	589.2	6,237.7
2008	12	1015.2	1062.0	726.7	1,450,406	162,739	1,690	699.9	6,525.8
2009	1	1223.3	1195.3	790.3	1,451,417	162,806	1,695	842.8	7,341.9
2009	2	1077.1	1083.5	691.3	1,452,555	162,699	1,697	741.5	6,659.8
2009	3	978.5	1021.6	713.7	1,453,421	162,718	1,689	673.3	6,278.5
2009	4	896.9	1075.9	696.8	1,454,599	163,239	1,687	616.6	6,591.0
2009	5	765.2	961.4	702.1	1,453,033	163,483	1,690	526.6	5,880.9
2009	6	774.7	997.3	681.2	1,452,131	163,532	1,691	533.5	6,098.2
2009	7	898.0	1099.1	752.7	1,451,007	163,487	1,686	618.9	6,722.9
2009	8	942.4	1077.7	725.6	1,451,620	163,510	1,693	649.2	6,590.9
2009	9	965.3	1105.3	752.0	1,452,031	163,445	1,689	664.8	6,762.6
2009	10	806.4	1015.1	710.6	1,451,618	163,156	1,662	555.5	6,221.6
2009	11	820.5	957.2	738.1	1,452,789	162,898	1,662	564.8	5,875.8
2009	12	982.7	1065.2	728.3	1,455,156	162,920	1,661	675.3	6,538.2
2010	1	1218.1	1135.3	742.0	1,456,267	162,978	1,663	836.4	6,965.8
2010	2	1031.4	1038.0	714.8	1,457,434	162,898	1,658	707.7	6,371.9
2010	3	997.6	1081.9	720.4	1,457,669	162,909	1,660	684.4	6,641.1
2010	4	846.4	1002.6	720.2	1,458,248	163,345	1,659	580.4	6,138.1
2010	5	750.6	923.8	710.9	1,456,908	163,619	1,656	515.2	5,646.1
2010	6	858.8	1038.6	687.4	1,455,758	163,673	1,653	590.0	6,345.9
2010	7	1108.9	1212.8	632.8	1,454,851	163,725	1,652	762.2	7,407.7
2010	8	1152.3	1185.4	1017.9	1,456,416	163,707	1,648	791.2	7,241.1
2010	9	991.3	1097.9	801.2	1,456,927	163,670	1,653	680.4	6,708.2
2010	10	783.4	986.5	749.8	1,456,298	163,273	1,653	537.9	6,042.3
2010	11	821.7	979.7	711.5	1,457,852	163,016	1,653	563.6	6,009.9
2010	12	1021.7	1046.4	754.1	1,459,666	163,131	1,651	700.0	6,414.4
2011	1	1156.5	1106.6	776.8	1,460,962	163,164	1,647	791.6	6,782.3
2011	2	1077.2	1040.1	714.3	1,461,944	163,190	1,647	736.8	6,373.6
2011	3	1026.8	1070.6	793.9	1,462,177	163,241	1,647	702.3	6,558.4
2011	4	939.3	1023.6	725.0	1,462,055	163,728	1,642	642.5	6,251.8
2011	5	805.8	975.3	789.5	1,461,078	164,077	1,644	551.5	5,943.9
2011	6	858.0	1052.0	799.4	1,459,296	164,074	1,644	587.9	6,412.0
2011	7	1023.7	1117.8	766.6	1,458,590	164,063	1,643	701.9	6,813.0
2011	8	1170.8	1180.6	-39.0	1,460,063	164,099	1,640	801.9	7,194.3
2011	9	968.1	1119.0	1600.0	1,459,413	163,992	1,636	663.3	6,823.5
2011	10	825.0	1009.1	763.1	1,458,328	163,675	1,632	565.7	6,165.2
2011	11	854.2	992.1	595.5	1,459,611	163,346	1,632	585.2	6,073.3
2011	12	963.4	990.8	727.4	1,460,792	163,462	1,633	659.5	6,061.1
2012	1	1078.4	1073.2	782.2	1,462,783	163,567	1,633	737.3	6,561.2
2012	2	1037.3	963.1	717.1	1,463,895	163,578	1,635	708.6	5,887.7
2012	3	969.4	1043.7	715.7	1,463,748	163,744	1,633	662.3	6,373.8
2012	4	843.1	1016.4	520.5	1,464,251	164,212	1,630	575.8	6,189.7
2012	5	824.0	1014.5	983.2	1,461,527	164,536	1,631	563.8	6,165.6

2012	6	888.3	1081.9	708.2	1,744,704	169,585	1,627	509.1	6,379.6
2012	7	1089.9	1105.6	695.0	1,750,853	164,660	1,629	622.5	6,714.2
2012	8	1200.7	1169.7	823.2	1,463,708	164,747	1,627	820.3	7,099.7
2012	9	1032.9	1171.4	785.4	1,463,814	164,676	1,626	705.6	7,113.5
2012	10	770.3	976.8	831.1	1,463,153	164,382	1,623	526.5	5,942.2
2012	11	827.9	955.0	741.8	1,464,416	164,152	1,624	565.4	5,817.8
2012	12	1025.8	1020.4	734.8	1,465,972	164,152	1,621	699.8	6,216.0
2013	1	1174.9	1067.6	826.6	1,467,578	164,227	1,619	800.6	6,500.8
2013	2	1072.4	1070.8	763.3	1,468,449	164,232	1,620	730.3	6,520.3
2013	3	996.9	987.3	846.3	1,469,237	164,314	1,619	678.5	6,008.8
2013	4	942.3	1014.2	692.6	1,469,534	164,825	1,616	641.2	6,153.3
2013	5	836.6	1020.4	845.4	1,468,493	165,121	1,613	569.7	6,179.6
2013	6	863.0	1007.9	784.2	1,468,189	165,222	1,614	587.8	6,100.5
2013	7	1085.9	1093.5	889.0	1,467,724	165,311	1,615	739.8	6,614.9
2013	8	1088.3	1174.5	826.7	1,468,305	165,299	1,612	741.2	7,105.0
2013	9	984.4	1089.6	843.3	1,468,231	165,239	1,614	670.5	6,594.4
2013	10	778.7	963.4	820.5	1,467,753	165,035	1,613	530.5	5,837.7
2013	11	822.6	965.4	792.7	1,469,328	164,890	1,614	559.9	5,854.7
2013	12	1068.5	1034.8	787.4	1,470,931	164,987	1,611	726.4	6,271.8
2014	1	1273.8	1113.8	793.4	1,472,150	165,069	1,610	865.3	6,747.6
2014	2	1151.9	1088.3	845.7	1,472,685	165,050	1,608	782.2	6,593.5
2014	3	1092.2	1060.8	670.4	1,473,096	165,047	1,605	741.4	6,427.3
2014	4	934.5	1049.4	1005.1	1,472,270	165,357	1,604	634.8	6,346.1
2014	5	834.4	984.5	823.1	1,470,815	165,611	1,602	567.3	5,944.7
2014	6	794.0	1013.9	833.6	1,469,845	165,657	1,600	540.2	6,120.7
2014	7	979.5	1083.4	857.9	1,468,302	165,701	1,594	667.1	6,538.4
2014	8	1008.5	1129.7	878.1	1,468,745	165,709	1,594	686.6	6,817.1
2014	9	919.9	1064.9	819.9	1,469,810	165,752	1,592	625.8	6,424.7
2014	10	799.1	997.4	839.2	1,468,598	165,553	1,591	544.1	6,024.9
2014	11	847.3	987.1	796.2	1,471,465	165,447	1,592	575.8	5,966.0
2014	12	1026.4	1033.7	829.0	1,473,264	165,617	1,592	696.7	6,241.4
2015	1	1163.2	1124.7	862.5	1,475,447	165,730	1,591	788.4	6,786.3
2015	2	1155.5	1053.4	785.0	1,476,916	165,805	1,591	782.4	6,353.5
2015	3	1109.4	1073.5	851.1	1,477,364	165,821	1,588	750.9	6,473.7
2015	4	947.9	1029.1	777.2	1,477,385	166,129	1,591	641.6	6,194.6
2015	5	783.0	973.8	551.4	1,475,753	166,483	1,590	530.6	5,849.0
2015	6	863.7	1033.7	1070.0	1,475,361	166,568	1,587	585.4	6,206.2
2015	7	927.4	1085.1	942.2	1,474,681	166,587	1,583	628.9	6,513.6
2015	8	1071.2	1129.1	827.4	1,475,268	166,657	1,584	726.1	6,774.9
2015	9	1055.4	1143.8	935.5	1,475,994	166,762	1,582	715.0	6,858.6
2015	10	841.9	1000.6	806.8	1,475,955	166,566	1,580	570.4	6,006.9
2015	11	777.8	932.6	802.2	1,477,938	166,471	1,576	526.3	5,602.4
2015	12	1022.6	1026.8	853.2	1,479,460	166,708	1,571	691.2	6,159.4
2016	1	1095.4	1052.6	840.4	1,482,223	166,910	1,569	739.0	6,306.3
2016	2	1002.4	1021.3	783.8	1,483,523	167,088	1,569	675.7	6,112.4
2016	3	1002.9	1029.9	777.5	1,484,125	167,248	1,570	675.7	6,158.2
2016	4	875.3	989.0	804.6	1,484,857	167,722	1,568	589.5	5,896.9
2016	5	740.0	913.1	813.2	1,484,401	167,951	1,568	498.5	5,436.4
2016	6	896.3	1036.8	801.4	1,483,793	168,133	1,567	604.0	6,166.5
2016	7	1088.6	1145.6	848.6	1,483,319	168,282	1,565	733.9	6,807.8
2016	8	1179.6	1164.1	858.0	1,484,633	168,402	1,566	794.5	6,912.7
2016	9	1096.7	1150.8	794.5	1,484,768	168,443	1,564	738.6	6,831.9
2016	10	821.3	1032.3	779.6	1,485,206	168,506	1,562	553.0	6,126.2
2016	11	808.7	940.9	794.2	1,487,623	168,397	1,558	543.6	5,587.6
2016	12	993.1	1002.1	759.7	1,489,942	168,743	1,560	666.5	5,938.4
2017	1	1134.1	1063.6	719.8	1,491,715	168,894	1,560	760.2	6,297.6
2017	2	977.0	998.4	751.5	1,492,758	168,977	1,559	654.5	5,908.6
2017	3	988.8	1014.8	872.0	1,493,441	169,120	1,559	662.1	6,000.2
2017	4	909.1	1014.4	807.9	1,494,002	169,585	1,556	608.5	5,981.8

2017	5	761.2	875.2	836.4	1,493,287	169,813	1,553	509.8	5,154.2
2017	6	852.5	1075.2	857.1	1,492,597	169,869	1,552	571.2	6,329.8
2017	7	1007.1	1112.4	884.8	1,492,469	169,995	1,552	674.8	6,543.6
2017	8	1030.6	1103.0	907.3	1,493,253	170,138	1,553	690.2	6,483.2
2017	9	902.4	1066.7	851.7	1,493,251	170,230	1,554	604.3	6,266.1
2017	10	841.7	1045.3	883.0	1,493,370	170,127	1,554	563.6	6,144.2
2017	11	827.3	991.5	842.4	1,496,038	170,166	1,553	553.0	5,826.6
2017	12	1015.4	1015.5	850.0	1,498,192	170,493	1,554	677.8	5,956.0
2018	1	1236.0	1080.7	864.1	1,499,365	170,729	1,553	824.4	6,330.1
2018	2	1068.1	1064.3	810.7	1,500,023	170,884	1,554	712.0	6,228.0
2018	3	962.4	1021.0	829.4	1,500,682	170,944	1,556	641.3	5,972.9
2018	4	937.8	1005.4	810.1	1,501,516	171,418	1,553	624.6	5,865.0
2018	5	797.3	899.5	-329.3	1,500,598	171,677	1,554	531.3	5,239.5
2018	6	869.3	1138.8	2126.8	1,500,375	171,756	1,551	579.4	6,630.6
2018	7	1121.4	1113.7	958.2	1,500,206	171,859	1,551	747.5	6,480.6
2018	8	1147.1	1170.3	880.6	1,501,060	171,987	1,549	764.2	6,804.4
2018	9	1145.4	1166.1	926.8	1,501,467	172,108	1,546	762.9	6,775.3
2018	10	862.1	1028.4	877.1	1,502,057	171,940	1,544	573.9	5,981.2
2018	11	862.1	954.9	865.7	1,504,272	172,004	1,540	573.1	5,551.6
2018	12	1059.8	1032.9	877.4	1,505,430	172,168	1,543	704.0	5,999.2
2019	1	1155.2	1080.5	843.7	1,506,878	172,341	1,542	766.6	6,269.8
2019	2	1099.6	1045.9	786.9	1,507,573	172,432	1,545	729.4	6,065.5
2019	3	1050.4	1047.9	836.7	1,508,233	172,684	1,545	696.4	6,068.4
2019	4	879.1	990.2	811.5	1,508,485	173,028	1,545	582.7	5,722.8
2019	5	795.6	943.2	525.6	1,507,833	173,259	1,545	527.7	5,443.9
2019	6	788.2	1000.3	1015.5	1,507,090	173,388	1,541	523.0	5,769.0
2019	7	1068.3	1120.2	979.5	1,506,429	173,468	1,544	709.2	6,457.7
2019	8	1177.2	1154.6	867.3	1,506,878	173,627	1,545	781.2	6,649.8
2019	9	930.1	1096.4	814.3	1,506,336	173,598	1,544	617.5	6,315.5
2019	10	763.4	969.7	805.9	1,507,083	173,532	1,544	506.6	5,587.8
2019	11	823.5	926.0	833.6	1,509,422	173,548	1,545	545.6	5,335.8
2019	12	1044.4	1022.9	793.3	1,510,245	173,672	1,545	691.5	5,890.0
2020	1	1145.9	1138.6	723.0	1,511,217	173,831	1,545	758.2	6,550.3
2020	2	1009.8	976.0	842.1	1,512,087	174,005	1,546	667.8	5,608.9
2020	3	986.4	1007.8	768.6	1,512,576	174,219	1,543	652.1	5,784.6
2020	4	906.2	906.4	766.9	1,512,821	174,406	1,544	599.0	5,197.3
2020	5	850.8	819.9	710.4	1,513,318	174,677	1,544	562.2	4,694.1
2020	6	958.9	888.3	769.6	1,514,082	174,850	1,544	633.3	5,080.5
2020	7	1310.0	1073.4	797.5	1,514,641	174,934	1,540	864.9	6,135.8
2020	8	1253.9	1068.6	852.6	1,515,786	175,104	1,542	827.2	6,102.7
2020	9	1048.0	1008.5	809.3	1,516,270	175,205	1,541	691.2	5,756.0
2020	10	821.8	915.2	730.8	1,517,002	175,289	1,540	541.7	5,221.3
2020	11	859.0	906.0	761.9	1,517,509	175,211	1,538	566.1	5,171.1
2020	12	1034.7	967.8	822.5	1,518,451	175,490	1,538	681.4	5,515.0
2021	1	1194.7	1042.5	840.1	1,519,086	175,693	1,537	786.4	5,933.8
2021	2	1133.9	902.0	716.9	1,519,972	175,980	1,538	746.0	5,125.4
2021	3	1037.0	1003.4	741.8	1,520,369	176,244	1,537	682.1	5,693.0
2021	4	922.4	1030.5	843.9	1,521,080	176,674	1,534	606.4	5,832.5
2021	5	759.7	874.7	799.6	1,525,040	176,897	1,532	498.2	4,944.5
2021	6	965.1	983.8	752.5	1,525,004	177,093	1,533	632.8	5,555.4
2021	7	1151.3	1096.3	926.1	1,525,401	177,217	1,532	754.8	6,186.2
2021	8	1174.3	1081.3	806.9	1,526,344	177,431	1,530	769.4	6,094.3
2021	9	1161.6	1115.6	926.0	1,525,995	177,584	1,531	761.2	6,282.3
2021	10	801.6	983.3	793.6	1,522,677	177,589	1,530	526.4	5,537.0
2021	11	827.0	952.8	855.1	1,523,623	177,497	1,531	542.8	5,367.9
2021	12	1037.2	1028.0	803.7	1,524,310	177,582	1,530	680.5	5,788.8
2022	1	1167.6	1054.4	639.5	1,525,146	177,781	1,531	765.6	5,930.6
2022	2	1141.3	1046.6	568.3	1,525,708	177,980	1,531	748.0	5,880.4
2022	3	1086.8	1046.6	715.2	1,525,759	178,171	1,532	712.3	5,874.1

2022	4	926.5	1016.6	628.1	1,525,832	178,432	1,533	607.2	5,697.5
2022	5	824.6	945.2	754.4	1,525,497	178,614	1,530	540.5	5,292.0
2022	6	883.8	1005.7	778.0	1,524,456	178,657	1,531	579.7	5,628.9
2022	7	1109.7	1110.9	814.4	1,523,703	178,723	1,531	728.3	6,215.9
2022	8	1222.0	1160.0	807.2	1,523,729	178,851	1,532	802.0	6,486.1
2022	9	1099.2	1126.6	766.0	1,523,322	178,885	1,532	721.6	6,297.7
2022	10	806.1	983.4	805.6	1,523,192	178,896	1,530	529.2	5,496.9
2022	11	805.9	868.5	746.2	1,524,127	178,874	1,529	528.7	4,855.2
2022	12	970.5	1072.7	717.6	1,525,014	178,992	1,528	636.4	5,993.1
2023	1	1179.7	1037.7	668.8	1,525,633	179,022	1,528	773.2	5,796.4
2023	2	1027.6	1002.4	732.1	1,526,315	179,006	1,528	673.2	5,599.5
2023	3	1048.0	984.8	737.7	1,526,678	179,057	1,525	686.5	5,499.9
2023	4	899.0	1042.0	757.5	1,526,854	179,377	1,524	588.8	5,809.2
2023	5	782.7	932.8	714.7	1,526,627	179,521	1,524	512.7	5,196.2
2023	6	841.0	963.6	732.1	1,526,198	179,564	1,526	551.0	5,366.2
2023	7	1105.5	1087.8	796.0	1,526,025	179,627	1,525	724.4	6,056.0
2023	8	1131.7	1117.7	777.5	1,525,896	179,774	1,521	741.7	6,217.1
2023	9	1008.7	1073.4	797.0	1,526,065	179,893	1,521	661.0	5,966.7
2023	10	829.2	1011.3	731.2	1,526,700	180,071	1,521	543.1	5,616.2
2023	11	840.4	968.8	756.0	1,528,166	180,113	1,521	549.9	5,378.7
2023	12	1025.5	1022.7	721.9	1,529,598	180,250	1,521	670.5	5,673.6
2024	1	1093.9	1047.1	770.1	1,530,399	180,384	1,520	714.8	5,805.1
2024	2	1027.0	1005.6	786.3	1,530,706	180,508	1,522	670.9	5,571.1
2024	3	952.0	1002.8	767.4	1,531,781	180,617	1,521	621.5	5,552.3
2024	4	918.8	1035.2	789.3	1,532,754	180,896	1,522	599.4	5,722.6
2024	5	796.0	979.8	767.7	1,532,658	180,996	1,521	519.4	5,413.2

year	month	EMPL_MANUF	idx_EMPL_MANUF	EMPL_TOTAL	idx_EMPL_TOTAL	GDP	idx_GDP	PCI	idx_PCI	HHOLDS	idx_HHOLDS
year	month	Manufacturing Employment (000's)	Manufacturing Employment Index (based January 2024)	Total Employment (000's)	Total Employment Index (based January 2024)	Gross Domestic Product ($XX, base 2017)	GDP Index (based January 2024)	Real Per Capita Income (base 2017)	Real Per Capita Income Index (based January 2024)	Number of Households (000's)	Households Index (based January 2024)
2003	1	[redacted]									
2003	2										
2003	3										
2003	4										
2003	5										
2003	6										
2003	7										
2003	8										
2003	9										
2003	10										
2003	11										
2003	12										
2004	1										
2004	2										
2004	3										
2004	4										
2004	5										
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2004	10										
2004	11										
2004	12										
2005	1										
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2005	9										
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2006	4										
2006	5										
2006	6										
2006	7										
2006	8										
2006	9										
2006	10										
2006	11										
2006	12										
2007	1										
2007	2										
2007	3										
2007	4										
2007	5										
2007	6										
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2007	9										
2007	10										
2007	11										
2007	12										
2008	1										
2008	2										
2008	3										
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2008	6										
2008	7										
2008	8										
2008	9										
2008	10										
2008	11										
2008	12										
2009	1										
2009	2										
2009	3										
2009	4										
2009	5										
2009	6										
2009	7										

2009	8	[redacted]
2009	9	
2009	10	
2009	11	
2009	12	
2010	1	
2010	2	
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2010	4	
2010	5	
2010	6	
2010	7	
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2010	11	
2010	12	
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2011	5	
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2011	11	
2011	12	
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2012	2	
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2012	12	
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2013	2	
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2013	10	
2013	11	
2013	12	
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2014	10	
2014	11	
2014	12	
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2015	6	
2015	7	
2015	8	
2015	9	
2015	10	
2015	11	
2015	12	
2016	1	
2016	2	
2016	3	
2016	4	
2016	5	
2016	6	

2016	7	[redacted]
2016	8	
2016	9	
2016	10	
2016	11	
2016	12	
2017	1	
2017	2	
2017	3	
2017	4	
2017	5	
2017	6	
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2017	10	
2017	11	
2017	12	
2018	1	
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2018	11	
2018	12	
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2019	10	
2019	11	
2019	12	
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2020	10	
2020	11	
2020	12	
2021	1	
2021	2	
2021	3	
2021	4	
2021	5	
2021	6	
2021	7	
2021	8	
2021	9	
2021	10	
2021	11	
2021	12	
2022	1	
2022	2	
2022	3	
2022	4	
2022	5	
2022	6	
2022	7	
2022	8	
2022	9	
2022	10	
2022	11	
2022	12	
2023	1	
2023	2	
2023	3	
2023	4	
2023	5	

2023	6	[redacted]
2023	7	
2023	8	
2023	9	
2023	10	
2023	11	
2023	12	
2024	1	
2024	2	
2024	3	
2024	4	
2024	5	

year	month	hdd_10	cdd_10
year	month	Heating Degree Days (actual)	Cooling Degree Days (actual)
1994	1	1,521.4	0.0
1994	2	1,432.2	0.0
1994	3	1,132.8	0.0
1994	4	725.1	0.3
1994	5	397.4	2.7
1994	6	157.8	82.7
1994	7	3.4	239.8
1994	8	20.2	171.7
1994	9	102.4	50.1
1994	10	293.3	9.1
1994	11	464.0	0.0
1994	12	898.8	0.0
1995	1	1,125.5	0.0
1995	2	1,173.3	0.0
1995	3	1,018.1	0.0
1995	4	747.9	0.0
1995	5	403.8	0.0
1995	6	98.9	66.0
1995	7	13.5	221.7
1995	8	1.7	270.0
1995	9	89.7	88.9
1995	10	247.4	3.4
1995	11	608.3	0.0
1995	12	1,159.4	0.0
1996	1	1,457.1	0.0
1996	2	1,225.6	0.0
1996	3	1,071.8	0.0
1996	4	841.9	0.0
1996	5	443.2	5.9
1996	6	137.3	57.2
1996	7	6.9	124.9
1996	8	2.0	146.4
1996	9	42.5	111.4
1996	10	312.8	6.9
1996	11	622.3	0.0
1996	12	1,001.3	0.0

1997	1	1,196.2	0.0
1997	2	1,170.2	0.0
1997	3	1,006.3	0.0
1997	4	807.3	0.0
1997	5	502.8	0.0
1997	6	192.7	38.0
1997	7	9.4	166.6
1997	8	10.2	137.7
1997	9	69.2	38.0
1997	10	288.7	3.1
1997	11	667.9	0.6
1997	12	1,027.8	0.0
1998	1	1,124.0	0.0
1998	2	1,058.5	0.0
1998	3	945.5	0.5
1998	4	629.3	4.9
1998	5	278.4	11.2
1998	6	118.6	57.3
1998	7	12.4	168.4
1998	8	3.9	190.9
1998	9	44.1	106.0
1998	10	249.7	24.8
1998	11	564.9	0.2
1998	12	769.8	0.0
1999	1	1,399.4	0.0
1999	2	1,114.6	0.0
1999	3	1,116.8	0.0
1999	4	672.9	0.0
1999	5	325.8	6.8
1999	6	92.4	104.8
1999	7	16.5	231.1
1999	8	4.0	210.8
1999	9	36.3	110.4
1999	10	291.2	24.9
1999	11	536.7	0.0
1999	12	847.3	0.0
2000	1	1,189.0	0.0
2000	2	1,351.5	0.0
2000	3	880.7	0.0
2000	4	686.2	0.0

2000	5	412.8	21.6
2000	6	192.6	35.6
2000	7	33.3	95.5
2000	8	16.8	108.5
2000	9	62.4	94.0
2000	10	308.2	19.2
2000	11	540.2	0.0
2000	12	1,090.6	0.0
2001	1	1,478.0	0.0
2001	2	1,106.7	0.0
2001	3	1,119.8	0.0
2001	4	818.1	0.3
2001	5	333.3	14.9
2001	6	179.5	33.3
2001	7	24.3	149.0
2001	8	4.9	230.8
2001	9	25.1	160.6
2001	10	208.8	26.2
2001	11	483.1	2.1
2001	12	689.3	0.0
2002	1	1,198.0	0.0
2002	2	1,030.7	0.0
2002	3	959.2	0.0
2002	4	754.7	8.3
2002	5	493.7	14.6
2002	6	240.1	40.1
2002	7	23.2	214.6
2002	8	0.6	273.5
2002	9	8.8	165.9
2002	10	155.0	61.2
2002	11	660.1	2.7
2002	12	1,092.5	0.0
2003	1	1,399.2	0.0
2003	2	1,453.1	0.0
2003	3	1,239.6	0.0
2003	4	822.7	0.7
2003	5	448.2	0.7
2003	6	214.4	7.4
2003	7	22.6	155.1
2003	8	0.3	200.2

2003	9	29.0	131.1
2003	10	253.9	16.5
2003	11	581.2	0.1
2003	12	1,002.3	0.0
2004	1	1,327.2	0.0
2004	2	1,426.0	0.0
2004	3	1,069.3	0.0
2004	4	784.5	0.8
2004	5	398.8	16.3
2004	6	136.4	45.4
2004	7	44.8	93.1
2004	8	12.7	126.9
2004	9	27.9	99.5
2004	10	214.7	21.9
2004	11	584.5	0.0
2004	12	966.8	0.0
2005	1	1,259.3	0.0
2005	2	1,334.1	0.0
2005	3	1,287.3	0.0
2005	4	774.5	0.0
2005	5	460.6	1.5
2005	6	190.1	90.4
2005	7	13.1	278.8
2005	8	0.0	295.0
2005	9	5.6	167.4
2005	10	129.0	50.1
2005	11	530.2	2.5
2005	12	1,051.3	0.0
2006	1	1,210.5	0.0
2006	2	998.1	0.0
2006	3	1,184.9	0.0
2006	4	726.4	0.0
2006	5	375.8	0.0
2006	6	157.7	62.8
2006	7	16.9	200.5
2006	8	2.1	274.9
2006	9	51.4	70.4
2006	10	258.5	5.8
2006	11	592.8	0.0
2006	12	806.5	0.0

2007	1	938.2	0.0
2007	2	1,300.8	0.0
2007	3	1,208.8	0.0
2007	4	839.2	0.2
2007	5	404.3	9.7
2007	6	105.7	91.0
2007	7	16.9	150.1
2007	8	5.4	199.8
2007	9	37.3	135.0
2007	10	110.6	52.6
2007	11	482.3	8.7
2007	12	1,019.2	0.0
2008	1	1,148.2	0.0
2008	2	1,104.9	0.0
2008	3	1,060.4	0.0
2008	4	786.5	0.6
2008	5	333.0	1.7
2008	6	208.6	58.3
2008	7	16.8	163.5
2008	8	4.4	178.4
2008	9	35.9	97.2
2008	10	232.7	19.4
2008	11	576.2	0.0
2008	12	994.7	0.0
2009	1	1,346.4	0.0
2009	2	1,282.7	0.0
2009	3	1,053.9	0.0
2009	4	745.9	1.5
2009	5	349.9	10.3
2009	6	150.0	12.7
2009	7	22.6	56.2
2009	8	3.4	148.9
2009	9	48.2	101.4
2009	10	313.3	8.5
2009	11	546.2	0.0
2009	12	841.7	0.0
2010	1	1,346.4	0.0
2010	2	1,201.7	0.0
2010	3	962.7	0.0
2010	4	578.2	2.6

2010	5	347.2	17.8
2010	6	95.5	95.0
2010	7	18.9	222.9
2010	8	0.6	250.0
2010	9	50.1	135.9
2010	10	247.2	19.8
2010	11	545.7	0.0
2010	12	959.8	0.0
2011	1	1,298.4	0.0
2011	2	1,292.0	0.0
2011	3	1,082.7	0.0
2011	4	818.3	0.4
2011	5	391.9	4.8
2011	6	80.3	85.8
2011	7	8.6	191.6
2011	8	0.1	279.9
2011	9	30.5	128.1
2011	10	163.5	30.8
2011	11	517.0	0.0
2011	12	732.9	0.0
2012	1	1,062.8	0.0
2012	2	1,007.2	0.0
2012	3	822.8	0.3
2012	4	551.0	3.1
2012	5	385.7	14.6
2012	6	80.9	100.8
2012	7	7.4	254.0
2012	8	0.3	278.9
2012	9	31.8	151.8
2012	10	243.5	12.6
2012	11	524.0	0.0
2012	12	854.7	0.0
2013	1	1,147.3	0.0
2013	2	1,160.8	0.0
2013	3	1,014.3	0.0
2013	4	829.2	0.0
2013	5	346.7	9.6
2013	6	142.3	68.6
2013	7	17.3	223.3
2013	8	4.9	177.5

2013	9	64.4	123.8
2013	10	201.6	13.5
2013	11	540.6	0.0
2013	12	1,028.3	0.0
2014	1	1,361.1	0.0
2014	2	1,319.4	0.0
2014	3	1,268.8	0.0
2014	4	843.5	0.6
2014	5	410.9	10.8
2014	6	95.3	63.5
2014	7	6.8	185.7
2014	8	6.3	132.6
2014	9	48.7	116.2
2014	10	197.3	21.4
2014	11	518.5	4.4
2014	12	968.0	0.0
2015	1	1,253.5	0.0
2015	2	1,447.5	0.0
2015	3	1,337.7	0.0
2015	4	850.6	0.0
2015	5	313.7	35.4
2015	6	102.2	92.4
2015	7	13.6	118.0
2015	8	0.6	211.6
2015	9	15.8	180.0
2015	10	202.9	39.7
2015	11	457.0	0.0
2015	12	700.1	0.0
2016	1	1,000.5	0.0
2016	2	1,080.3	0.0
2016	3	950.6	0.0
2016	4	736.3	0.0
2016	5	429.8	2.1
2016	6	116.8	102.1
2016	7	16.6	205.0
2016	8	0.0	284.7
2016	9	12.4	206.0
2016	10	170.6	40.7
2016	11	509.2	3.5
2016	12	872.2	0.0

2017	1	1,132.3	0.0
2017	2	1,012.9	0.0
2017	3	941.2	0.0
2017	4	778.3	2.0
2017	5	369.3	12.5
2017	6	154.2	59.6
2017	7	15.3	166.9
2017	8	3.9	157.2
2017	9	73.1	82.1
2017	10	124.5	72.9
2017	11	489.0	3.8
2017	12	930.7	0.0
2018	1	1,438.4	0.0
2018	2	1,111.0	0.0
2018	3	943.1	0.0
2018	4	922.1	0.0
2018	5	420.1	13.3
2018	6	62.2	80.3
2018	7	4.6	224.2
2018	8	0.0	263.1
2018	9	24.6	225.2
2018	10	204.4	65.1
2018	11	642.7	6.6
2018	12	1,015.8	0.0
2019	1	1,175.3	0.0
2019	2	1,242.2	0.0
2019	3	1,120.1	0.0
2019	4	737.1	0.0
2019	5	427.5	1.5
2019	6	149.4	22.8
2019	7	8.3	211.2
2019	8	0.3	251.9
2019	9	29.0	96.0
2019	10	192.8	26.0
2019	11	564.3	0.3
2019	12	998.9	0.0
2020	1	1,075.7	0.0
2020	2	1,035.2	0.0
2020	3	867.2	0.0
2020	4	695.1	0.0

2020	5	509.5	6.8
2020	6	131.5	111.9
2020	7	15.7	289.7
2020	8	0.1	269.4
2020	9	40.7	124.8
2020	10	231.8	24.5
2020	11	505.8	0.4
2020	12	828.8	0.0
2021	1	1,138.5	0.0
2021	2	1,230.3	0.0
2021	3	1,045.7	0.0
2021	4	630.3	0.0
2021	5	408.7	9.4
2021	6	127.5	102.6
2021	7	13.1	191.5
2021	8	4.6	180.5
2021	9	12.1	178.4
2021	10	97.7	24.3
2021	11	437.9	2.5
2021	12	837.4	0.0
2022	1	1,076.5	0.0
2022	2	1,258.6	0.0
2022	3	1,012.2	0.0
2022	4	749.9	0.0
2022	5	391.7	15.4
2022	6	67.7	76.1
2022	7	13.4	178.9
2022	8	0.0	281.3
2022	9	13.7	164.5
2022	10	252.4	19.8
2022	11	447.1	3.0
2022	12	851.5	1.3
2023	1	1,051.6	0.0
2023	2	1,006.7	0.0
2023	3	959.3	0.0
2023	4	712.5	6.3
2023	5	373.8	9.4
2023	6	125.2	61.0
2023	7	15.0	196.2
2023	8	0.0	198.1

2023	9	22.0	131.4
2023	10	169.8	33.3
2023	11	502.5	6.1
2023	12	820.4	0.0
2024	1	996.8	0.0
2024	2	979.7	0.0
2024	3	805.3	0.0
2024	4	688.6	0.0
2024	5	296.8	14.0

year	month	ee_r_cum_m	ee_c_cum_m	ee_i_cum_m	pv_r_cum_m	pv_c_cum_m	pv_i_cum_m	eh_r_cum_m	eh_c_cum_m	eh_i_cum_m	ev_r_cum_m	ev_c_cum_m	ev_i_cum_m
year	month	Cumulative Residential EE (GWh)	Cumulative Commercial EE (GWh)	Cumulative Industrial EE (GWh)	Cumulative Residential PV (GWh)	Cumulative Commercial PV (GWh)	Cumulative Industrial PV (GWh)	Cumulative Residential EHP (GWh)	Cumulative Commercial EHP (GWh)	Cumulative Industrial EHP (GWh)	Cumulative Residential EV (GWh)	Cumulative Commercial EV (GWh)	Cumulative Industrial EV (GWh)
2003	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2003	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2005	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	3	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	4	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006	5	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2006	6	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2006	7	0.00	0.00	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2006	8	0.00	0.00	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2006	9	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2006	10	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2006	11	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2006	12	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	1	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	2	0.00	0.00	0.00	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	3	0.00	0.00	0.00	0.04	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	4	0.00	0.00	0.00	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	5	0.00	0.00	0.00	0.07	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	6	0.00	0.00	0.00	0.08	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2007	7	0.00	0.00	0.00	0.08	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2007	8	0.00	0.00	0.00	0.08	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2007	9	0.00	0.00	0.00	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	10	0.00	0.00	0.00	0.05	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	11	0.00	0.00	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2007	12	0.00	0.00	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2008	1	0.00	0.00	0.00	0.03	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2008	2	0.00	0.00	0.00	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2008	3	0.00	0.00	0.00	0.09	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2008	4	0.00	0.00	0.00	0.12	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2008	5	0.00	0.00	0.00	0.14	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2008	6	0.00	0.00	0.00	0.17	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2008	7	0.00	0.00	0.00	0.16	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2008	8	0.00	0.00	0.00	0.15	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2008	9	0.00	0.00	0.00	0.12	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2008	10	0.00	0.00	0.00	0.09	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2008	11	0.00	0.00	0.00	0.06	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2008	12	0.00	0.00	0.00	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2009	1	0.00	0.03	0.02	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
2009	2	0.01	0.05	0.04	0.10	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2009	3	0.01	0.08	0.06	0.17	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00
2009	4	0.01	0.11	0.07	0.22	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00
2009	5	0.02	0.14	0.09	0.26	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00
2009	6	0.03	0.16	0.11	0.30	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00

2009	7	0.04	0.20	0.13	0.29	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00
2009	8	0.04	0.23	0.16	0.28	0.06	0.04	0.00	0.00	0.00	0.00	0.00	0.00
2009	9	0.04	0.25	0.17	0.22	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00
2009	10	0.03	0.29	0.20	0.17	0.05	0.04	0.00	0.00	0.00	0.00	0.00	0.00
2009	11	0.03	0.31	0.21	0.11	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00
2009	12	0.04	0.35	0.24	0.09	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00
2010	1	0.10	0.87	0.61	0.09	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00
2010	2	0.14	1.24	0.87	0.17	0.08	0.06	0.00	0.00	0.00	0.00	0.00	0.00
2010	3	0.21	1.87	1.31	0.30	0.13	0.09	0.00	0.00	0.00	0.00	0.00	0.00
2010	4	0.26	2.28	1.60	0.38	0.16	0.11	0.00	0.00	0.00	0.00	0.00	0.00
2010	5	0.38	2.85	2.01	0.45	0.19	0.14	0.00	0.00	0.00	0.00	0.00	0.00
2010	6	0.54	3.26	2.29	0.53	0.24	0.17	0.00	0.00	0.00	0.00	0.00	0.00
2010	7	0.82	3.91	2.75	0.51	0.24	0.17	0.00	0.00	0.00	0.00	0.00	0.00
2010	8	0.90	4.50	3.17	0.48	0.25	0.18	0.00	0.00	0.00	0.00	0.00	0.00
2010	9	0.72	4.90	3.45	0.38	0.23	0.16	0.00	0.00	0.00	0.00	0.00	0.00
2010	10	0.62	5.57	3.92	0.29	0.23	0.16	0.00	0.00	0.00	0.00	0.00	0.00
2010	11	0.63	5.93	4.17	0.19	0.18	0.13	0.00	0.00	0.00	0.00	0.00	0.00
2010	12	0.74	6.68	4.71	0.15	0.17	0.12	0.00	0.00	0.00	0.00	0.00	0.00
2011	1	0.93	7.75	5.48	0.15	0.17	0.12	0.00	0.00	0.00	0.01	0.00	0.00
2011	2	1.02	7.90	5.59	0.28	0.29	0.21	0.00	0.00	0.00	0.01	0.00	0.00
2011	3	1.29	9.73	6.90	0.48	0.43	0.30	0.00	0.00	0.00	0.01	0.00	0.00
2011	4	1.44	10.35	7.35	0.60	0.48	0.34	0.00	0.00	0.00	0.01	0.00	0.00
2011	5	1.95	11.76	8.36	0.70	0.55	0.39	0.00	0.00	0.00	0.01	0.00	0.00
2011	6	2.64	12.45	8.86	0.79	0.66	0.47	0.00	0.00	0.00	0.01	0.00	0.00
2011	7	3.82	14.07	10.02	0.76	0.66	0.47	0.00	0.00	0.00	0.01	0.00	0.00
2011	8	4.03	15.46	11.01	0.70	0.65	0.46	0.00	0.00	0.00	0.01	0.01	0.00
2011	9	3.13	16.15	11.51	0.56	0.59	0.42	0.00	0.00	0.00	0.01	0.01	0.00
2011	10	2.64	17.75	12.66	0.42	0.56	0.40	0.00	0.00	0.00	0.01	0.01	0.00
2011	11	2.64	18.37	13.10	0.27	0.44	0.32	0.00	0.00	0.00	0.02	0.01	0.00
2011	12	3.03	20.20	14.41	0.21	0.40	0.29	0.00	0.00	0.00	0.02	0.01	0.00
2012	1	3.20	20.66	14.75	0.22	0.38	0.27	0.00	0.00	0.00	0.03	0.01	0.00
2012	2	3.04	18.93	13.51	0.42	0.65	0.47	0.00	0.00	0.00	0.03	0.02	0.00
2012	3	3.45	21.30	15.20	0.70	0.89	0.64	0.00	0.00	0.00	0.04	0.02	0.00
2012	4	3.52	20.94	14.95	0.89	0.98	0.70	0.00	0.00	0.00	0.04	0.02	0.00
2012	5	4.41	22.19	15.85	1.05	1.10	0.78	0.00	0.00	0.00	0.05	0.02	0.00
2012	6	5.58	22.10	15.78	1.21	1.27	0.91	0.00	0.00	0.00	0.05	0.03	0.00
2012	7	7.64	23.63	16.88	1.16	1.24	0.89	0.00	0.00	0.00	0.05	0.03	0.00
2012	8	7.66	24.69	17.64	1.09	1.21	0.86	0.00	0.00	0.00	0.06	0.03	0.00
2012	9	5.69	24.65	17.61	0.87	1.08	0.77	0.00	0.00	0.00	0.07	0.04	0.01
2012	10	4.61	26.00	18.58	0.67	1.00	0.72	0.00	0.00	0.00	0.09	0.05	0.01
2012	11	4.45	25.90	18.51	0.42	0.78	0.56	0.00	0.00	0.00	0.09	0.05	0.01
2012	12	4.94	27.50	19.65	0.33	0.70	0.50	0.00	0.00	0.00	0.11	0.06	0.01
2013	1	4.99	27.97	20.03	0.35	0.67	0.48	0.00	0.00	0.00	0.12	0.06	0.01
2013	2	4.52	25.49	18.29	0.64	1.13	0.82	0.00	0.00	0.00	0.11	0.06	0.01
2013	3	4.92	28.53	20.51	1.10	1.61	1.17	0.00	0.00	0.00	0.13	0.07	0.01
2013	4	4.81	27.92	20.11	1.38	1.79	1.30	0.00	0.00	0.00	0.12	0.06	0.01
2013	5	5.81	29.45	21.25	1.62	2.01	1.47	0.00	0.00	0.00	0.12	0.06	0.01
2013	6	7.07	29.20	21.10	1.86	2.35	1.72	0.00	0.00	0.00	0.11	0.06	0.01
2013	7	9.34	31.09	22.50	1.77	2.30	1.70	0.00	0.00	0.00	0.11	0.06	0.01
2013	8	9.04	32.36	23.46	1.65	2.25	1.66	0.00	0.00	0.00	0.12	0.06	0.01
2013	9	6.51	32.18	23.36	1.31	2.02	1.49	0.00	0.00	0.00	0.13	0.07	0.01
2013	10	5.10	33.82	24.58	1.01	1.89	1.40	0.00	0.00	0.00	0.16	0.08	0.01
2013	11	4.78	33.57	24.43	0.64	1.48	1.10	0.00	0.00	0.00	0.16	0.09	0.01
2013	12	5.15	35.52	25.89	0.50	1.33	0.99	0.00	0.00	0.00	0.18	0.09	0.01
2014	1	5.31	36.03	26.31	0.54	1.24	0.92	0.00	0.00	0.00	0.20	0.11	0.01
2014	2	4.92	32.74	23.94	1.05	2.03	1.52	0.00	0.00	0.00	0.19	0.10	0.01
2014	3	5.46	36.56	26.78	1.86	2.83	2.12	0.00	0.00	0.00	0.22	0.12	0.02
2014	4	5.44	35.69	26.19	2.41	3.08	2.31	0.00	0.00	0.00	0.21	0.11	0.02
2014	5	6.69	37.55	27.60	2.91	3.39	2.56	0.00	0.00	0.00	0.23	0.11	0.02
2014	6	8.31	37.15	27.34	3.43	3.90	2.94	0.00	0.00	0.00	0.21	0.11	0.02
2014	7	11.17	39.46	29.09	3.36	3.76	2.85	0.00	0.00	0.00	0.21	0.11	0.02
2014	8	11.01	40.99	30.26	3.20	3.63	2.75	0.00	0.00	0.00	0.24	0.12	0.02
2014	9	8.05	40.68	30.06	2.60	3.21	2.43	0.00	0.00	0.00	0.25	0.14	0.02
2014	10	6.42	42.67	31.58	2.03	2.97	2.25	0.00	0.00	0.00	0.31	0.16	0.02
2014	11	6.12	42.28	31.33	1.30	2.31	1.75	0.00	0.00	0.00	0.33	0.17	0.03
2014	12	6.70	44.66	33.13	1.04	2.04	1.55	0.00	0.00	0.00	0.37	0.19	0.03
2015	1	7.37	45.35	33.70	1.13	1.87	1.42	0.00	0.00	0.00	0.39	0.20	0.03
2015	2	7.23	41.25	30.71	2.18	3.01	2.29	0.00	0.00	0.00	0.34	0.18	0.03
2015	3	8.45	46.12	34.38	3.86	4.12	3.15	0.00	0.00	0.00	0.38	0.20	0.03
2015	4	8.84	45.06	33.65	5.00	4.41	3.37	0.00	0.00	0.00	0.34	0.18	0.03
2015	5	11.36	47.47	35.50	6.03	4.79	3.67	0.00	0.00	0.00	0.34	0.17	0.02
2015	6	14.67	47.00	35.20	7.10	5.43	4.16	0.00	0.00	0.00	0.31	0.16	0.02
2015	7	20.46	49.97	37.48	6.95	5.17	3.97	0.00	0.00	0.00	0.30	0.15	0.02
2015	8	20.86	51.96	39.02	6.62	4.93	3.79	0.00	0.00	0.00	0.32	0.16	0.02
2015	9	15.75	51.60	38.80	5.37	4.31	3.31	0.00	0.00	0.00	0.32	0.18	0.03
2015	10	12.93	54.18	40.79	4.19	3.94	3.03	0.00	0.00	0.00	0.39	0.20	0.03
2015	11	12.66	53.72	40.49	2.69	3.02	2.33	0.00	0.00	0.00	0.39	0.21	0.03
2015	12	14.24	56.79	42.85	2.15	2.65	2.04	0.00	0.00	0.00	0.43	0.22	0.03
2016	1	14.35	56.87	42.93	2.22	2.46	1.89	0.00	0.00	0.00	0.45	0.23	0.03
2016	2	13.00	51.05	38.54	4.25	4.15	3.20	0.00	0.00	0.00	0.39	0.21	0.03
2016	3	14.13	56.34	42.55	6.99	5.56	4.29	0.00	0.00	0.00	0.44	0.23	0.03
2016	4	13.81	54.36	41.07	8.76	6.02	4.64	0.00	0.00	0.00	0.39	0.20	0.03

2016	5	16.64	56.57	42.74	10.22	6.61	5.10	0.00	0.00	0.00	0.40	0.20	0.03
2016	6	20.26	55.35	41.83	11.69	7.56	5.84	0.00	0.00	0.00	0.35	0.19	0.03
2016	7	26.73	58.17	43.98	11.14	7.27	5.62	0.00	0.00	0.00	0.34	0.17	0.02
2016	8	25.86	59.81	45.23	10.36	6.99	5.40	0.00	0.00	0.00	0.36	0.19	0.03
2016	9	18.59	58.76	44.44	8.21	6.16	4.76	0.00	0.00	0.00	0.37	0.20	0.03
2016	10	14.56	61.04	46.17	6.28	5.68	4.39	0.00	0.00	0.00	0.44	0.23	0.03
2016	11	13.63	59.90	45.33	3.96	4.40	3.40	0.00	0.00	0.00	0.44	0.24	0.03
2016	12	14.69	62.68	47.44	3.11	3.89	3.00	0.00	0.00	0.00	0.48	0.25	0.04
2017	1	14.92	62.68	47.47	3.14	3.68	2.85	0.00	0.00	0.00	0.53	0.27	0.04
2017	2	13.62	56.18	42.56	5.68	6.11	4.75	0.00	0.00	0.00	0.47	0.25	0.04
2017	3	14.91	61.91	46.93	9.49	8.64	6.73	0.00	0.00	0.00	0.55	0.28	0.04
2017	4	14.68	59.66	45.24	11.66	9.50	7.42	0.00	0.00	0.00	0.50	0.26	0.04
2017	5	17.83	61.99	47.03	13.37	10.59	8.28	0.00	0.00	0.00	0.53	0.26	0.04
2017	6	21.87	60.56	45.97	15.03	12.29	9.62	0.00	0.00	0.00	0.48	0.25	0.04
2017	7	29.05	63.57	48.27	14.10	11.97	9.39	0.00	0.00	0.00	0.48	0.24	0.03
2017	8	28.30	65.27	49.59	12.91	11.66	9.15	0.00	0.00	0.00	0.52	0.27	0.04
2017	9	20.48	64.04	48.67	10.08	10.39	8.16	0.00	0.00	0.00	0.54	0.30	0.04
2017	10	16.16	66.43	50.51	7.60	9.68	7.61	0.00	0.00	0.00	0.67	0.35	0.05
2017	11	15.23	65.11	49.53	4.73	7.56	5.96	0.00	0.00	0.00	0.69	0.37	0.05
2017	12	16.52	68.05	51.79	3.66	6.74	5.32	0.00	0.00	0.00	0.76	0.40	0.06
2018	1	16.85	68.11	51.89	3.68	6.28	4.97	0.00	0.00	0.00	0.84	0.43	0.06
2018	2	15.45	61.09	46.59	6.63	10.29	8.18	0.00	0.00	0.00	0.74	0.39	0.06
2018	3	16.98	67.37	51.44	11.00	14.36	11.46	0.00	0.00	0.00	0.85	0.44	0.06
2018	4	16.79	64.97	49.65	13.47	15.61	12.50	0.00	0.00	0.00	0.78	0.41	0.06
2018	5	20.47	67.55	51.68	15.36	17.21	13.82	0.00	0.00	0.00	0.81	0.41	0.06
2018	6	25.20	66.05	50.59	17.20	19.77	15.92	0.00	0.00	0.00	0.74	0.39	0.06
2018	7	33.60	69.38	53.19	16.06	19.08	15.41	0.00	0.00	0.00	0.73	0.37	0.05
2018	8	32.86	71.29	54.71	14.65	18.42	14.91	0.00	0.00	0.00	0.79	0.41	0.06
2018	9	23.86	69.99	53.76	11.39	16.28	13.21	0.00	0.00	0.00	0.82	0.45	0.07
2018	10	18.89	72.66	55.86	8.55	15.06	12.24	0.00	0.00	0.00	1.01	0.53	0.08
2018	11	17.87	71.27	54.84	5.30	11.68	9.52	0.00	0.00	0.00	1.04	0.56	0.08
2018	12	19.45	74.53	57.41	4.08	10.35	8.45	0.00	0.00	0.00	1.15	0.60	0.09
2019	1	19.90	74.77	57.62	4.10	9.37	7.64	0.00	0.00	0.00	1.24	0.63	0.09
2019	2	18.31	67.23	51.82	7.36	14.95	12.19	0.00	0.00	0.00	1.08	0.58	0.09
2019	3	20.19	74.31	57.30	12.21	20.32	16.57	0.00	0.00	0.00	1.23	0.63	0.09
2019	4	20.02	71.82	55.40	14.91	21.56	17.58	0.00	0.00	0.00	1.10	0.58	0.09
2019	5	24.48	74.85	57.76	16.97	23.23	18.93	0.00	0.00	0.00	1.14	0.57	0.08
2019	6	30.22	73.34	56.62	18.96	26.10	21.26	0.00	0.00	0.00	1.03	0.54	0.08
2019	7	40.41	77.21	59.62	17.67	24.68	20.10	0.00	0.00	0.00	1.00	0.50	0.07
2019	8	39.62	79.50	61.41	16.08	23.35	19.01	0.00	0.00	0.00	1.07	0.56	0.08
2019	9	28.85	78.21	60.44	12.48	20.25	16.49	0.00	0.00	0.00	1.10	0.61	0.09
2019	10	22.89	81.36	62.89	9.35	18.39	14.97	0.00	0.00	0.00	1.34	0.70	0.10
2019	11	21.71	79.96	61.83	5.78	14.03	11.41	0.00	0.00	0.00	1.37	0.73	0.11
2019	12	23.69	83.79	64.81	4.45	12.22	9.94	0.00	0.00	0.00	1.50	0.78	0.12
2020	1	25.17	84.07	65.05	4.47	11.36	9.24	0.15	0.00	0.00	1.41	0.72	0.11
2020	2	23.98	75.59	58.52	8.32	19.25	15.65	0.23	0.00	0.00	1.22	0.65	0.10
2020	3	27.32	83.56	64.71	13.31	25.89	21.03	0.29	0.00	0.00	1.38	0.71	0.11
2020	4	27.93	80.77	62.57	16.26	28.10	22.82	0.20	0.00	0.00	1.24	0.64	0.10
2020	5	35.14	84.18	65.24	18.52	30.94	25.12	0.06	0.00	0.00	1.27	0.64	0.09
2020	6	44.58	82.50	63.96	20.69	35.49	28.80	0.00	0.00	0.00	1.14	0.60	0.09
2020	7	61.14	86.85	67.36	19.29	34.22	27.76	0.00	0.00	0.00	1.11	0.56	0.08
2020	8	61.41	89.44	69.39	17.56	32.99	26.76	0.00	0.00	0.00	1.18	0.62	0.09
2020	9	45.75	88.00	68.29	13.63	29.13	23.62	0.04	0.00	0.00	1.21	0.67	0.10
2020	10	37.09	91.55	71.07	10.22	26.91	21.82	0.29	0.00	0.00	1.47	0.77	0.11
2020	11	35.90	89.98	69.88	6.32	20.87	16.91	0.81	0.00	0.00	1.50	0.80	0.12
2020	12	39.94	94.29	73.25	4.86	18.48	14.97	1.32	0.00	0.00	1.64	0.85	0.13
2021	1	41.16	94.47	73.42	4.88	16.96	13.74	1.96	0.26	0.00	2.04	1.04	0.15
2021	2	38.12	84.83	65.96	8.75	27.43	22.23	1.73	0.39	0.00	1.81	0.96	0.14
2021	3	42.29	93.65	72.84	14.49	37.78	30.62	1.54	0.43	0.00	2.07	1.07	0.16
2021	4	42.20	90.40	70.34	17.67	40.60	32.90	0.88	0.24	0.00	1.89	0.99	0.15
2021	5	51.90	94.10	73.25	20.10	44.27	35.88	0.22	0.08	0.00	1.98	0.99	0.15
2021	6	64.44	92.10	71.72	22.43	50.33	40.79	0.00	0.00	0.00	1.80	0.95	0.14
2021	7	86.64	96.84	75.43	20.89	48.12	39.00	0.00	0.00	0.00	1.77	0.89	0.13
2021	8	85.40	99.60	77.61	18.99	46.02	37.30	0.00	0.00	0.00	1.92	1.00	0.15
2021	9	62.50	97.88	76.29	14.72	40.33	32.69	0.10	0.06	0.00	2.00	1.10	0.16
2021	10	49.84	101.71	79.31	11.02	36.99	29.98	0.73	0.32	0.00	2.45	1.28	0.19
2021	11	47.49	99.85	77.88	6.81	28.49	23.09	1.95	0.98	0.00	2.52	1.35	0.20
2021	12	52.04	104.52	81.55	5.23	25.06	20.31	3.17	1.94	0.00	2.79	1.45	0.21
2022	1	53.29	104.63	81.58	5.27	22.99	18.57	4.57	0.82	0.00	3.12	1.60	0.24
2022	2	49.04	93.88	73.14	9.52	37.19	29.93	3.82	0.77	0.00	2.71	1.47	0.22
2022	3	54.08	103.55	80.61	15.84	51.21	41.07	3.21	0.68	0.00	3.07	1.62	0.25
2022	4	53.65	99.88	77.70	19.42	55.02	43.99	1.72	0.34	0.00	2.77	1.48	0.23
2022	5	65.63	103.89	80.75	22.20	59.98	47.80	0.42	0.10	0.00	2.86	1.48	0.23
2022	6	81.05	101.60	78.92	24.90	68.18	54.18	0.00	0.00	0.00	2.57	1.40	0.22
2022	7	108.42	106.75	82.86	23.30	65.18	51.65	0.00	0.00	0.00	2.50	1.30	0.21
2022	8	106.33	109.71	85.09	21.28	62.32	49.26	0.00	0.00	0.00	2.69	1.45	0.24
2022	9	77.46	107.74	83.50	16.57	54.61	43.05	0.17	0.07	0.00	2.76	1.60	0.26
2022	10	61.48	111.87	86.65	12.47	50.08	39.39	1.25	0.34	0.00	3.36	1.86	0.30
2022	11	58.32	109.75	84.94	7.74	38.57	30.26	3.32	1.00	0.00	3.43	1.96	0.32
2022	12	63.64	114.80	88.79	5.97	33.92	26.55	5.35	1.94	0.00	3.76	2.09	0.36
2023	1	64.67	114.88	88.79	6.02	30.90	24.14	7.75	1.95	0.00	4.23	2.43	0.46
2023	2	59.08	103.03	79.58	10.87	49.64	38.70	6.48	1.57	0.00	3.81	2.36	0.47

2023	3	64.69	113.60	87.69	18.10	67.93	52.85	5.42	1.24	0.00	4.45	2.69	0.56
2023	4	63.72	109.53	84.49	22.20	72.53	56.32	2.88	0.56	0.00	4.13	2.56	0.55
2023	5	77.42	113.88	87.79	25.38	78.61	60.93	0.70	0.15	0.00	4.38	2.64	0.58
2023	6	94.98	111.33	85.77	28.48	88.86	68.75	0.00	0.00	0.00	4.04	2.55	0.58
2023	7	126.24	116.93	90.03	26.65	84.49	65.26	0.00	0.00	0.00	4.03	2.50	0.60
2023	8	123.03	120.13	92.43	24.35	80.38	61.98	0.00	0.00	0.00	4.42	2.84	0.68
2023	9	89.08	117.92	90.68	18.97	70.09	53.96	0.28	0.09	0.00	4.64	3.22	0.76
2023	10	70.28	122.41	94.07	14.27	63.97	49.18	2.08	0.41	0.00	5.75	3.85	0.93
2023	11	66.29	120.04	92.20	8.86	49.04	37.64	5.54	1.19	0.00	5.98	4.18	1.05
2023	12	71.93	125.52	96.36	6.84	42.94	32.92	9.05	2.24	0.00	6.67	4.66	1.26
2024	1	73.00	125.54	96.29	6.89	38.96	29.80	12.86	3.63	0.00	7.50	5.45	1.54
2024	2	66.61	112.53	86.24	12.86	64.55	49.28	10.55	2.85	0.00	6.70	5.24	1.52
2024	3	72.86	124.02	94.96	20.64	84.95	64.73	8.63	2.20	0.00	7.69	5.82	1.70
2024	4	71.69	119.51	91.44	25.28	90.36	68.73	4.48	0.97	0.00	7.34	5.59	1.61
2024	5	87.01	124.19	94.94	28.86	97.58	74.08	1.09	0.26	0.00	7.65	5.64	1.63

year	month	EMPL_MANUF	idx_EMPL_MANU	EMPL_TOTA	idx_EMPL_TO	GDP	idx_GDP	PCI	idx_PCI	HHOLDS	idx_HHOLDS
year	month	Manufacturing Employment (000's)	Manufacturing Employment Index (based January 2024)	Total Employment (000's)	Total Employment Index (based January 2024)	Gross Domestic Product ($XX, base 2017)	GDP Index (based January 2024)	Real Per Capita Income (base 2017)	Real Per Capita Income Index (based January 2024)	Number of Households (000's)	Households Index (based January 2024)
2024	6	[redacted]									
2024	7	[redacted]									
2024	8	[redacted]									
2024	9	[redacted]									
2024	10	[redacted]									
2024	11	[redacted]									
2024	12	[redacted]									
2025	1	[redacted]									
2025	2	[redacted]									
2025	3	[redacted]									
2025	4	[redacted]									
2025	5	[redacted]									
2025	6	[redacted]									
2025	7	[redacted]									
2025	8	[redacted]									
2025	9	[redacted]									
2025	10	[redacted]									
2025	11	[redacted]									
2025	12	[redacted]									
2026	1	[redacted]									
2026	2	[redacted]									
2026	3	[redacted]									
2026	4	[redacted]									
2026	5	[redacted]									
2026	6	[redacted]									
2026	7	[redacted]									
2026	8	[redacted]									
2026	9	[redacted]									
2026	10	[redacted]									
2026	11	[redacted]									
2026	12	[redacted]									
2027	1	[redacted]									
2027	2	[redacted]									
2027	3	[redacted]									
2027	4	[redacted]									
2027	5	[redacted]									
2027	6	[redacted]									
2027	7	[redacted]									
2027	8	[redacted]									
2027	9	[redacted]									
2027	10	[redacted]									
2027	11	[redacted]									
2027	12	[redacted]									
2028	1	[redacted]									
2028	2	[redacted]									
2028	3	[redacted]									
2028	4	[redacted]									
2028	5	[redacted]									
2028	6	[redacted]									
2028	7	[redacted]									
2028	8	[redacted]									
2028	9	[redacted]									
2028	10	[redacted]									
2028	11	[redacted]									
2028	12	[redacted]									
2029	1	[redacted]									
2029	2	[redacted]									
2029	3	[redacted]									
2029	4	[redacted]									
2029	5	[redacted]									
2029	6	[redacted]									
2029	7	[redacted]									
2029	8	[redacted]									
2029	9	[redacted]									
2029	10	[redacted]									
2029	11	[redacted]									
2029	12	[redacted]									
2030	1	[redacted]									

2030	2	[redacted]
2030	3	
2030	4	
2030	5	
2030	6	
2030	7	
2030	8	
2030	9	
2030	10	
2030	11	
2030	12	

year	month	hdd_10	cdd_10	n_hdd_10	n_cdd_10
year	month	Heating Degree Days Revenue Months(normal)	Cooling Degree Days Revenue Months (normal)	Heating Degree Days (normal)	Cooling Degree Days (normal)
2023	9	22.0	131.4	39.5	57.8
2023	10	169.8	33.3	218.9	4.3
2023	11	502.5	6.1	541.4	0.1
2023	12	820.4	0.0	922.0	0.0
2024	1	996.8	0.0	1229.2	0.0
2024	2	979.7	0.0	1199.0	0.0
2024	3	805.3	0.0	1056.1	0.2
2024	4	688.6	0.0	753.2	2.6
2024	5	296.8	14.0	396.3	32.1
2024	6	136.8	119.7	136.8	119.7
2024	7	15.7	227.2	15.7	227.2
2024	8	3.8	180.0	3.8	180.0
2024	9	39.5	57.8	39.5	57.8
2024	10	218.9	4.3	218.9	4.3
2024	11	541.4	0.1	541.4	0.1
2024	12	922.0	0.0	922.0	0.0
2025	1	1229.2	0.0	1229.2	0.0
2025	2	1199.0	0.0	1199.0	0.0
2025	3	1056.1	0.2	1056.1	0.2
2025	4	753.2	2.6	753.2	2.6
2025	5	396.3	32.1	396.3	32.1
2025	6	136.8	119.7	136.8	119.7
2025	7	15.7	227.2	15.7	227.2
2025	8	3.8	180.0	3.8	180.0
2025	9	39.5	57.8	39.5	57.8
2025	10	218.9	4.3	218.9	4.3
2025	11	541.4	0.1	541.4	0.1
2025	12	922.0	0.0	922.0	0.0
2026	1	1229.2	0.0	1229.2	0.0
2026	2	1199.0	0.0	1199.0	0.0
2026	3	1056.1	0.2	1056.1	0.2
2026	4	753.2	2.6	753.2	2.6
2026	5	396.3	32.1	396.3	32.1
2026	6	136.8	119.7	136.8	119.7
2026	7	15.7	227.2	15.7	227.2
2026	8	3.8	180.0	3.8	180.0
2026	9	39.5	57.8	39.5	57.8
2026	10	218.9	4.3	218.9	4.3
2026	11	541.4	0.1	541.4	0.1
2026	12	922.0	0.0	922.0	0.0
2027	1	1229.2	0.0	1229.2	0.0
2027	2	1199.0	0.0	1199.0	0.0

2027	3	1056.1	0.2	1056.1	0.2
2027	4	753.2	2.6	753.2	2.6
2027	5	396.3	32.1	396.3	32.1
2027	6	136.8	119.7	136.8	119.7
2027	7	15.7	227.2	15.7	227.2
2027	8	3.8	180.0	3.8	180.0
2027	9	39.5	57.8	39.5	57.8
2027	10	218.9	4.3	218.9	4.3
2027	11	541.4	0.1	541.4	0.1
2027	12	922.0	0.0	922.0	0.0
2028	1	1229.2	0.0	1229.2	0.0
2028	2	1199.0	0.0	1199.0	0.0
2028	3	1056.1	0.2	1056.1	0.2
2028	4	753.2	2.6	753.2	2.6
2028	5	396.3	32.1	396.3	32.1
2028	6	136.8	119.7	136.8	119.7
2028	7	15.7	227.2	15.7	227.2
2028	8	3.8	180.0	3.8	180.0
2028	9	39.5	57.8	39.5	57.8
2028	10	218.9	4.3	218.9	4.3
2028	11	541.4	0.1	541.4	0.1
2028	12	922.0	0.0	922.0	0.0
2029	1	1229.2	0.0	1229.2	0.0
2029	2	1199.0	0.0	1199.0	0.0
2029	3	1056.1	0.2	1056.1	0.2
2029	4	753.2	2.6	753.2	2.6
2029	5	396.3	32.1	396.3	32.1
2029	6	136.8	119.7	136.8	119.7
2029	7	15.7	227.2	15.7	227.2
2029	8	3.8	180.0	3.8	180.0
2029	9	39.5	57.8	39.5	57.8
2029	10	218.9	4.3	218.9	4.3
2029	11	541.4	0.1	541.4	0.1
2029	12	922.0	0.0	922.0	0.0
2030	1	1229.2	0.0	1229.2	0.0
2030	2	1199.0	0.0	1199.0	0.0
2030	3	1056.1	0.2	1056.1	0.2
2030	4	753.2	2.6	753.2	2.6
2030	5	396.3	32.1	396.3	32.1
2030	6	136.8	119.7	136.8	119.7
2030	7	15.7	227.2	15.7	227.2
2030	8	3.8	180.0	3.8	180.0
2030	9	39.5	57.8	39.5	57.8
2030	10	218.9	4.3	218.9	4.3
2030	11	541.4	0.1	541.4	0.1
2030	12	922.0	0.0	922.0	0.0

year	month	ee_r_cum_m	ee_c_cum_m	ee_i_cum_m	pv_r_cum_m	pv_c_cum_m	pv_i_cum_m	eh_r_cum_m	eh_c_cum_m	eh_i_cum_m	ev_r_cum_m	ev_c_cum_m	ev_i_cum_m
year	month	Cumulative Residential EE (GWh)	Cumulative Commercial EE (GWh)	Cumulative Industrial EE (GWh)	Cumulative Residential PV (GWh)	Cumulative Commercial PV (GWh)	Cumulative Industrial PV (GWh)	Cumulative Residential EHP (GWh)	Cumulative Commercial EHP (GWh)	Cumulative Industrial EHP (GWh)	Cumulative Residential EV (GWh)	Cumulative Commercial EV (GWh)	Cumulative Industrial EV (GWh)
2024	6.0	106.6	121.4	92.7	32.3	109.9	83.3	0.0	0.0	0.0	6.9	5.3	1.6
2024	7.0	141.6	127.4	97.2	30.2	104.1	78.8	0.0	0.0	0.0	7.1	5.4	1.7
2024	8.0	137.8	130.8	99.8	27.6	98.8	74.6	0.0	0.0	0.0	7.6	5.9	1.8
2024	9.0	99.7	128.3	97.8	21.5	85.8	64.7	0.4	0.1	0.0	8.0	6.8	2.0
2024	10.0	78.6	133.2	101.4	16.1	78.1	58.8	3.1	0.6	0.0	10.0	8.2	2.5
2024	11.0	74.0	130.5	99.3	10.0	59.7	44.9	8.1	1.8	0.0	10.3	8.9	2.8
2024	12.0	80.3	136.4	103.7	7.7	52.1	39.1	13.2	3.4	0.0	11.6	10.1	3.4
2025	1.0	81.4	136.4	103.6	7.8	47.1	35.3	18.7	5.4	0.0	12.9	11.6	3.9
2025	2.0	74.2	122.2	92.7	14.0	75.2	56.3	15.2	4.2	0.0	11.5	10.9	3.6
2025	3.0	81.1	134.6	102.1	23.2	102.3	76.3	12.3	3.2	0.0	13.1	11.8	3.9
2025	4.0	79.7	129.7	98.2	28.4	108.5	80.8	6.3	1.4	0.0	12.5	11.0	3.5
2025	5.0	96.6	134.7	101.9	32.3	116.9	86.9	1.5	0.4	0.0	12.9	11.0	3.4
2025	6.0	118.3	131.5	99.5	36.2	131.3	97.5	0.0	0.0	0.0	11.8	10.1	3.3
2025	7.0	157.0	138.0	104.3	33.8	124.1	92.0	0.0	0.0	0.0	11.9	10.1	3.3
2025	8.0	152.7	141.7	106.9	30.8	117.4	86.9	0.0	0.0	0.0	12.7	10.9	3.6
2025	9.0	110.3	138.9	104.8	23.9	101.8	75.2	0.6	0.2	0.0	13.5	12.7	3.9
2025	10.0	86.9	144.1	108.6	18.0	92.5	68.2	4.2	0.9	0.0	16.7	15.1	4.7
2025	11.0	81.8	141.2	106.3	11.1	70.5	51.9	10.9	2.5	0.0	17.0	16.3	5.2
2025	12.0	88.6	147.5	110.9	8.6	61.5	45.2	17.8	4.6	0.0	19.4	18.4	6.3
2026	1.0	89.7	147.4	110.7	8.6	55.5	40.7	25.6	7.5	0.0	21.1	21.4	7.1
2026	2.0	81.6	132.0	99.1	15.5	88.3	64.7	21.0	5.8	0.0	18.7	20.2	6.6
2026	3.0	89.0	145.4	109.0	25.7	119.8	87.6	17.1	4.4	0.0	21.4	21.5	6.9
2026	4.0	87.4	140.0	104.8	31.4	126.9	92.6	8.8	1.9	0.0	20.1	19.9	6.2
2026	5.0	105.7	145.4	108.7	35.8	136.5	99.4	2.1	0.5	0.0	20.6	19.8	6.0
2026	6.0	129.2	141.9	106.1	40.1	153.1	111.3	0.0	0.0	0.0	18.9	17.4	5.6
2026	7.0	171.2	148.9	111.2	37.4	144.4	104.9	0.0	0.0	0.0	18.9	17.2	5.7
2026	8.0	166.2	152.8	113.9	34.0	136.4	98.9	0.0	0.0	0.0	20.0	18.5	6.0
2026	9.0	119.9	149.8	111.6	26.4	118.1	85.5	0.8	0.3	0.0	21.2	22.8	6.5
2026	10.0	94.3	155.3	115.6	19.8	107.1	77.4	6.0	1.1	0.0	25.9	26.9	7.8
2026	11.0	88.6	152.1	113.1	12.3	81.5	58.8	15.9	3.2	0.0	26.5	29.5	8.6
2026	12.0	95.9	158.9	118.0	9.4	70.9	51.1	26.7	6.1	0.0	30.0	31.6	10.3
2027	1.0	97.0	158.7	117.8	9.5	63.9	46.0	38.6	10.1	0.0	32.3	38.2	11.6
2027	2.0	88.2	142.1	105.3	17.0	101.7	73.0	31.5	7.8	0.0	28.6	36.0	10.7
2027	3.0	96.2	156.5	115.8	28.3	137.7	98.7	25.3	5.9	0.0	32.7	37.1	11.1
2027	4.0	94.4	150.6	111.4	34.5	145.6	104.1	12.6	2.5	0.0	30.3	33.9	9.9
2027	5.0	114.2	156.4	115.5	39.3	156.4	111.6	3.0	0.7	0.0	30.9	33.4	9.5
2027	6.0	139.6	152.6	112.6	43.9	175.2	124.8	0.0	0.0	0.0	28.2	27.7	8.9
2027	7.0	184.8	160.1	117.9	40.9	165.1	117.4	0.0	0.0	0.0	27.9	27.2	9.0
2027	8.0	179.4	164.2	120.8	37.3	155.7	110.6	0.0	0.0	0.0	29.8	29.4	9.5
2027	9.0	129.4	160.9	118.3	28.9	134.6	95.5	1.2	0.3	0.0	31.3	37.4	10.3
2027	10.0	101.7	166.8	122.5	21.7	121.9	86.3	8.4	1.6	0.0	37.9	43.8	12.2
2027	11.0	95.6	163.4	119.8	13.4	92.7	65.5	22.4	4.5	0.0	39.2	48.2	13.5
2027	12.0	103.3	170.6	125.0	10.3	80.6	56.9	38.2	8.6	0.0	43.9	50.2	16.1
2028	1.0	104.5	170.4	124.7	10.3	72.5	51.1	56.0	14.3	0.0	47.0	61.5	18.0
2028	2.0	95.1	152.5	111.5	19.3	119.3	83.9	45.6	11.2	0.0	41.4	57.5	16.5
2028	3.0	103.6	167.8	122.5	30.8	155.9	109.4	36.3	8.4	0.0	47.1	58.0	17.1
2028	4.0	101.6	161.5	117.8	37.6	164.7	115.4	17.7	3.6	0.0	42.8	52.1	15.0
2028	5.0	123.0	167.6	122.1	42.8	176.6	123.5	4.2	0.9	0.0	44.5	51.6	14.4
2028	6.0	150.2	163.6	119.0	47.8	197.6	137.9	0.0	0.0	0.0	40.1	41.7	13.4
2028	7.0	198.8	171.5	124.6	44.5	186.0	129.7	0.0	0.0	0.0	39.3	40.7	13.5
2028	8.0	193.0	175.9	127.6	40.5	175.3	122.0	0.0	0.0	0.0	42.4	44.1	14.3
2028	9.0	139.2	172.4	124.9	31.4	151.4	105.2	1.6	0.5	0.0	43.8	55.8	15.3
2028	10.0	109.4	178.6	129.3	23.5	137.0	95.0	11.7	2.3	0.0	53.5	65.3	18.1
2028	11.0	102.8	174.9	126.5	14.5	104.1	72.1	31.7	6.6	0.0	54.9	71.5	19.9
2028	12.0	111.1	182.5	131.9	11.2	90.4	62.5	55.1	12.8	0.0	60.4	73.5	23.7
2029	1.0	112.3	182.3	131.5	11.2	81.3	56.1	82.0	21.5	0.0	66.0	90.7	26.6
2029	2.0	102.1	163.1	117.5	20.1	129.0	88.8	66.6	16.9	0.0	57.5	84.2	24.1
2029	3.0	111.3	179.5	129.1	33.3	174.3	119.8	52.3	12.9	0.0	64.9	84.1	24.8
2029	4.0	109.1	172.7	124.1	40.7	184.0	126.3	24.9	5.4	0.0	59.7	75.6	21.8
2029	5.0	132.0	179.2	128.6	46.3	197.2	135.1	5.9	1.4	0.0	61.4	74.2	20.7
2029	6.0	161.2	174.8	125.3	51.6	220.4	150.7	0.0	0.0	0.0	55.0	59.7	19.2
2029	7.0	213.3	183.3	131.2	48.1	207.3	141.5	0.0	0.0	0.0	54.6	58.5	19.3
2029	8.0	207.0	187.9	134.3	43.7	195.2	133.0	0.0	0.0	0.0	58.4	62.9	20.3
2029	9.0	149.2	184.1	131.4	33.9	168.5	114.6	2.2	0.8	0.0	59.9	78.7	21.6
2029	10.0	117.3	190.7	136.0	25.4	152.3	103.4	16.5	3.6	0.0	74.0	92.4	25.6
2029	11.0	110.1	186.7	133.0	15.7	115.6	78.4	44.8	10.4	0.0	75.3	100.7	28.1
2029	12.0	119.0	194.8	138.6	12.0	100.3	67.9	79.3	20.3	0.0	82.9	103.9	33.3
2030	1.0	120.3	194.5	138.2	12.1	90.2	61.0	119.4	34.4	0.0	90.3	127.0	37.3
2030	2.0	109.4	174.0	123.5	21.7	143.2	96.5	96.6	27.2	0.0	78.3	117.1	33.6
2030	3.0	119.2	191.5	135.6	35.9	193.5	130.3	75.1	20.7	0.0	87.4	116.3	34.4
2030	4.0	116.8	184.2	130.3	43.8	204.3	137.2	35.2	8.7	0.0	81.4	104.7	30.1
2030	5.0	141.3	191.0	135.0	49.9	218.9	146.8	8.4	2.4	0.0	82.9	101.9	28.5
2030	6.0	172.5	186.4	131.5	55.7	244.7	163.8	0.0	0.0	0.0	73.6	82.1	26.2
2030	7.0	228.2	195.3	137.6	51.9	230.2	153.8	0.0	0.0	0.0	73.8	80.8	26.4

2030	8.0	221.4	200.2	140.9	47.2	216.8	144.5	0.0	0.0	0.0	77.6	85.8	27.6
2030	9.0	159.6	196.1	137.8	36.6	187.1	124.5	3.1	1.3	0.0	80.4	106.8	29.3
2030	10.0	125.3	203.1	142.6	27.4	169.1	112.3	23.3	5.9	0.0	98.5	124.7	34.5
2030	11.0	117.7	198.8	139.3	16.9	128.4	85.2	63.6	17.2	0.0	99.3	134.9	37.8
2030	12.0	127.2	207.4	145.2	13.0	111.4	73.7	113.7	33.6	0.0	110.6	140.8	44.8

Year	Average_Annual_Temperature
1994	44.1
1995	44.8
1996	43.6
1997	43.6
1998	47.8
1999	46.4
2000	43.8
2001	47.9
2002	47.4
2003	44.9
2004	44.8
2005	45.9
2006	47.0
2007	45.6
2008	45.6
2009	44.9
2010	47.2
2011	47.1
2012	48.9
2013	45.5
2014	44.6
2015	45.9
2016	47.9
2017	46.9
2018	46.5
2019	44.9
2020	47.9
2021	47.9
2022	46.8
2023	48.3

Year	Average_Annual_Temperature
1994	48.4
1995	48.4
1996	46.8
1997	47.0
1998	51.1
1999	49.5
2000	47.6
2001	50.2
2002	49.5
2003	47.1
2004	47.9
2005	49.2
2006	50.7
2007	49.5
2008	48.5
2009	47.7
2010	49.3
2011	49.8
2012	52.2
2013	48.9
2014	47.2
2015	48.8
2016	51.2
2017	50.1
2018	49.5
2019	48.3
2020	51.5
2021	52.2
2022	50.0
2023	51.1

Year	Average_Annual_Temperature
1994	46.9
1995	48.4
1996	47.3
1997	47.5
1998	51.1
1999	49.9
2000	47.4
2001	50.4
2002	50.9
2003	47.5
2004	47.8
2005	49.4
2006	50.4
2007	48.6
2008	48.3
2009	47.8
2010	50.0
2011	50.8
2012	52.7
2013	49.1
2014	48.1
2015	48.6
2016	49.9
2017	49.1
2018	48.5
2019	48.5
2020	51.5
2021	52.1
2022	50.3
2023	51.9

Year	Average_Annual_Temperature
1994	48.1
1995	48.9
1996	46.7
1997	46.8
1998	50.7
1999	49.5
2000	47.9
2001	49.9
2002	50.4
2003	47.2
2004	47.5
2005	48.7
2006	51.6
2007	49.6
2008	49.1
2009	47.3
2010	49.6
2011	49.7
2012	51.9
2013	49.2
2014	47.9
2015	49.4
2016	51.5
2017	50.5
2018	50.4
2019	48.9
2020	50.4
2021	50.9
2022	49.4
2023	51.0

Year	Average_Annual_Temperature
1994	44.1
1995	45.1
1996	44.6
1997	44.4
1998	48.1
1999	45.8
2000	42.7
2001	45.7
2002	45.4
2003	42.7
2004	42.9
2005	44.9
2006	46.7
2007	44.4
2008	44.5
2009	44.3
2010	47.3
2011	46.9
2012	47.5
2013	44.6
2014	44.0
2015	45.0
2016	46.5
2017	46.0
2018	46.0
2019	44.1
2020	46.7
2021	46.7
2022	45.1
2023	46.9

Year	Average_Annual_Temperature
1994	47.4
1995	48.9
1996	47.5
1997	47.5
1998	50.9
1999	49.8
2000	47.3
2001	50.0
2002	49.9
2003	47.6
2004	48.2
2005	49.4
2006	50.8
2007	48.8
2008	49.2
2009	48.0
2010	50.6
2011	50.2
2012	51.8
2013	49.1
2014	48.5
2015	50.0
2016	51.3
2017	50.5
2018	50.6
2019	49.8
2020	50.9
2021	49.2
2022	51.0
2023	52.4

Year	Average_Annual_Temperature
1994	45.7

Date of Request: July 15, 2024 | Request No. DPS-578
Due Date: July 25, 2024 | NG Request No. NG-623

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: NYPSC - Arslan Gohir

TO: National Grid

SUBJECT: Electric Forecasting

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. Confirm whether the existing and new large loads in the Commercial and Industrial class such as Micron's semi-conductor plant and OSW Manufacturing are being incorporated in the forecast?

   a. If the large loads are incorporated separately, clarify the methodology and provide associated workpapers in Excel format.

2. Regarding the Table 2.1 and 2.2 in Exhibit_(ELF_24) page 30 of 54, from the NMPC Electric Forecasting Testimony:

   a. Provide the monthly "Streetlighting & Other" sales and customer data in Excel format.

   b. Provide the monthly DER data, if applicable, related to the "Streetlighting & Other" class.

Response:

1. Yes, existing and new large loads are incorporated in the electric load forecast. Specifically, existing large loads in the commercial and industrial class are recognized in the Company's historic load data through May 2024, which data are reflected in the corrections and updates testimony of the Electric Load Forecasting Panel ("ELF C&U Testimony") and in the forecast data in Exhibit_(ELF-4CU), Exhibit_(ELF-5CU), Exhibit_(ELF-7CU), and Exhibit_(ELF-8CU). As explained in the ELF C&U Testimony, the Company forecast higher electric retail energy deliveries for the industrial class than it had in the original direct testimony. The higher forecast is

primarily from expected growth in Service Classification No. 4 (“SC-4”). This growth is reflected through a post-model adjustment for anticipated incremental load in SC-4 in the next six months. The model itself is not Excel based, and thus there are no Excel workpapers responsive to this request, but rather the adjustment was made in a SAS program. To adjust for a separate, expected large load, as the Company did for SC-4, the Company input the expected load into the appropriate portion of the program code, which as mentioned, resulted in a large share of the shift seen in the industrial class from the original direct testimony.

Additionally, all existing loads, including existing large loads, are used in the Company’s forecast models, and therefore they also indirectly impact the forecast as existing loads are used for the model estimations. Specifically, for large-anticipated loads, the Company tracks these planned larger projects to ensure that their projected load demand, when reasonably certain, can be absorbed in the forecast annual incremental load growth. Here, “reasonably certain” means that the Company is confident that the electric load will materialize as a potential customer has indicated, making it predictable and assured. With the exception of the anticipated loads in SC-4, no other discrete post-model adjustments were made during the forecasting process, including the customers referenced above. It is generally the Company’s practice that the economic drivers will capture the anticipated effects of large new customers. Any future load that the Company is reasonably certain will materialize is captured within the forecast growth assumptions. This includes those customers referenced in DPS-578.

2. The source material for Table 2.1 and 2.2 is set forth in Exhibit_(ELF_24) page 30 of 54, from the direct testimony of the Electric Forecasting Testimony attached:

   a. Please see Attachment 1.

   b. Distributed energy resources (“DERs”) are not considered for “Streetlighting & Other.”

Name of Respondent: Date of Reply:
Electric Load Forecast Panel July 25, 2024

year	month	k_10_s	k_10_m	c_10_s	c_10_m
year	month	Streetlighting Deliveries (GWh)	Other Deliveries (GWh)	Streetlighting Customer Counts	Other Customer Counts
2008	1	20.5	0.6	5,207	129
2008	2	18.0	0.4	5,207	129
2008	3	14.9	0.6	5,209	129
2008	4	14.3	0.5	5,213	129
2008	5	11.8	0.4	5,214	129
2008	6	12.6	0.4	5,209	129
2008	7	11.4	0.3	5,211	129
2008	8	13.2	0.4	5,206	129
2008	9	14.0	0.3	5,215	129
2008	10	15.2	0.8	5,215	129
2008	11	18.6	0.0	5,211	129
2008	12	18.7	0.4	5,209	130
2009	1	21.2	0.5	5,207	130
2009	2	17.0	0.5	5,215	130
2009	3	15.4	0.6	5,215	130
2009	4	15.5	0.4	5,210	130
2009	5	11.5	0.5	5,204	130
2009	6	11.3	0.3	5,196	130
2009	7	12.4	0.4	5,198	130
2009	8	11.6	0.3	5,195	130
2009	9	13.9	0.5	5,192	130
2009	10	16.8	0.3	5,186	130
2009	11	16.9	0.3	5,175	131
2009	12	18.6	0.4	5,171	131
2010	1	21.1	0.8	5,173	131
2010	2	16.9	0.4	5,154	132
2010	3	16.3	0.4	5,153	131
2010	4	14.4	0.6	5,147	132
2010	5	11.4	0.3	5,145	132
2010	6	12.0	0.4	5,143	132
2010	7	11.6	0.1	5,140	132
2010	8	11.9	0.5	5,135	132
2010	9	14.9	0.6	5,099	132
2010	10	15.3	0.3	5,096	133
2010	11	16.8	0.4	5,097	134
2010	12	19.8	0.4	5,104	134
2011	1	19.2	0.7	5,105	134

2011	2	19.2	0.5	5,101	134
2011	3	13.8	0.4	5,099	134
2011	4	13.9	0.6	5,096	134
2011	5	11.8	0.4	5,081	134
2011	6	11.9	0.3	5,076	134
2011	7	11.5	0.4	5,060	134
2011	8	11.8	0.5	5,049	134
2011	9	14.6	0.5	5,055	134
2011	10	15.1	0.6	5,050	134
2011	11	17.2	0.5	5,035	134
2011	12	19.6	0.3	5,024	134
2012	1	19.0	0.4	5,014	134
2012	2	16.2	0.5	5,010	134
2012	3	17.2	0.8	5,005	134
2012	4	13.8	0.5	5,001	134
2012	5	12.5	1.0	5,002	134
2012	6	11.1	0.7	4,990	134
2012	7	11.0	0.5	4,985	134
2012	8	13.3	0.5	4,985	134
2012	9	13.3	0.5	4,974	134
2012	10	15.0	0.5	4,970	135
2012	11	17.7	0.4	4,963	135
2012	12	18.3	0.5	4,962	135
2013	1	17.2	0.7	4,956	135
2013	2	13.7	0.5	4,845	135
2013	3	11.9	0.6	4,842	135
2013	4	22.8	0.5	4,810	135
2013	5	13.3	0.6	4,796	135
2013	6	10.6	0.3	4,791	135
2013	7	11.7	0.4	4,791	135
2013	8	12.6	0.3	4,774	135
2013	9	13.3	0.7	4,771	135
2013	10	16.1	0.5	4,760	135
2013	11	16.7	0.3	4,741	135
2013	12	18.3	0.5	4,742	135
2014	1	20.8	0.5	4,731	135
2014	2	16.6	0.7	4,730	135
2014	3	14.9	0.6	4,729	135
2014	4	14.6	0.4	4,724	135
2014	5	12.0	0.5	4,723	135
2014	6	10.6	0.5	4,722	135
2014	7	11.7	0.5	4,721	135

2014	8	11.7	0.5	4,713	135
2014	9	13.6	0.4	4,711	135
2014	10	16.0	0.5	4,707	135
2014	11	17.1	0.4	4,709	135
2014	12	18.3	0.5	4,710	135
2015	1	20.7	0.5	4,700	135
2015	2	16.5	0.5	4,697	135
2015	3	14.4	0.5	4,698	135
2015	4	15.1	0.7	4,695	135
2015	5	11.5	0.6	4,684	135
2015	6	11.7	0.4	4,678	135
2015	7	11.0	0.5	4,669	135
2015	8	11.7	0.5	4,666	135
2015	9	14.5	0.4	4,663	135
2015	10	15.0	0.6	4,652	135
2015	11	16.5	0.4	4,647	135
2015	12	18.2	0.4	4,640	135
2016	1	20.7	0.5	4,636	135
2016	2	16.5	0.6	4,634	135
2016	3	15.9	0.6	4,627	134
2016	4	14.1	0.4	4,618	134
2016	5	11.6	0.3	4,613	134
2016	6	12.0	0.4	4,599	134
2016	7	10.9	0.3	4,598	134
2016	8	12.4	1.8	4,597	134
2016	9	13.7	-0.5	4,600	134
2016	10	14.9	1.6	4,600	134
2016	11	16.5	-0.7	4,594	134
2016	12	19.4	0.6	4,584	134
2017	1	18.8	1.5	4,569	134
2017	2	16.0	-0.3	4,564	134
2017	3	16.4	0.4	4,562	134
2017	4	14.0	0.7	4,560	135
2017	5	12.3	0.9	4,558	135
2017	6	10.9	0.8	4,557	135
2017	7	10.9	0.3	4,542	135
2017	8	12.3	0.7	4,519	135
2017	9	13.5	0.7	4,513	135
2017	10	14.8	1.2	4,501	135
2017	11	18.0	0.7	4,501	135
2017	12	18.1	1.0	4,500	135
2018	1	19.8	1.0	4,482	135

2018	2	16.3	1.4	4,461	135
2018	3	14.6	0.9	4,457	135
2018	4	13.2	1.2	4,456	135
2018	5	12.0	0.4	4,454	135
2018	6	10.9	2.2	4,444	135
2018	7	11.0	0.8	4,437	134
2018	8	12.1	1.0	4,435	135
2018	9	13.8	1.0	4,431	135
2018	10	14.6	0.6	4,424	135
2018	11	17.3	0.9	4,418	135
2018	12	17.9	1.1	4,417	135
2019	1	20.2	0.9	4,405	135
2019	2	16.1	0.8	4,407	135
2019	3	14.4	1.0	4,403	135
2019	4	12.5	1.0	4,400	135
2019	5	12.7	1.0	4,396	135
2019	6	9.9	0.7	4,397	135
2019	7	9.5	0.8	4,397	135
2019	8	12.3	1.0	4,393	135
2019	9	11.9	0.8	4,391	135
2019	10	14.3	0.8	4,385	135
2019	11	14.8	0.9	4,377	135
2019	12	16.1	0.9	4,375	135
2020	1	18.1	0.7	4,357	135
2020	2	15.0	0.5	4,344	135
2020	3	15.9	0.6	4,340	135
2020	4	12.9	0.5	4,338	135
2020	5	11.9	1.0	4,336	135
2020	6	9.7	0.7	4,324	135
2020	7	10.7	0.7	4,324	135
2020	8	9.7	0.8	4,310	135
2020	9	11.9	0.8	4,298	135
2020	10	13.9	1.1	4,297	135
2020	11	14.5	0.8	4,298	135
2020	12	15.7	0.9	4,297	135
2021	1	17.8	0.9	4,293	135
2021	2	14.4	0.5	4,289	135
2021	3	-3.0	1.3	4,283	135
2021	4	7.5	1.5	4,276	135
2021	5	10.4	0.6	4,276	135
2021	6	12.4	1.0	4,271	135
2021	7	7.8	0.9	4,266	135

2021	8	14.5	0.6	4,261	135
2021	9	11.4	0.5	4,260	135
2021	10	9.9	1.1	4,252	135
2021	11	12.3	0.5	4,257	135
2021	12	14.4	1.2	4,256	135
2022	1	14.6	0.8	4,241	135
2022	2	12.0	0.7	4,228	135
2022	3	12.2	1.2	4,212	135
2022	4	10.8	1.3	4,218	135
2022	5	8.7	0.5	4,209	135
2022	6	8.8	0.7	4,168	135
2022	7	8.0	0.6	4,151	135
2022	8	8.5	0.5	4,142	135
2022	9	10.5	0.6	4,138	135
2022	10	11.1	0.8	4,130	135
2022	11	11.9	0.2	4,123	135
2022	12	13.9	0.7	4,100	135
2023	1	13.3	0.9	4,100	135
2023	2	11.4	1.0	4,095	135
2023	3	11.3	1.1	4,096	135
2023	4	9.7	1.3	4,090	135
2023	5	7.3	0.5	4,113	135
2023	6	8.7	0.4	4,284	135
2023	7	8.5	0.2	4,283	135
2023	8	8.0	1.3	4,279	135
2023	9	10.5	0.6	4,297	135
2023	10	11.2	0.8	4,299	135
2023	11	12.4	0.2	4,294	135
2023	12	13.8	0.7	4,290	135
2024	1	13.3	0.9	4,285	135
2024	2	12.0	1.0	4,281	135
2024	3	11.0	1.1	4,276	135
2024	4	9.6	1.3	4,272	135
2024	5	7.3	0.5	4,267	135
2024	6	8.2	0.4	4,263	135
2024	7	8.0	0.2	4,258	135
2024	8	8.0	1.3	4,254	135
2024	9	10.4	0.6	4,249	135
2024	10	11.3	0.8	4,245	135
2024	11	12.6	0.2	4,241	135
2024	12	13.7	0.7	4,236	135
2025	1	13.2	0.9	4,232	135

2025	2	12.3	1.0	4,227	135
2025	3	10.8	1.1	4,223	135
2025	4	9.4	1.3	4,218	135
2025	5	7.2	0.5	4,214	135
2025	6	7.8	0.4	4,210	135
2025	7	7.6	0.2	4,205	135
2025	8	8.0	1.3	4,201	135
2025	9	10.3	0.6	4,196	135
2025	10	11.2	0.8	4,192	135
2025	11	12.7	0.2	4,188	135
2025	12	13.6	0.7	4,183	135
2026	1	13.1	0.9	4,179	135
2026	2	12.5	1.0	4,175	135
2026	3	10.6	1.1	4,170	135
2026	4	9.2	1.3	4,166	135
2026	5	7.2	0.5	4,162	135
2026	6	7.5	0.4	4,157	135
2026	7	7.3	0.2	4,153	135
2026	8	8.0	1.3	4,148	135
2026	9	10.2	0.6	4,144	135
2026	10	11.2	0.8	4,140	135
2026	11	12.8	0.2	4,135	135
2026	12	13.5	0.7	4,131	135
2027	1	13.0	0.9	4,127	135
2027	2	12.5	1.0	4,123	135
2027	3	10.4	1.1	4,118	135
2027	4	9.1	1.3	4,114	135
2027	5	7.1	0.5	4,110	135
2027	6	7.2	0.4	4,105	135
2027	7	7.0	0.2	4,101	135
2027	8	7.9	1.3	4,097	135
2027	9	10.0	0.6	4,092	135
2027	10	11.1	0.8	4,088	135
2027	11	12.8	0.2	4,084	135
2027	12	13.4	0.7	4,080	135
2028	1	12.9	0.9	4,075	135
2028	2	12.5	1.0	4,071	135
2028	3	10.2	1.1	4,067	135
2028	4	8.9	1.3	4,063	135
2028	5	6.9	0.5	4,058	135
2028	6	7.0	0.4	4,054	135
2028	7	6.8	0.2	4,050	135

2028	8	7.8	1.3	4,046	135
2028	9	9.9	0.6	4,041	135
2028	10	11.0	0.8	4,037	135
2028	11	12.7	0.2	4,033	135
2028	12	13.2	0.7	4,029	135
2029	1	12.8	0.9	4,025	135
2029	2	12.5	1.0	4,020	135
2029	3	10.0	1.1	4,016	135
2029	4	8.8	1.3	4,012	135
2029	5	6.8	0.5	4,008	135
2029	6	6.8	0.4	4,004	135
2029	7	6.6	0.2	3,999	135
2029	8	7.7	1.3	3,995	135
2029	9	9.7	0.6	3,991	135
2029	10	10.9	0.8	3,987	135
2029	11	12.6	0.2	3,983	135
2029	12	13.1	0.7	3,979	135
2030	1	12.6	0.9	3,974	135
2030	2	12.4	1.0	3,970	135
2030	3	9.8	1.1	3,966	135
2030	4	8.6	1.3	3,962	135
2030	5	6.7	0.5	3,958	135
2030	6	6.6	0.4	3,954	135
2030	7	6.4	0.2	3,949	135
2030	8	7.5	1.3	3,945	135
2030	9	9.6	0.6	3,941	135
2030	10	10.7	0.8	3,937	135
2030	11	12.5	0.2	3,933	135
2030	12	12.9	0.7	3,929	135

Date of Request: July 15, 2024 | Request No. DPS-578 (Supplemental)
Due Date: August 6, 2024 | NG Request No. NG-623 (Supplemental)

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: NYPSC - Arslan Gohir

TO: National Grid

SUBJECT: Electric Forecasting - Supplemental - 1

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. Confirm whether the existing and new large loads in the Commercial and Industrial class such as Micron's semi-conductor plant and OSW Manufacturing are being incorporated in the forecast?

    a. If the large loads are incorporated separately, clarify the methodology and provide associated workpapers in Excel format.

2. Regarding the Table 2.1 and 2.2 in Exhibit_(ELF_24) page 30 of 54, from the NMPC Electric Forecasting Testimony:

    a. Provide the monthly "Streetlighting & Other" sales and customer data in Excel format.

    b. Provide the monthly DER data, if applicable, related to the "Streetlighting & Other" class.

Response:

1. a. Pursuant to Department of Public Service Staff’s request, the Company is providing Attachment 2, which contains the post-model monthly and annual incremental load adjustments made over the forecast horizon. Attachment 2 contains confidential, protected information. The Company is providing the attachment in accordance with the Protective Order adopted in these proceedings.

Name of Respondent: Electric Load Forecast Panel

Date of Reply: August 6, 2024

Form 103

Industrial/SC4 specific changes			
	First load addition (Gwh)	Second load addition (Gwh)	
	[redacted]	[redacted]	[redacted]
if month = 1,3,5,7,8,10,12	[redacted]	[redacted]	[redacted]
if month = 4,6,9,11	[redacted]	[redacted]	[redacted]
if month = 2	[redacted]	[redacted]	[redacted]

Industrial Load Growth Post-Model-Adjustment for SC4

Year	Month	First Load Addition (GWh)	Second Load Addition (GWh)	Total (GWh)	Annual Load Adjustment (GWh)
2024	1	[redacted]			
2024	2	[redacted]			
2024	3	[redacted]			
2024	4	[redacted]			
2024	5	[redacted]			
2024	6	[redacted]			
2024	7	[redacted]			
2024	8	[redacted]			
2024	9	[redacted]			
2024	10	[redacted]			
2024	11	[redacted]			
2024	12	[redacted]			
2025	1	[redacted]			
2025	2	[redacted]			
2025	3	[redacted]			
2025	4	[redacted]			
2025	5	[redacted]			
2025	6	[redacted]			
2025	7	[redacted]			
2025	8	[redacted]			
2025	9	[redacted]			
2025	10	[redacted]			
2025	11	[redacted]			
2025	12	[redacted]			
2026	1	[redacted]			
2026	2	[redacted]			
2026	3	[redacted]			
2026	4	[redacted]			
2026	5	[redacted]			
2026	6	[redacted]			
2026	7	[redacted]			
2026	8	[redacted]			
2026	9	[redacted]			
2026	10	[redacted]			
2026	11	[redacted]			
2026	12	[redacted]			
2027	1	[redacted]			
2027	2	[redacted]			
2027	3	[redacted]			

2027	4	[redacted]
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2027	6	[redacted]
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2027	9	[redacted]
2027	10	[redacted]
2027	11	[redacted]
2027	12	[redacted]
2028	1	[redacted]
2028	2	[redacted]
2028	3	[redacted]
2028	4	[redacted]
2028	5	[redacted]
2028	6	[redacted]
2028	7	[redacted]
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2028	9	[redacted]
2028	10	[redacted]
2028	11	[redacted]
2028	12	[redacted]
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2029	12	[redacted]

Date of Request: August 13, 2024 Request No. DPS-932
Due Date: August 23, 2024 NG Request No. NG-1142

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: NYPSC - Arslan Gohir

TO: National Grid

SUBJECT: Electric Forecasting - Follow-up to DPS-333

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. Referring to the Company's response to DPS-333, "a5_model_inputs_nimo_jun24" file:

   a. Explain how the price forecast for "p_10_r", "p_10_c", and "p_10_i" variables were developed?

   b. Confirm if the Company used the negative numbers as shown for Aug-2011 and May-2018 for Industrial Volume in the Sales Model?

      i. If yes, explain why the company used negative values instead of correcting the root cause for this negative value and a higher sales number in the subsequent month for these values?

   c. Provide the non-manufacturing economic variable for the electric service territory.

2. Provide more information on the types of industrial customers, such as the sector and sub-sector.

   a. Does the company have recent energy sales share by sector for the industrial class by sector? If yes, provide documentation to support this.

Response:

1. a. The price variables represent retail electricity prices in real dollar terms for the residential sector, the commercial sector, and the industrial sector, respectively. The forecasts were developed by using the Middle Atlantic region nominal electricity

price forecasts from the Annual Energy Outlook published by the U.S. Energy Information Administration (EIA). The nominal prices were then converted into real dollar terms using the Consumer Price Index (CPI) from Moody's.

b. The Company did not use negative numbers as shown for Aug-2011 and May-2018 for Industrial Volume in the Sales Model. The Company corrected for these outliers by using the previous year's corresponding values, Aug-2010 and May-2017. A "replace_outliers" function was used as defined in the Jupyter Notebook used to estimate the Industrial total energy model, as provided in Attachment 3 of DPS-333.

c. The non-manufacturing employment variables are provided in Attachment 1. Attachment 1 contains confidential, protected information and is being provided in accordance with the Protective Order adopted in these proceedings.

2. a. The Company does not have information on recent energy sales share by sector for the industrial customers.

Name of Respondent:	Date of Reply:
Electric Load Forecast Panel	August 21, 2024

Year	Month	EMPL_NON_MANUF (thousands)	idx_EMPL_NON_MANUF
2003	1	[redacted]	[redacted]
2003	2	[redacted]	[redacted]
2003	3	[redacted]	[redacted]
2003	4	[redacted]	[redacted]
2003	5	[redacted]	[redacted]
2003	6	[redacted]	[redacted]
2003	7	[redacted]	[redacted]
2003	8	[redacted]	[redacted]
2003	9	[redacted]	[redacted]
2003	10	[redacted]	[redacted]
2003	11	[redacted]	[redacted]
2003	12	[redacted]	[redacted]
2004	1	[redacted]	[redacted]
2004	2	[redacted]	[redacted]
2004	3	[redacted]	[redacted]
2004	4	[redacted]	[redacted]
2004	5	[redacted]	[redacted]
2004	6	[redacted]	[redacted]
2004	7	[redacted]	[redacted]
2004	8	[redacted]	[redacted]
2004	9	[redacted]	[redacted]
2004	10	[redacted]	[redacted]
2004	11	[redacted]	[redacted]
2004	12	[redacted]	[redacted]
2005	1	[redacted]	[redacted]
2005	2	[redacted]	[redacted]
2005	3	[redacted]	[redacted]
2005	4	[redacted]	[redacted]
2005	5	[redacted]	[redacted]
2005	6	[redacted]	[redacted]
2005	7	[redacted]	[redacted]
2005	8	[redacted]	[redacted]
2005	9	[redacted]	[redacted]
2005	10	[redacted]	[redacted]
2005	11	[redacted]	[redacted]
2005	12	[redacted]	[redacted]
2006	1	[redacted]	[redacted]
2006	2	[redacted]	[redacted]
2006	3	[redacted]	[redacted]
2006	4	[redacted]	[redacted]
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Date of Request: August 13, 2024 Request No. DPS-941
Due Date: August 23, 2024 NG Request No. NG-1151

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: NYPSC - Arslan Gohir

TO: National Grid

SUBJECT: Electric Forecasting

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. In the C&U workpaper "FY26 Electric Revenue Forecast_V11,", tab "Full Service SalesForecast":

   a. Outline the process for calculating the full service forecast by rate code.
   b. Provide any Excel workpapers associated with the calculation of subpart (a).

2. In the C&U workpaper "FY26 Electric Revenue Forecast_V11.1," tab "Customers" - the SC2ND average customers are 129,303 while the average customers for SC2ND in file "Exhibits_(ELF-CU)_Sales", tab "ELF-14CU-RateClass_CUST" is 126,168.

   a. What does the difference of 135 represent between the two files.
   b. Confirm if the difference of 135 was added to the "Customers" tab in file "FY26 Electric Revenue Forecast_V11.1" as post-rate-code allocation.

3. In the C&U workpaper "Exhibits_(ELF-CU)_Sales", tabs ELF_11CU and ELF_12CU - the Residential, and Commercial percentage allocations do not add up to 100%:

   a. Confirm if the rate allocation should add up to 100%.
   b. Explain where the remaining percentage is allocated.

Response:

1. a. For all rates except for the SC1 Light, SC2 Light, SC3 Light, SC4 Light, SC5 Light, and SC6 Light (collectively, the "Outdoor Lighting Service Classes") that are presented in the Full Service Sales Forecast tab of FY26 Electric Revenue

Forecast V11.1, the Company used the recent Full Service sales share of delivered energy in each rate class to identify the future shares. Then, the shares were applied to the delivered energy forecasts to get the sales forecasts for the Full Service. For the Outdoor Lighting Service Classes, the Company applied the Full Service shares shown on Attachment 1 to the total outdoor lighting kWh calculated in the "SL Target Revenue at Existing Rates (proposed loss factors)_v062124.xlsx" workpaper. This extra step is performed for the outdoor lighting classes to align with the Company's Rate Design Panel's independent asset sale and LED conversion forecasts used in the revenue forecast and rate design.

b. Attachment 1 provides the calculation of Full Service sales. Columns (a) to (m) present the monthly delivered energy forecasts by rate for the Rate Year in GWh. Columns (n) to (y) present the sales share of Full Service. Columns (z) to (ak) present the monthly sales forecasts of Full Service by rate for the Rate Year in GWh.

2. a. In the "FY26 Electric Revenue Forecast_V11.1," tab "Customers," the SC2ND row includes the customer counts for SC2ND and the customer counts for Borderline. In "Exhibits_(ELF-CU) Sales," tab "ELF-14CU-RateClass_CUST", SC2ND only includes the customer counts for SC2ND. The difference is the customer counts for Borderline.

b. In the "Customers" tab in file "FY26 Electric Revenue Forecast_V11.1, the Company manually added Borderline customers into the SC2ND total to ensure Borderline customer counts were included in the revenue price-out.

3. a. The revenue class to rate class allocation should add up to 100%. The remaining percentage in the residential and commercial sectors are allocated to streetlighting class.

b. Please see the response to part (a).

Name of Respondent: Date of Reply:
Electric Load Forecast Panel August 20, 2024

Delivered (GWh)

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)
	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26
SC1	886.1	763.5	817.7	1,028.1	1,091.6	977.4	793.3	815.6	1,017.8	1,192.6	1,088.5	1,028.2
SC1C	20.9	18.0	19.3	24.3	25.8	23.1	18.7	19.3	24.0	28.2	25.7	24.3
SC2ND	59.2	54.7	56.3	62.2	65.2	64.2	58.3	57.2	62.1	66.7	61.8	59.8
SC2D	320.2	296.5	305.0	336.1	351.9	347.2	315.8	310.1	335.5	359.3	333.7	322.7
SC3	495.6	462.7	474.9	519.6	542.0	535.1	490.5	483.7	518.4	551.2	515.3	497.8
SC3A	436.3	419.5	426.8	455.9	469.4	464.2	437.5	437.9	454.1	470.3	450.5	433.2
SC4	148.8	150.1	148.8	154.5	155.9	152.9	152.3	151.6	154.0	154.6	146.8	149.3
SC7	13.7	12.8	13.2	14.4	15.0	14.8	13.6	13.4	14.3	15.2	14.2	13.7
SC11&12	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
NYPA R&E	162.1	160.5	162.0	168.8	171.4	169.9	164.7	167.3	167.9	169.0	166.2	159.0
NYPA RNY	93.2	92.3	93.1	97.0	98.5	97.6	94.7	96.2	96.5	97.2	95.5	91.4
NYPA HLF	76.6	75.8	76.5	79.7	81.0	80.2	77.8	79.0	79.3	79.8	78.5	75.1
NYPA PP	2.8	2.8	2.8	2.9	3.0	2.9	2.8	2.9	2.9	2.9	2.9	2.7
ST.LAWRENCE	-	-	-	-	-	-	-	-	-	-	-	-
SC1 Light	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
SC2 Light	3.9	3.6	3.2	3.4	3.9	4.3	5.0	5.4	5.8	5.7	4.7	4.6
SC3 Light	3.7	3.3	3.0	3.2	3.6	4.0	4.8	5.1	5.5	5.4	4.5	4.4
SC4 Light	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SC5 Light	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SC6 Light	-	-	-	-	-	-	-	-	-	-	-	-
BORDERLINE	1.1	0.4	0.4	0.2	1.3	1.0	1.4	1.2	1.0	0.5	0.7	0.9

Full Service Share

(a)	(n)	(o)	(p)	(q)	(r)	(s)	(t)	(u)	(v)	(w)	(x)	(y)
	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26
SC1	94.6%	94.8%	95.0%	95.1%	95.3%	95.4%	95.6%	95.8%	95.9%	95.9%	95.9%	95.9%
SC1C	66.6%	66.8%	67.0%	67.3%	67.5%	67.7%	67.9%	68.2%	68.4%	68.6%	68.8%	69.1%
SC2ND	75.8%	76.0%	76.2%	76.4%	76.5%	76.7%	76.9%	77.0%	77.2%	77.4%	77.5%	77.7%
SC2D	46.8%	46.9%	47.0%	47.1%	47.2%	47.2%	47.3%	47.4%	47.5%	47.5%	47.6%	47.7%
SC3	19.8%	19.8%	19.9%	19.9%	19.9%	19.9%	20.0%	20.0%	20.0%	20.0%	20.1%	20.1%
SC3A	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%	18.2%
SC4	90.6%	91.0%	91.2%	91.4%	91.7%	91.9%	92.4%	92.5%	92.9%	92.9%	92.7%	93.1%
SC7	22.4%	22.4%	22.4%	22.4%	22.4%	22.4%	22.4%	22.4%	22.4%	22.4%	22.4%	22.4%
SC11&12	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NYPA R&E	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NYPA RNY	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NYPA HLF	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
NYPA PP	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ST.LAWRENCE												
SC1 Light	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%
SC2 Light	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%
SC3 Light	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%
SC4 Light	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%
SC5 Light	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%	35.9%
SC6 Light												
BORDERLINE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Full Service Sales (GWh)

(a)	(z)	(aa)	(ab)	(ac)	(ad)	(ae)	(af)	(ag)	(ah)	(ai)	(aj)	(ak)
	Apr-25	May-25	Jun-25	Jul-25	Aug-25	Sep-25	Oct-25	Nov-25	Dec-25	Jan-26	Feb-26	Mar-26
SC1	838.6	723.8	776.5	978.0	1,040.1	932.8	758.4	781.0	976.3	1,144.0	1,044.2	986.3
SC1C	13.9	12.0	12.9	16.3	17.4	15.6	12.7	13.1	16.4	19.3	17.7	16.8
SC2ND	44.9	41.6	42.9	47.5	49.9	49.2	44.8	44.1	47.9	51.6	47.9	46.5
SC2D	150.0	139.1	143.4	158.2	165.9	164.0	149.4	146.9	159.2	170.8	158.9	153.9
SC3	98.2	91.8	94.4	103.4	108.0	106.7	98.0	96.7	103.8	110.5	103.4	100.0
SC3A	79.6	76.5	77.9	83.2	85.6	84.7	79.8	79.9	82.9	85.8	82.2	79.0
SC4	134.8	136.6	135.6	141.2	142.9	140.5	140.7	140.3	143.1	143.6	136.0	139.0
SC7	3.1	2.9	2.9	3.2	3.3	3.3	3.0	3.0	3.2	3.4	3.2	3.1
SC11&12	-	-	-	-	-	-	-	-	-	-	-	-
NYPA R&E	-	-	-	-	-	-	-	-	-	-	-	-
NYPA RNY	-	-	-	-	-	-	-	-	-	-	-	-
NYPA HLF	-	-	-	-	-	-	-	-	-	-	-	-
NYPA PP	-	-	-	-	-	-	-	-	-	-	-	-
ST.LAWRENCE	-	-	-	-	-	-	-	-	-	-	-	-
SC1 Light	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
SC2 Light	1.4	1.3	1.1	1.2	1.4	1.5	1.8	1.9	2.1	2.0	1.7	1.7
SC3 Light	1.3	1.2	1.1	1.1	1.3	1.5	1.7	1.8	2.0	1.9	1.6	1.6
SC4 Light	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
SC5 Light	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SC6 Light	-	-	-	-	-	-	-	-	-	-	-	-
BORDERLINE	1.1	0.4	0.4	0.2	1.3	1.0	1.4	1.2	1.0	0.5	0.7	0.9

Date of Request: August 16, 2024 | Request No. DPS-972
Due Date: August 26, 2024 | NG Request No. NG-1230

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: PSC - Caitlyn Edmundson

TO: National Grid

SUBJECT: Forecasting FTEs & additional funding

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. For each proposed Electric Load Forecast Panel FTE listed in Exhibit___(RRP-11), Workpapers to Exhibit RRP-3, Schedule 41, Workpaper 1, provide a detailed description of the job duties and responsibilities and the reasons why the job duties merit entirely new positions and cannot be incorporated into the job responsibilities of existing FTEs.

    a. Provide an organizational chart that maps the roles of these incremental 3.2 FTEs within the current structure.

2. Page 50 of the Electric Load Forecast Panel states, "These FTEs will...primarily support electric load forecasting with a small amount of support for the gas load forecast. What percentage of time will the requested 3.2 incremental FTEs spend on the electric load forecast versus the gas load forecast?

3. How many FTEs are currently assigned to National Grid's Electric and Gas Load Forecasting teams? How many of these current FTEs are allocated to NMPC?

    a. For each current National Grid Electric and Gas Load Forecasting position, provide the job title, salary, and amount of time allocated to the NMPC Electric or Gas Load Forecasting team, in the same format as the proposed FTEs listed in Exhibit___(RRP-11), Workpapers to Exhibit RRP-3, Schedule 41, Workpaper 1.

    b. For each current National Grid Electric and Gas Load Forecasting position, provide a detailed description of the job duties and responsibilities.

4. Regarding Exhibit___(RRP-3CU), Schedule 40, Page 7 of 7.

   a. Provide a detailed breakdown and description of how exactly the $320,000 annually requested for "incremental forecasting work" by the Electric Load Forecast Panel on page 50 of its testimony will be spent on "additional data, increased cloud computing requirements, and consulting services" and a justification for why the funding is necessary.

   b. Discuss if the $320,000 requested annually includes an allocation of overheads from NMPC's parent company and/or affiliates.

   c. Confirm that the $320,000 does not include compensation for FTEs.

<u>Response</u>:

1. Table 1 below provides the descriptions of the job duties and responsibilities of each required role. These job duties merit entirely new positions because all the listed work are new work that are not currently performed by existing FTEs and each of them requires significant amounts of time and efforts in research and implementation and expertise in that area, which is beyond the current FTEs' availabilities and/or capabilities.

Table 1: Descriptions of Job Duties and Responsibilities of Required Roles

FTE ID	Job Title	Job Descriptions
SSP028	Snr Data Scientist Data Science	This role will analyze the data collected by Advanced Metering Infrastructure ("AMI") for enhancing the accuracy of the electric load forecast, particularly at the feeder level. This role will also research and develop enhanced models for distributed generation resource forecasts at the feeder level to help plan the system to meet the State's climate targets under the Climate Leadership & Community Protection Act ("CLCPA").
SSP029	Lead Data Scientist Data Science	There are various pathways to achieve the State's climate targets under the CLCPA. This role will develop and enhance probabilistic and scenario-based forecasting work to support planning.
SSP030	Snr Data Scientist	This role will perform integrated gas and electric planning for gas and electric load forecasting, including coordination with other local distribution companies and electric distribution companies.
SSP031	Lead Data Scientist Data Science	The CLCPA requires deep electrification in the building sector. This role will develop more sophisticated analytical frameworks for heating electrification load forecasts at local level (feeder

FTE ID	Job Title	Job Descriptions
		for electric, zip code for gas), both temporally and spatially.
SSP032	Lead Data Scientist Data Science	This role will develop more sophisticated analytical frameworks for transportation electrification load forecasts both temporally and spatially to support the State's transportation electrification target.
SSP033	Snr Data Scientist Data Science	This role will develop advanced models for short-term distributed generation ("DG") forecasts at local level (feeders, non-wire alternatives, etc.) to support the State's goals of increasing penetration of DG.
SSP034	Snr Data Scientist Data Science	This role will perform ongoing data extraction and processing for AMI data to be incorporated into the load forecasting work.
SSP035	Lead Data Scientist Data Science	This role will provide support for short-term load forecasting including data processing, cloud computing, and analytical and reporting platforms management.

a. Figure 1 presents the current organization chart of the Load Forecasting and Analytics group that performs electric load forecasting and gas load forecasting work. There are five teams under the group: (1) the Electric Load Forecasting team focuses on long-term electric load forecasting; (2) the Gas Load Forecasting team focuses on long-term gas load forecasting; (3) the Short-term Load Forecasting team focuses on short-term electric load forecasting and gas load forecasting; (4) the DER, Policy, and Economics team focuses on analyzing distributed energy resources, electrification, policies, and the economic environment to support electric and gas load forecasting work; and (5) the Data Management and Analytics team supports the data needs and computational environment needs of the four teams. The 3.2 FTEs will perform the function of electric load forecasting work and gas load forecasting work listed in Table 1 above and report to these teams.

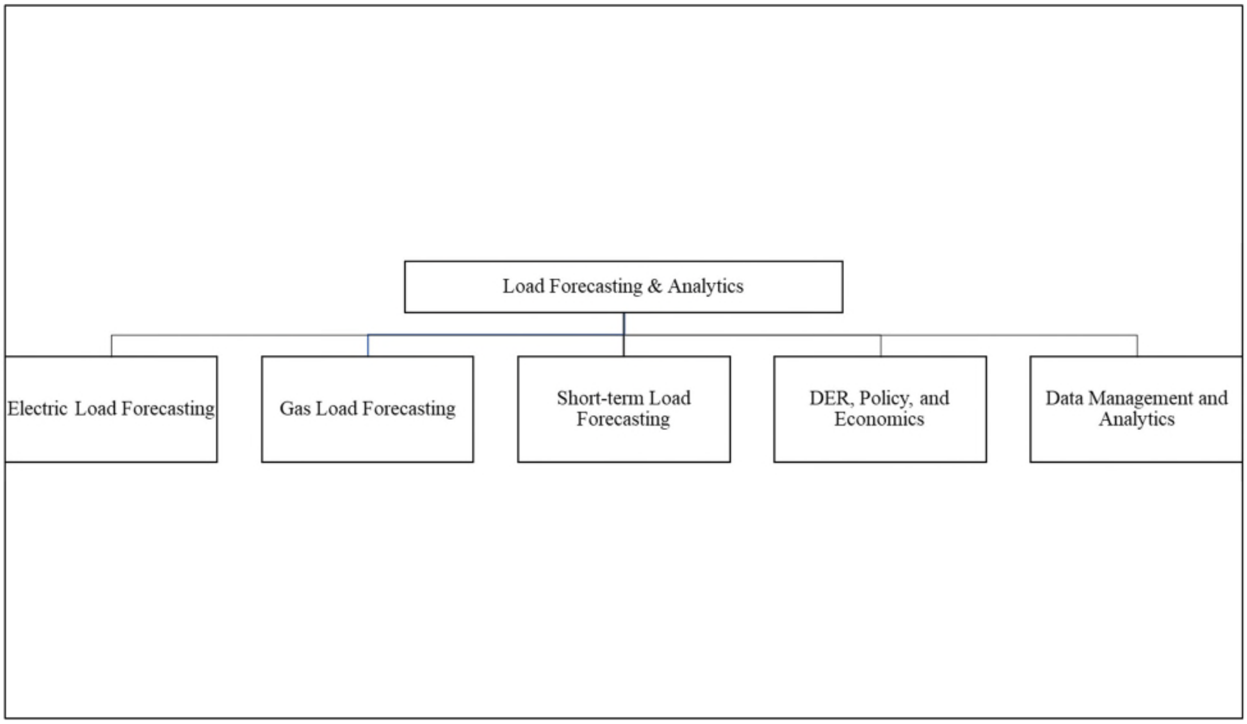

Figure 1: Organization Chart of Load Forecasting and Analytics Group

2. As presented in Workpapers to Exhibit RRP-3, Schedule 41, Workpaper 1, for the required 3.2 FTEs, about 93% of the time will be spent on supporting electric load forecasting and the rest 7% will be spent on supporting gas load forecasting.

3. Figure 2 provides the current FTEs in the Load Forecasting and Analytics group. The five teams under Load Forecasting and Analytics together support the electric load forecasting work and gas load forecasting work. All Load Forecasting and Analytics employees are employed by National Grid USA Service Company ("Service Company"). Service Company employees charge their time based on the projects they support and the operating company benefitting from the services they perform. As such, the allocation to Niagara Mohawk can vary over time and is not a fixed percentage.

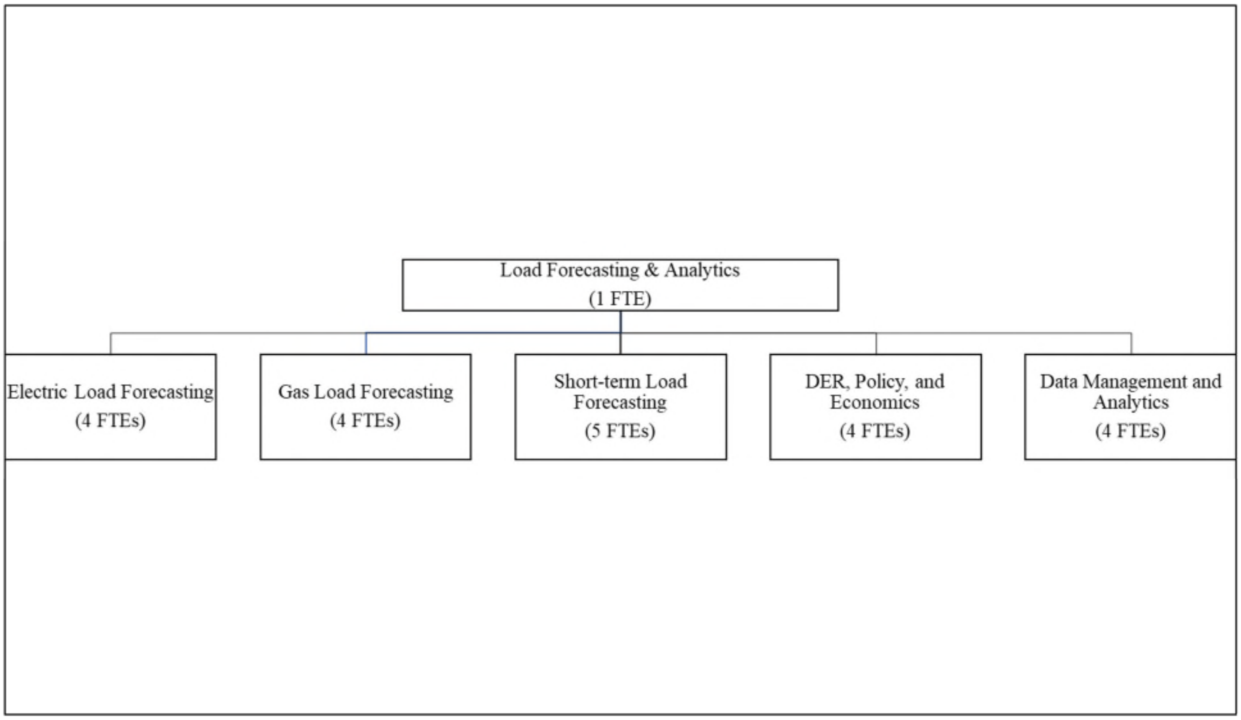

Figure 2: Organization Chart of Load Forecasting and Analytics Group with FTEs Associated

a. Attachment 1 provides the job title and the salary range for the current FTEs. As explained in the response to Question 3, the Service Company does not allocate employees in the same format as presented on Exhibit RRP-11, Workpapers to RRP-3, Schedule 41, Workpaper 1. Attachment 1 is confidential and should be protected from disclosure in accordance with the Protective Order.

b. Attachment 2 provides the job duties and responsibilities of current electric and gas load forecasting positions.

4. a. The estimation is based on the current cost of similar services that support existing data analysis and modeling work and the projection on the incremental needs. With more granular data including AMI data, the volume of data that needs to be stored, processed, and modeled is exponential compared to today's data volume that the Company analyzes. The Company does not have the exact breakdown but estimates more than half of the incremental funding is expected to be on purchasing computation power, while the rest will be on consulting and data services.

b. The request does not include allocation of overheads from NMPC's parent company and/or affiliates.

c. The $320,000 does not include compensation for FTEs.

<u>Name of Respondent</u>: Electric Load Forecast Panel

<u>Date of Reply</u>: August 26, 2024

Job Title: Lead Data Scientist, Electric Load Forecasting

Lead Quantitative Analyst, Electric Load Forecasting

Sr. Data Scientist, Electric Load Forecasting

- Develop long-term electric load forecasts at the system and feeder level using econometric regression, time series, and machine learning models, as appropriate.
- Perform exploratory analysis of large complex data sets to derive insights and valuable actions.
- Discover business narrative told by the data and be able to present them to peer data scientists, business stakeholders, and managers at various levels.
- Provide expert testimony before regulators and defend the forecasts. Respond to data request from regulatory bodies for rate cases and other proceedings.
- The position of Lead requires the ability to work independently with minimal guidance and communicate to both internal and external stakeholders to present and defend results. The ability to speak to both technical and non-technical persons to present projects is essential.

Job Title: Lead Data Scientist, Gas Load Forecasting

Sr. Data Scientist, Gas Load Forecasting

- Develop long-term gas load forecasts using econometric regression, time series, and machine learning models, as appropriate.
- Perform exploratory analysis of large complex data sets to derive insights and valuable actions.
- Discover business narrative told by the data and be able to present them to peer data scientists, business stakeholders, and managers at various levels.
- Provide expert testimony before regulators and defend the forecasts. Respond to data request from regulatory bodies for rate cases and other proceedings.
- The position of Lead requires the ability to work independently with minimal guidance and communicate to both internal and external stakeholders to present and defend results. The ability to speak to both technical and non-technical persons to present projects is essential.

Job Title: Lead Data Scientist, Short-term Load Forecasting

Sr. Data Scientist, Short-term Load Forecasting

- Develop and implement short-term load forecast models and processes. Enable processes to be integrated with daily transmission and distribution level control center operations and supply procurement.
- Develop short-term forecasts at both the company level and more granular areas including substations and feeders.
- Implement forecasts using time series, regression analysis, neural nets and other machine learning methods.
- Ensure the forecasts properly account for distributed energy resources (DERs) and new technologies (e.g. solar, demand response, energy storage, electric vehicles, etc).
- The position of Lead requires the ability to work independently and in teams and to present and defend results. The ability to speak to both technical and non-technical persons to present projects is essential.

Job Title: Lead Data Scientist, DER, Policy and Economics

Sr. Data Scientist, DER Policy and Economics

- Developing long-term forecasts for distributed resources (including solar PV, energy efficiency, demand response, EVs, storage), and creating long-term outlooks for policy based decarbonization goals. Performing additional analysis relating to DERs, DSM, and decarbonization policies in the forecast as necessary.
- Supporting the long-term electric and gas load forecasting teams in integrating DERs, policies, and decarbonization forecasts into the long-term forecasts.
- Introducing data-driven methodologies to determine typical operational profiles for various DERs.
- Creating interactive graphics, dashboards, and other visualizations using specialized software like Shiny, Tableau, etc., to convey the results of the forecasts and forecast variance to external and internal stakeholders.
- Applying image processing and text mining techniques to accurately classify existing solar, energy storage and EV parking sites and help improve the quality of in-house data and analyses.
- Reading research papers, articles, conference papers, or other material to remain up to date with data science tools and technologies. Accordingly, improving and updating forecast processes to ensure they are efficient and reliable.
- Providing expert testimony before regulators and defending the forecasts. Responding to data requests from regulatory bodies for rate cases and other proceedings.
- Collaborating with internal stakeholders (including supply, engineering, regulatory, strategy) regarding forecast methodology and analysis and ensure our deliverables meet their needs.

- Staying current in all policies, regulatory requirements, market trends, and industry standards regarding customer energy use and technologies and programs impacting that use, such as energy efficiency and demand response.
- The position of Lead requires the ability to work independently and in teams and to present and defend results. The ability to speak to both technical and non-technical persons to present projects is essential.

Job Title: Lead Data Scientist, Data Management and Analytics

Sr. Data Scientist, Data Management and Analytics

- Assemble small and large individual data sets that meet internal business requirements
- Design and implement ETL processes to collect, transform, and store data from various data sources (databases, APIs, FTPs, SharePoint, Power Platform, Azure) using a range of technologies depending upon the use case (SQL, R, Python, PowerShell)
- Develop, manage, and maintain the data platform, which includes database architecture, stored procedures, server task management, and reporting
- Drive the process to automate manual procedures and optimize data delivery for end-users
- Work with stakeholders to assist with data-related technical issues and support their data infrastructure needs
- The position of Lead requires the ability to work independently with minimal guidance and communicate to both internal and external stakeholders to present and defend results. The ability to speak to both technical and non-technical persons to present projects is essential.

Job Title	Company	Employee ID	Minimum Pay	Mid Point/MRP	Maximum Pay
Lead Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Lead Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Lead Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Manager, Data Science	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Manager, Data Science	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Associate Quantitative Analyst	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Lead Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Lead Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Lead Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Manager, Data Science	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Manager, Data Science	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Manager, Data Science	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Senior Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Senior Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Senior Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Senior Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Director	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Lead Quantitative Analyst	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Lead Quantitative Analyst	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Senior Quantitative Analyst	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Lead Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]
Senior Data Scientist	National Grid Service Company	[redacted]	[redacted]	[redacted]	[redacted]

Date of Request: September 12, 2024 | Request No. DPS-1025
Due Date: September 23, 2024 | NG Request No. NG-1531

Niagara Mohawk Power Corporation d/b/a National Grid
Case No. 24-E-0322 & 24-G-0323
Data Request

Request for Information

FROM: PSC - James Creaser

TO: National Grid

SUBJECT: Data Discrepancy

Request:

In all interrogatories, any requests for workpapers or supporting calculations shall be construed as requesting any Word, Excel, or other computer spreadsheet models in original electronic format with all formulae intact and unlocked.

1. Regarding exhibits G-RDP-2CU, GLF-4CU, and GLF-5CU:

   a. Explain why accounts and volumes do not match between these exhibits.

   b. Provide the correct numbers for accounts and volumes and all workpapers associated with these corrected numbers.

Response:

Exhibit __ (G-RDP-2CU) is correct. In preparing its Corrections and Updates exhibits, the Gas Load Forecasting Panel inadvertently omitted the manual adjustment reflecting the transfer of certain accounts from Service Classifications Nos. 8 and 9 to Service Classification No. 6, which resulted in the discrepancy.

Please see Attachments 1 through 7 for revised versions of Exhibits __ (GLF-4CU), (GLF-5CU), (GLF-7CU), (GLF-8CU), (GLF-12CU), (GLF-13CU), and (GLF-14CU), which reflect the manual adjustment beginning March 2024.

Name of Respondent: | Date of Reply:
Theodore Poe, Jr. | September 17, 2024

NMPC Forecast Fiscal Year Deliveries by Service and Revenue Class for the Period FY2024 - FY2029
(Therms)

	9	10	11	12	13	14			
Class Name	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY24-FY29 Change	FY24-FY29 PA Change	FY24-FY29 PPA Change
SC1 Residential Heat - EAP	50,802,524	57,994,002	58,238,563	58,477,637	59,008,733	58,936,328	8,133,804	1,626,761	3.0%
SC1 MB Residential Heat - EAP	583,320	1,036,583	1,040,861	1,045,092	1,055,836	1,053,137	469,817	93,963	12.5%
SC1 Residential Non Heat - EAP	318,299	357,632	345,530	334,570	324,793	312,780	-5,519	-1,104	-0.3%
SC1 MB Residential Non-Heat - EAP	3,612	6,788	6,536	6,307	6,106	5,856	2,244	449	10.1%
SC1 Residential Non Heat	2,683,969	2,860,521	2,771,801	2,690,707	2,620,463	2,529,409	-154,560	-30,912	-1.2%
SC1 Residential Heat	391,046,680	440,731,745	442,852,328	444,870,954	449,162,651	448,744,665	57,697,985	11,539,597	2.8%
SC1 MB Residential Non-Heat	127,211	187,943	181,810	176,289	171,517	165,306	38,095	7,619	5.4%
SC1 MB Residential Heat	30,290,065	45,398,994	45,609,971	45,813,052	46,297,241	46,200,406	15,910,341	3,182,068	8.8%
Total SC1	475,855,680	548,574,208	551,047,400	553,414,608	558,647,340	557,947,887	82,092,207	16,418,441	3.2%
SC2 Residential Non Heat	27,173	25,404	24,621	23,911	23,272	22,497	-4,676	-935	-3.7%
SC2 Residential Heat	1,760,734	2,038,580	2,048,375	2,057,757	2,077,184	2,075,742	315,008	63,002	3.3%
SC2 Commercial Non Heat	2,446,594	2,770,556	2,799,875	2,828,951	2,868,042	2,885,955	439,361	87,872	3.4%
SC2 Commercial Heat	109,266,382	112,504,975	113,796,049	115,071,978	116,864,275	117,585,193	8,318,811	1,663,762	1.5%
SC2 Industrial	1,100,458	1,200,009	1,212,422	1,227,119	1,247,849	1,256,276	155,818	31,164	2.7%
SC2 MB Residential Non Heat	7,556	9,381	9,017	8,684	8,378	8,025	469	94	1.2%
SC2 MB Residential Heat	960,096	1,105,006	1,109,908	1,114,696	1,125,087	1,123,866	163,770	32,754	3.2%
SC2 MB Commercial Non Heat	2,966,142	3,290,067	3,325,573	3,360,572	3,409,853	3,429,027	462,885	92,577	2.9%
SC2 MB Commercial Heat	77,285,384	86,363,694	87,358,768	88,341,475	89,717,067	90,272,056	12,986,672	2,597,334	3.2%
SC2 MB Industrial	822,850	889,241	896,472	904,474	917,788	921,086	98,236	19,647	2.3%
Total SC2	196,643,369	210,196,913	212,581,080	214,939,617	218,258,795	219,579,723	22,936,354	4,587,271	2.2%
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	-
SC3 Commercial Heat	0	0	0	0	0	0	0	0	-
SC3 Industrial	0	0	0	0	0	0	0	0	-
Total SC3	0	0	0	0	0	0	0	0	-
SC5 Firm Sales	58,509,362	63,751,250	63,751,250	63,751,250	63,788,418	63,751,250	5,241,888	1,048,378	1.7%
SC6 Interruptible	40,296,384	51,834,437	51,834,437	51,834,437	51,859,337	51,834,437	11,538,053	2,307,611	5.2%
SC7 Small Volume Firm Sales	75,133,268	87,055,778	88,055,865	89,040,173	90,400,354	90,963,486	15,830,218	3,166,044	3.9%
SC8 Firm Sales and Transportation	177,683,620	197,120,467	197,120,467	197,120,467	197,255,370	197,120,467	19,436,847	3,887,369	2.1%
SC9 Negotiated Transportation Service	72,504,769	73,744,778	73,744,778	73,744,778	73,749,924	73,744,778	1,240,009	248,002	0.3%
SC9 NYSEG Transportation	2,484,924	2,409,554	2,409,554	2,409,554	2,414,798	2,409,554	-75,370	-15,074	-0.6%
SC10 Natural Gas Vehicles	15,569	24,730	24,936	25,143	25,432	25,551	9,982	1,996	10.4%
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	-
SC12 Distributed Generation	16,672,439	15,686,086	15,686,086	15,686,086	15,699,145	15,686,086	-986,353	-197,271	-1.2%
SC13 Residential Distributed Generation	4,028	3,939	3,955	3,971	4,009	4,003	-25	-5	-0.1%
Total SC5 - SC13	443,304,363	491,631,019	492,631,328	493,615,859	495,196,787	495,539,612	52,235,249	10,447,050	2.3%
SC14 Dual Fuel Electric Generators	388,516,885	371,598,654	371,598,654	371,598,654	371,648,316	371,598,654	-16,918,231	-3,383,646	-0.9%
TOTAL	1,504,320,297	1,622,000,794	1,627,858,462	1,633,568,738	1,643,751,238	1,644,665,876	140,345,579	28,069,116	1.8%

NMPC Forecast End of Fiscal Year Customer Count by Service and Revenue Class for the Period FY2024 - FY2029

	9	10	11	12	13	14	FY24-FY29	FY24-FY29	FY24-FY29
Class Name	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	Change	PA Change	PPA Change
SC1 Residential Heat - EAP	60,504	60,940	61,403	61,821	62,245	62,664	2,160	432	0.7%
SC1 MB Residential Heat - EAP	551	555	560	563	567	570	19	4	0.7%
SC1 Residential Non Heat - EAP	2,401	2,298	2,226	2,155	2,083	2,012	-389	-78	-3.5%
SC1 MB Residential Non-Heat - EAP	25	24	23	22	21	21	-4	-1	-3.4%
SC1 Residential Non Heat	20,947	20,140	19,566	19,003	18,441	17,878	-3,069	-614	-3.1%
SC1 Residential Heat	480,237	483,954	487,891	491,414	494,976	498,506	18,269	3,654	0.7%
SC1 MB Residential Non-Heat	704	676	655	635	615	594	-110	-22	-3.3%
SC1 MB Residential Heat	25,702	25,896	26,102	26,288	26,475	26,659	958	192	0.7%
Total SC1	591,071	594,483	598,425	601,901	605,423	608,904	17,834	3,567	0.6%
SC2 Residential Non Heat	52	49	48	46	45	44	-8	-2	-3.3%
SC2 Residential Heat	759	765	772	777	783	788	29	6	0.8%
SC2 Commercial Non Heat	1,422	1,428	1,434	1,441	1,447	1,453	31	6	0.4%
SC2 Commercial Heat	34,563	34,711	34,875	35,017	35,163	35,307	744	149	0.4%
SC2 Industrial	117	117	117	118	118	119	2	0	0.3%
SC2 MB Residential Non Heat	13	13	12	12	11	11	-2	0	-3.3%
SC2 MB Residential Heat	197	199	200	202	203	204	7	1	0.7%
SC2 MB Commercial Non Heat	492	494	497	498	501	503	11	2	0.4%
SC2 MB Commercial Heat	10,360	10,405	10,453	10,495	10,538	10,580	220	44	0.4%
SC2 MB Industrial	57	58	58	58	58	58	1	0	0.3%
Total SC2	48,033	48,238	48,466	48,663	48,867	49,067	1,034	207	0.4%
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	-
SC3 Commercial Heat	0	0	0	0	0	0	0	0	-
SC3 Industrial	0	0	0	0	0	0	0	0	-
Total SC3	0	0	0	0	0	0	0	0	-
SC5 Firm Sales	126	126	126	126	126	126	0	0	0.0%
SC6 Interruptible	16	16	16	16	16	16	0	0	0.0%
SC7 Small Volume Firm Sales	794	798	803	807	809	811	18	4	0.4%
SC8 Firm Sales and Transportation	70	70	70	70	70	70	0	0	0.0%
SC9 Negotiated Transportation Service	2	2	2	2	2	2	0	0	0.0%
SC9 NYSEG Transportation	1	1	1	1	1	1	0	0	0.0%
SC10 Natural Gas Vehicles	3	3	3	3	3	3	0	0	0.0%
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	-
SC12 Distributed Generation	18	18	18	18	18	18	0	0	0.0%
SC13 Residential Distributed Generation	4	4	4	4	4	4	0	0	0.0%
Total SC5 - SC13	1,034	1,038	1,043	1,047	1,049	1,051	18	4	0.3%
SC14 Dual Fuel Electric Generators	6	6	6	6	6	6	0	0	0.0%
TOTAL	640,143	643,765	647,940	651,617	655,345	659,029	18,886	3,777	0.6%

NMPC Historical Actual Deliveries by Service and Revenue Class
For the Period April 2018 - March 2024 (FY2019 - FY2024)
(Therms)

	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Class Name	Apr-2018	May-2018	Jun-2018	Jul-2018	Aug-2018	Sep-2018	Oct-2018	Nov-2018	Dec-2018	Jan-2019	Feb-2019	Mar-2019	Apr-2019	May-2019	Jun-2019	Jul-2019
SC1 Residential Heat - EAP	6,685,120	3,461,126	1,216,050	832,478	705,222	795,916	1,468,498	4,285,256	7,366,120	9,022,354	9,652,000	8,442,366	5,866,338	3,384,211	1,719,301	903,657
SC1 MB Residential Heat - EAP	1,061,799	515,461	164,669	106,988	85,210	90,236	152,994	438,393	749,227	907,559	976,310	798,302	537,757	295,265	142,138	69,101
SC1 Residential Non Heat - EAP	54,047	31,987	19,586	14,143	12,570	17,413	14,379	33,076	54,270	68,166	72,800	61,652	48,283	33,464	23,977	16,881
SC1 MB Residential Non-Heat - EAP	6,822	4,147	2,241	1,610	1,397	1,469	1,890	3,315	4,424	5,577	5,440	4,558	2,986	2,059	1,506	1,142
SC1 Residential Non Heat	408,244	246,344	144,039	111,803	98,644	107,763	135,508	276,336	455,339	530,929	588,143	514,998	357,329	230,851	156,755	117,350
SC1 Residential Heat	50,092,521	25,456,634	9,306,832	6,570,460	5,676,541	6,450,695	11,164,540	34,078,699	57,980,057	67,989,988	74,201,120	64,943,677	42,761,809	23,705,914	12,215,073	7,119,037
SC1 MB Residential Non-Heat	50,169	35,759	26,008	20,978	18,156	19,051	23,004	36,236	54,025	61,929	66,353	59,983	46,311	34,634	26,686	20,236
SC1 MB Residential Heat	10,718,301	5,462,288	1,913,171	1,343,658	1,147,026	1,296,164	2,279,493	7,002,751	11,760,043	13,851,208	15,026,123	13,086,216	8,673,286	4,788,334	2,417,815	1,360,018
Total SC1	69,077,023	35,213,746	12,792,596	9,002,118	7,744,766	8,778,707	15,240,306	46,154,062	78,423,505	92,437,710	100,588,289	87,911,752	58,294,099	32,474,732	16,703,251	9,607,422
SC2 Residential Non Heat	1,335	902	729	656	638	701	814	1,296	2,531	2,506	2,481	2,340	2,015	1,858	1,047	989
SC2 Residential Heat	210,633	109,633	43,020	33,540	30,981	34,228	52,858	141,713	249,716	271,057	314,011	281,286	186,922	106,387	56,861	38,785
SC2 Commercial Non Heat	313,448	196,220	134,276	112,116	106,449	116,380	138,788	223,290	330,259	375,642	398,941	362,899	265,400	188,616	146,021	115,594
SC2 Commercial Heat	12,285,356	6,009,757	2,439,381	1,811,141	1,607,898	1,808,334	2,950,456	8,242,227	14,540,327	19,482,969	17,505,366	15,578,273	10,474,383	5,627,430	3,067,427	2,030,507
SC2 Industrial	129,669	62,229	10,715	9,819	8,067	9,704	19,320	97,506	148,463	199,970	209,053	189,073	114,158	53,118	18,313	11,391
SC2 MB Residential Non Heat	3,082	1,247	1,135	980	906	1,123	2,133	3,729	4,418	5,980	4,846	4,047	2,216	1,609	1,121	930
SC2 MB Residential Heat	147,535	80,451	37,227	29,209	27,051	28,969	41,304	98,101	165,662	192,155	206,329	191,594	122,792	71,197	40,880	30,040
SC2 MB Commercial Non Heat	409,429	311,463	176,241	142,738	128,582	143,602	182,145	273,300	413,563	462,921	501,827	458,084	343,837	246,659	173,196	129,381
SC2 MB Commercial Heat	10,985,986	5,634,179	2,441,598	1,915,175	1,880,186	1,957,554	2,976,167	7,642,895	12,501,758	14,650,501	15,732,387	13,965,850	9,255,664	5,359,960	2,929,955	1,974,262
SC2 MB Industrial	128,706	56,995	20,880	17,382	14,784	21,970	28,883	95,198	162,915	201,838	198,675	163,586	121,212	64,525	28,837	22,446
Total SC2	24,615,179	12,463,076	5,305,202	4,072,756	3,805,542	4,122,565	6,392,868	16,819,255	28,519,612	35,845,539	35,073,916	31,197,032	20,888,599	11,721,359	6,463,658	4,354,325
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	6,502,730	4,351,120	3,884,380	3,593,527	4,006,528	3,690,792	5,272,365	5,469,893	7,253,452	8,378,115	7,804,451	7,652,718	5,393,250	4,611,528	4,093,261	3,637,592
SC6 Interruptible	4,506,385	4,624,707	3,478,833	4,527,159	5,452,078	4,835,957	5,329,091	4,442,530	5,359,314	4,839,480	3,377,351	5,038,855	3,837,441	3,988,932	4,253,841	3,221,573
SC7 Small Volume Firm Sales	10,447,186	5,436,619	2,866,125	2,127,059	2,156,645	2,415,968	4,218,069	9,233,868	11,955,641	14,313,776	14,381,844	12,418,169	8,736,127	5,439,136	3,115,445	2,161,734
SC8 Firm Sales and Transportation	22,971,412	19,235,323	15,528,598	14,638,480	15,728,594	15,359,924	21,348,055	10,852,350	22,645,148	22,685,610	24,090,486	24,285,563	20,667,728	17,951,312	17,331,547	14,192,116
SC9 Negotiated Transportation Service	7,411,682	6,548,915	7,011,254	5,535,360	6,251,680	6,017,779	6,598,375	6,460,586	7,513,430	6,903,737	6,732,795	6,976,482	6,287,167	6,452,454	6,867,605	5,199,599
SC9 NYSEG Transportation	410,748	263,686	67,459	51,269	43,095	42,135	57,888	155,329	378,289	441,071	544,823	508,448	360,826	188,057	104,542	49,327
SC10 Natural Gas Vehicles	14,704	20,203	12,445	9,961	7,795	9,153	13,436	17,158	16,783	15,496	14,334	17,507	12,058	14,973	10,731	6,716
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	1,203,607	1,129,524	1,111,081	1,068,358	1,108,295	1,051,387	1,108,632	1,069,051	1,284,980	1,315,213	1,304,844	1,466,083	1,197,991	1,066,327	959,098	730,216
SC13 Residential Distributed Generation	311	204	68	45	37	46	89	316	568	623	683	622	373	200	109	55
Total SC5 - SC13	53,468,765	41,610,301	33,960,243	31,551,218	34,754,747	33,423,141	43,946,000	37,701,081	56,407,605	58,893,121	58,251,611	58,364,447	46,492,961	39,712,919	36,736,179	29,198,928
SC14 Dual Fuel Electric Generators	36,048,612	50,846,559	17,176,947	27,585,976	35,138,370	59,095,377	46,997,892	39,236,273	38,427,245	27,991,548	51,665,551	42,183,607	28,759,999	6,407,812	8,404,148	24,179,534
TOTAL	183,209,579	140,133,682	69,234,988	72,212,068	81,443,425	105,419,790	112,577,066	139,910,671	201,777,967	215,167,918	245,579,367	219,656,838	154,435,658	90,316,822	68,307,236	67,340,209
Actual BDD (KALB)	896	337	55	6	0	25	174	690	991	1048	1243	1017	689	334	80	0
Normal BDD (KALB)	737	313	135	4	2	28	258	670	925	1022	1299	959	737	313	135	4

NMPC Historical Actual Deliveries by Service and Revenue Class
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	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
Class Name	Aug-2019	Sep-2019	Oct-2019	Nov-2019	Dec-2019	Jan-2020	Feb-2020	Mar-2020	Apr-2020	May-2020	Jun-2020	Jul-2020	Aug-2020	Sep-2020	Oct-2020	Nov-2020
SC1 Residential Heat - EAP	797,335	871,675	1,519,784	3,813,895	7,631,913	8,855,804	8,266,329	7,289,951	5,655,956	4,156,164	1,751,499	963,711	753,008	921,412	1,722,361	3,709,964
SC1 MB Residential Heat - EAP	43,681	45,184	72,530	176,141	337,879	420,723	406,720	360,386	266,632	180,488	71,715	32,009	23,562	26,882	46,340	96,926
SC1 Residential Non Heat - EAP	14,894	14,595	17,444	28,400	55,073	47,241	50,166	45,248	40,902	32,805	20,579	15,379	11,882	13,505	17,427	26,507
SC1 MB Residential Non-Heat - EAP	606	540	617	954	1,456	2,086	2,145	1,901	1,816	1,391	934	541	422	437	490	747
SC1 Residential Non Heat	106,766	107,199	127,792	228,939	413,251	472,189	437,219	399,837	311,573	238,407	145,837	111,673	88,681	100,851	127,762	209,434
SC1 Residential Heat	6,325,888	7,052,037	11,766,870	30,486,630	58,809,724	65,776,189	62,542,940	55,600,801	41,222,534	29,052,551	12,667,385	7,521,256	5,987,569	7,445,960	12,606,533	27,096,931
SC1 MB Residential Non-Heat	18,080	17,850	20,093	30,519	49,520	54,075	51,251	45,934	37,644	31,398	20,764	16,121	12,909	14,821	17,845	23,542
SC1 MB Residential Heat	1,195,812	1,314,403	2,269,946	5,830,392	11,278,339	12,783,896	11,920,135	10,542,291	7,719,439	5,373,833	2,292,127	1,312,083	1,031,130	1,260,024	2,173,429	4,687,018
Total SC1	8,503,062	9,423,483	15,795,076	40,595,870	78,577,155	88,412,203	83,676,905	74,286,349	55,256,496	39,067,037	16,970,840	9,972,773	7,909,163	9,783,892	16,712,187	35,851,069
SC2 Residential Non Heat	920	1,203	1,494	2,538	4,469	4,306	4,154	3,462	2,640	2,405	1,470	988	1,561	2,158	1,454	1,798
SC2 Residential Heat	36,979	39,273	59,729	127,066	257,403	290,949	273,718	244,650	168,457	110,454	52,387	36,852	32,329	39,413	61,448	120,144
SC2 Commercial Non Heat	109,892	112,740	120,745	215,567	329,380	332,891	308,312	283,186	200,750	149,025	104,067	91,276	87,366	100,665	122,829	188,806
SC2 Commercial Heat	1,806,399	2,189,714	3,030,553	7,510,814	14,828,941	17,262,362	15,871,934	13,790,325	9,326,251	6,130,951	2,684,293	1,489,535	1,564,084	1,830,064	2,998,245	6,325,275
SC2 Industrial	13,447	9,192	28,684	89,546	162,739	207,546	178,917	173,373	116,334	100,483	37,246	9,011	8,012	14,665	24,490	71,037
SC2 MB Residential Non Heat	939	1,082	1,824	3,590	4,306	4,676	4,409	3,407	2,655	1,967	1,272	1,139	435	387	574	878
SC2 MB Residential Heat	27,786	29,928	42,340	87,334	162,109	178,532	169,045	148,016	103,309	69,971	30,963	23,997	21,155	24,835	39,589	70,751
SC2 MB Commercial Non Heat	127,467	140,110	158,543	241,379	393,741	465,241	439,154	399,013	288,254	201,840	134,517	105,935	95,114	107,170	145,255	195,813
SC2 MB Commercial Heat	1,878,660	2,017,901	2,953,537	6,773,754	12,383,649	14,148,695	13,202,503	11,633,047	8,221,901	5,542,812	2,611,230	1,845,331	1,489,488	1,819,453	2,808,034	5,712,491
SC2 MB Industrial	11,881	20,671	22,722	83,735	154,142	186,693	173,489	148,017	103,873	75,276	25,296	22,138	13,449	15,835	23,804	55,179
Total SC2	4,014,370	4,561,814	6,420,171	15,135,323	28,680,879	33,081,891	30,625,635	26,826,496	18,534,424	12,385,184	5,682,741	3,626,202	3,312,993	3,954,645	6,225,722	12,742,172
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	3,718,221	3,817,232	4,980,440	5,599,500	7,300,164	7,351,550	6,921,991	6,169,934	5,038,858	4,368,112	3,430,619	3,623,878	3,476,690	4,072,683	4,777,417	4,986,825
SC6 Interruptible	5,364,851	4,538,357	3,420,554	3,252,582	4,898,267	4,760,358	3,735,713	3,779,376	4,967,674	3,405,515	2,123,131	3,882,275	3,822,296	3,400,829	3,773,949	3,491,540
SC7 Small Volume Firm Sales	2,449,428	2,517,971	4,028,223	7,876,774	12,444,649	13,175,099	12,701,221	10,615,972	8,057,906	5,398,398	3,057,475	2,077,629	1,957,658	2,387,681	3,845,044	7,454,254
SC8 Firm Sales and Transportation	15,466,723	16,683,394	13,803,124	16,714,582	23,605,122	23,527,484	23,895,731	21,962,541	19,909,021	18,119,212	13,643,826	12,374,800	13,406,345	12,163,504	11,995,982	15,031,266
SC9 Negotiated Transportation Service	6,186,032	6,640,924	5,737,435	6,096,934	7,006,775	6,640,767	7,153,425	6,567,510	6,073,612	5,188,116	4,556,855	5,128,176	6,378,331	5,772,336	5,922,059	6,287,654
SC9 NYSEG Transportation	45,364	49,756	49,995	123,499	389,513	469,128	462,458	433,326	297,418	226,579	100,610	47,333	43,917	42,183	56,393	131,477
SC10 Natural Gas Vehicles	7,114	8,962	6,938	5,623	5,365	7,505	6,452	7,262	10,068	8,062	7,101	10,677	8,278	6,304	7,107	2,918
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	960,971	1,159,379	1,057,467	1,200,741	1,017,495	1,281,655	1,170,411	794,093	1,083,544	1,166,219	995,388	890,206	1,122,517	1,103,308	1,114,937	1,124,054
SC13 Residential Distributed Generation	43	48	99	470	484	489	604	487	359	321	96	62	47	60	114	270
Total SC5 - SC13	34,198,747	35,416,023	33,084,275	40,870,705	56,667,834	57,214,035	56,048,006	50,330,501	45,438,460	37,880,534	27,915,101	28,035,036	30,216,079	28,948,888	31,493,002	38,510,258
SC14 Dual Fuel Electric Generators	42,479,818	56,985,025	30,131,487	23,678,747	40,632,973	39,877,139	38,246,174	32,548,921	29,429,110	6,309,490	7,346,505	29,296,734	52,450,676	46,262,614	34,953,712	24,651,277
TOTAL	89,195,997	106,386,345	85,431,009	120,280,645	204,558,841	218,585,268	208,596,720	183,992,267	148,658,490	95,642,245	57,915,187	70,930,745	93,888,911	88,950,039	89,384,623	111,754,776
Actual BDD (KALB)	0	28	214	623	926	973	1125	786	613	482	57	0	0	76	333	588
Normal BDD (KALB)	2	28	258	670	925	1022	1299	994	737	313	135	4	2	28	258	670

NMPC Historical Actual Deliveries by Service and Revenue Class
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(Therms)

	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
Class Name	Dec-2020	Jan-2021	Feb-2021	Mar-2021	Apr-2021	May-2021	Jun-2021	Jul-2021	Aug-2021	Sep-2021	Oct-2021	Nov-2021	Dec-2021	Jan-2022	Feb-2022	Mar-2022
SC1 Residential Heat - EAP	6,678,911	9,284,561	9,706,431	8,355,481	5,446,794	3,248,155	1,618,855	967,807	834,752	879,373	1,288,084	3,459,957	7,052,295	9,140,919	10,349,555	8,297,679
SC1 MB Residential Heat - EAP	183,082	257,368	275,892	244,305	159,421	92,144	42,076	24,384	21,026	20,694	31,018	84,412	179,096	229,611	263,277	215,514
SC1 Residential Non Heat - EAP	42,126	54,248	57,462	49,769	37,829	27,509	20,383	15,295	13,408	13,692	15,728	25,470	41,899	50,810	55,509	46,350
SC1 MB Residential Non-Heat - EAP	1,147	1,562	1,386	1,741	1,080	665	529	411	363	353	393	621	1,057	1,056	1,277	1,055
SC1 Residential Non Heat	341,114	456,044	495,438	440,368	315,219	168,420	131,233	102,332	90,257	92,107	101,781	188,747	324,390	417,233	513,480	412,829
SC1 Residential Heat	48,338,850	66,919,388	72,713,965	63,918,617	39,257,342	22,491,291	11,882,803	7,702,066	6,749,634	7,027,295	9,367,599	25,659,710	52,153,922	67,830,159	81,622,109	65,277,612
SC1 MB Residential Non-Heat	35,328	45,375	47,181	43,681	31,299	21,881	16,386	13,349	11,173	11,138	11,644	15,918	25,196	30,489	36,163	29,295
SC1 MB Residential Heat	8,371,859	11,407,787	12,246,066	10,661,805	6,517,135	3,699,100	1,719,256	1,066,743	913,849	927,455	1,279,582	3,545,032	7,111,053	9,203,095	10,843,036	8,606,394
Total SC1	63,992,417	88,426,333	95,543,821	83,715,767	51,766,119	29,749,165	15,431,521	9,892,387	8,634,462	8,972,107	12,095,829	32,979,867	66,888,908	86,903,372	103,684,406	82,886,728
SC2 Residential Non Heat	2,776	3,463	3,926	3,801	2,903	2,194	2,939	1,441	1,407	1,304	1,501	1,854	2,346	1,922	2,244	2,108
SC2 Residential Heat	215,322	284,272	303,248	271,438	178,247	110,794	61,525	44,867	42,442	43,625	53,130	116,758	221,226	309,152	380,677	291,066
SC2 Commercial Non Heat	250,373	343,410	379,650	315,886	254,822	158,079	122,346	108,077	107,423	115,841	128,087	198,415	284,094	371,599	413,735	286,277
SC2 Commercial Heat	11,972,941	16,727,695	18,345,663	16,537,685	9,455,188	5,822,784	2,964,178	1,946,693	1,764,277	2,051,192	2,431,832	6,754,870	12,808,525	17,503,126	21,671,395	14,832,684
SC2 Industrial	170,046	217,628	246,453	177,226	176,893	90,325	66,546	66,654	62,042	160,047	198,552	255,760	291,060	210,426	230,444	159,071
SC2 MB Residential Non Heat	1,285	1,569	1,543	1,138	690	435	339	340	341	363	563	946	1,340	2,039	1,504	1,213
SC2 MB Residential Heat	128,987	180,761	205,114	175,112	111,396	68,769	37,339	26,716	26,212	26,033	30,577	70,204	129,789	169,584	189,173	158,097
SC2 MB Commercial Non Heat	313,885	391,906	421,890	385,419	298,657	213,579	142,866	121,212	109,881	116,323	125,479	182,745	323,943	389,217	689,075	509,725
SC2 MB Commercial Heat	10,024,451	13,626,423	14,908,290	12,767,124	7,961,950	4,628,279	2,401,200	1,807,337	1,729,871	1,887,110	2,509,567	5,666,662	10,526,983	12,802,513	17,457,730	10,856,111
SC2 MB Industrial	146,399	156,634	193,554	178,247	83,865	48,931	31,260	24,011	14,698	17,192	24,583	57,638	150,093	168,911	178,495	128,332
Total SC2	23,226,465	31,933,761	35,009,331	30,813,076	18,524,611	11,144,169	5,830,538	4,147,348	3,858,594	4,419,030	5,503,871	13,305,852	24,739,399	31,928,489	41,214,472	27,224,684
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	6,755,802	7,827,011	7,186,411	6,445,279	5,549,445	4,484,726	3,624,747	3,481,671	3,812,270	3,833,830	4,374,884	5,278,315	6,259,593	7,784,401	7,547,304	7,168,747
SC6 Interruptible	5,050,870	5,019,342	3,988,844	3,949,489	4,624,736	4,321,939	3,008,904	4,426,382	4,047,602	4,195,853	3,999,960	3,896,042	4,957,607	4,978,131	3,764,268	3,678,927
SC7 Small Volume Firm Sales	10,755,363	12,734,616	13,944,251	12,512,902	8,200,728	5,059,823	3,430,676	2,616,571	2,196,971	2,521,774	2,933,630	6,963,081	10,085,319	13,022,725	15,545,110	12,538,280
SC8 Firm Sales and Transportation	20,058,116	22,072,439	20,848,516	21,277,395	20,379,582	15,561,936	13,538,420	13,298,978	14,469,519	14,036,579	12,250,266	14,585,191	19,111,569	23,813,710	17,798,428	21,114,925
SC9 Negotiated Transportation Service	7,155,274	7,374,793	6,492,123	6,540,397	7,451,020	6,078,789	5,663,028	5,697,160	6,413,541	6,018,518	5,910,505	6,016,313	6,851,186	6,864,210	6,645,373	6,426,625
SC9 NYSEG Transportation	278,138	466,529	486,986	471,808	355,981	172,371	89,703	49,225	48,798	43,633	46,750	97,640	311,105	389,254	570,835	467,123
SC10 Natural Gas Vehicles	3,577	2,939	1,950	3,353	3,366	2,094	2,647	2,325	2,828	3,623	1,712	1,823	3,908	2,782	1,251	1,878
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	1,361,602	1,397,824	1,345,878	1,462,831	1,196,200	855,089	746,666	1,012,670	1,292,277	1,172,246	1,060,063	1,081,789	1,307,252	1,350,875	1,229,934	1,318,383
SC13 Residential Distributed Generation	434	632	755	489	259	208	77	75	51	52	91	282	360	607	674	598
Total SC5 - SC13	51,419,176	56,896,125	54,295,714	52,663,943	47,761,317	36,536,975	30,104,868	30,585,057	32,283,857	31,826,108	30,577,861	37,920,476	48,887,899	58,206,695	53,103,177	52,715,486
SC14 Dual Fuel Electric Generators	24,387,252	29,883,283	34,260,047	32,938,739	12,457,493	5,115,100	12,053,724	42,844,312	42,007,263	45,727,443	13,991,554	21,252,399	34,940,205	36,897,709	53,940,543	48,887,398
TOTAL	163,025,310	207,139,502	219,108,913	200,131,525	130,509,540	82,545,409	63,420,651	87,469,104	86,784,176	90,944,688	62,169,115	105,458,594	175,456,411	213,936,265	251,942,598	211,714,296
Actual BDD (KALB)	904	1155	1377	986	585	495	121	40	18	41	130	539	840	1117	1327	930
Normal BDD (KALB)	925	1022	1299	959	737	313	135	4	2	28	258	670	925	1022	1299	959

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(Therms)

	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Class Name	Apr-2022	May-2022	Jun-2022	Jul-2022	Aug-2022	Sep-2022	Oct-2022	Nov-2022	Dec-2022	Jan-2023	Feb-2023	Mar-2023	Apr-2023	May-2023	Jun-2023	Jul-2023
SC1 Residential Heat - EAP	6,312,132	3,540,304	1,304,324	970,042	819,625	898,613	1,913,720	3,575,829	7,271,881	8,920,001	8,556,990	8,160,092	6,204,732	3,228,289	1,604,244	967,283
SC1 MB Residential Heat - EAP	164,321	94,337	33,582	24,420	19,946	17,123	25,010	46,282	97,026	121,117	115,398	101,156	73,798	38,324	17,747	10,355
SC1 Residential Non Heat - EAP	38,968	27,662	17,097	14,613	12,973	13,532	17,704	25,113	41,414	48,294	45,923	43,484	36,560	23,945	17,075	13,713
SC1 MB Residential Non-Heat - EAP	1,004	890	525	398	396	357	441	547	751	620	533	571	491	278	268	233
SC1 Residential Non Heat	310,414	188,046	104,432	92,208	82,191	87,456	120,156	179,295	322,135	400,961	402,332	386,956	293,269	167,493	114,152	93,851
SC1 Residential Heat	46,522,259	24,206,088	9,501,095	7,382,830	6,236,571	7,023,753	13,948,204	25,884,500	52,849,056	66,526,535	66,635,449	63,069,202	45,024,883	22,248,864	11,505,584	7,644,031
SC1 MB Residential Non-Heat	23,398	16,363	11,049	9,812	7,820	7,951	7,527	10,094	15,224	17,473	16,834	16,630	13,302	9,322	6,652	5,542
SC1 MB Residential Heat	6,087,359	3,133,343	1,155,561	878,494	719,942	666,537	1,126,798	2,170,041	4,357,909	5,214,422	5,115,743	4,770,419	3,342,655	1,616,641	779,350	486,563
Total SC1	59,459,855	31,207,033	12,127,665	9,372,817	7,899,464	8,715,322	17,159,560	31,891,701	64,955,396	81,249,423	80,889,202	76,548,510	54,989,690	27,333,156	14,045,072	9,221,571
SC2 Residential Non Heat	1,624	1,550	1,367	1,269	1,322	1,307	1,175	1,622	1,958	1,961	2,496	2,285	2,296	1,625	1,382	1,288
SC2 Residential Heat	217,572	115,052	66,420	46,722	41,540	45,355	73,218	114,823	233,086	301,102	305,768	288,359	205,864	106,003	60,494	41,586
SC2 Commercial Non Heat	276,219	174,637	122,667	140,364	107,807	112,191	134,743	198,907	294,001	346,508	338,451	320,578	255,054	160,319	124,675	110,514
SC2 Commercial Heat	11,884,457	6,001,331	2,457,130	1,999,683	1,774,563	1,967,285	3,528,719	6,675,545	13,720,676	17,531,299	17,429,566	15,204,326	12,891,672	12,626,013	2,835,864	2,038,844
SC2 Industrial	141,745	53,741	13,007	5,201	10,771	13,412	29,419	59,672	163,946	225,922	237,394	241,156	134,464	55,952	19,639	10,402
SC2 MB Residential Non Heat	802	450	432	498	517	470	594	866	1,410	1,147	1,053	1,030	634	466	365	359
SC2 MB Residential Heat	119,496	60,749	29,589	20,640	20,173	23,754	34,974	64,761	133,979	147,616	140,960	144,041	100,625	60,005	32,218	26,542
SC2 MB Commercial Non Heat	261,639	255,230	144,745	121,928	107,167	118,094	145,680	213,992	328,495	403,475	400,578	418,672	329,057	203,314	136,527	112,688
SC2 MB Commercial Heat	9,369,339	5,312,860	2,399,429	1,840,609	1,648,486	1,803,812	3,044,571	5,260,759	10,213,821	12,539,983	12,260,748	12,199,926	8,779,371	4,714,040	2,742,963	1,889,443
SC2 MB Industrial	100,126	53,868	30,279	23,914	13,887	21,047	26,686	60,426	122,870	144,658	152,325	145,262	96,485	49,771	26,807	19,633
Total SC2	22,373,019	12,029,468	5,265,065	4,200,828	3,726,233	4,106,727	7,019,779	12,651,373	25,214,242	31,643,671	31,269,339	28,965,635	22,795,522	17,977,508	5,980,934	4,251,299
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	5,163,519	4,452,222	3,752,160	3,398,579	3,642,197	3,725,538	4,170,941	4,867,261	6,208,965	6,787,753	6,689,868	6,623,217	5,028,819	4,644,596	3,713,012	3,341,542
SC6 Interruptible	4,573,308	5,095,329	3,618,403	3,530,705	3,828,263	4,273,836	3,621,177	4,559,302	4,384,902	5,048,921	3,937,605	3,141,255	4,317,516	4,150,970	2,732,302	2,420,160
SC7 Small Volume Firm Sales	8,015,568	5,034,661	2,734,914	2,157,504	2,065,259	2,448,370	4,077,748	6,813,626	9,910,745	11,439,034	11,411,776	10,001,743	7,321,477	4,537,280	2,707,131	2,150,919
SC8 Firm Sales and Transportation	17,540,304	16,846,362	12,761,657	10,830,938	12,595,340	12,313,575	10,945,562	14,838,409	16,516,835	19,375,863	18,073,605	18,629,899	19,074,697	14,846,531	12,605,620	11,098,131
SC9 Negotiated Transportation Service	6,456,232	7,052,983	6,092,509	5,380,474	6,170,957	5,655,049	5,776,262	6,640,313	7,020,163	6,503,820	6,458,029	6,477,542	6,981,538	6,260,613	6,038,508	6,129,147
SC9 NYSEG Transportation	342,544	217,149	68,782	46,732	43,751	40,761	45,774	39,510	76,049	249,992	400,485	414,078	359,360	154,927	79,831	51,152
SC10 Natural Gas Vehicles	1,886	2,493	2,991	1,920	1,437	1,492	2,248	1,402	1,373	1,100	1,131	2,046	1,144	1,438	1,783	1,049
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	1,428,765	1,224,756	920,069	1,081,561	1,199,355	1,153,686	985,469	1,191,355	1,392,671	1,417,969	1,440,959	1,465,778	1,556,187	1,275,867	2,316,564	1,534,438
SC13 Residential Distributed Generation	356	165	47	62	28	50	137	194	350	587	563	701	534	194	71	47
Total SC5 - SC13	43,522,482	39,926,120	29,951,532	26,428,475	29,546,587	29,612,357	29,625,318	38,951,372	45,512,053	50,825,039	48,414,021	46,756,259	44,641,272	35,872,416	30,194,822	26,726,585
SC14 Dual Fuel Electric Generators	21,742,695	12,918,729	8,431,804	24,341,638	45,771,860	43,927,833	23,707,757	16,639,644	14,530,499	42,391,057	38,851,303	21,801,322	12,600,411	9,355,007	8,254,787	38,323,749
TOTAL	147,098,051	96,081,350	55,776,066	64,343,758	86,944,144	86,362,239	77,512,414	100,134,090	150,212,190	206,109,190	199,423,865	174,071,726	135,026,895	90,538,087	58,475,615	78,523,204
Actual BDD (KALB)	608	355	37	14	0	13	265	428	873	1019	1029	884	587	329	121	2
Normal BDD (KALB)	737	313	135	4	2	28	258	670	925	1022	1299	959	737	313	135	4

NMPC Historical Actual Deliveries by Service and Revenue Class
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(Therms)

	101	102	103	104	105	106	107	108
Class Name	Aug-2023	Sep-2023	Oct-2023	Nov-2023	Dec-2023	Jan-2024	Feb-2024	Mar-2024
SC1 Residential Heat - EAP	828,411	887,573	1,448,979	3,857,747	6,892,722	8,226,866	8,433,395	8,222,283
SC1 MB Residential Heat - EAP	8,457	8,672	10,037	27,397	53,330	72,756	78,849	183,598
SC1 Residential Non Heat - EAP	12,365	12,565	14,492	23,217	36,208	41,603	41,857	44,699
SC1 MB Residential Non-Heat - EAP	235	164	136	187	194	163	212	1,051
SC1 Residential Non Heat	86,881	91,777	111,280	201,341	332,237	387,360	408,554	395,774
SC1 Residential Heat	6,909,434	7,618,527	11,387,455	30,734,891	53,666,266	64,116,128	66,100,267	64,090,350
SC1 MB Residential Non-Heat	4,883	4,976	5,358	8,079	12,674	13,755	14,708	27,960
SC1 MB Residential Heat	437,170	467,380	756,716	2,113,105	3,666,832	4,317,013	4,387,927	7,918,713
Total SC1	8,287,836	9,091,634	13,734,453	36,965,964	64,660,463	77,175,644	79,465,769	80,884,428
SC2 Residential Non Heat	1,276	1,455	1,741	2,070	2,910	3,287	5,262	2,581
SC2 Residential Heat	39,669	40,042	58,797	130,270	232,801	278,991	282,229	283,988
SC2 Commercial Non Heat	106,115	109,418	120,015	194,390	280,155	330,412	335,219	320,308
SC2 Commercial Heat	1,996,763	1,996,626	3,028,390	7,799,029	13,674,261	16,958,521	17,270,428	16,149,971
SC2 Industrial	9,115	10,280	17,385	73,149	164,120	206,970	212,435	186,547
SC2 MB Residential Non Heat	357	355	431	734	837	1,058	868	1,092
SC2 MB Residential Heat	25,365	26,539	35,776	79,018	126,723	138,489	150,619	158,177
SC2 MB Commercial Non Heat	107,655	122,321	137,193	223,560	350,350	385,161	400,960	457,356
SC2 MB Commercial Heat	1,752,997	1,877,720	2,351,371	6,268,960	10,390,924	11,948,913	12,150,627	12,418,055
SC2 MB Industrial	17,816	20,000	27,751	55,095	106,614	128,350	119,604	154,924
Total SC2	4,057,128	4,204,756	5,778,850	14,826,275	25,329,695	30,380,152	30,928,251	30,132,999
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0
SC5 Firm Sales	3,647,467	3,676,547	4,121,486	5,004,160	6,212,880	6,708,980	6,316,185	6,093,688
SC6 Interruptible	3,618,604	2,532,242	2,630,975	2,981,569	3,607,863	3,603,688	3,950,021	3,750,474
SC7 Small Volume Firm Sales	2,164,498	2,360,777	3,546,778	7,300,751	9,169,405	10,953,463	10,794,283	12,126,506
SC8 Firm Sales and Transportation	11,011,201	11,604,788	11,469,599	13,319,866	18,153,425	17,259,377	18,051,747	19,188,638
SC9 Negotiated Transportation Service	5,761,626	5,937,997	5,939,533	5,352,158	6,945,090	6,340,235	6,463,512	4,354,812
SC9 NYSEG Transportation	40,859	42,877	49,701	103,717	335,276	367,320	442,899	457,005
SC10 Natural Gas Vehicles	1,131	1,161	1,398	1,110	1,114	597	1,140	2,504
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0
SC12 Distributed Generation	983,966	1,006,043	1,099,155	1,101,986	1,545,666	1,367,763	1,440,517	1,444,287
SC13 Residential Distributed Generation	27	71	169	405	443	772	699	596
Total SC5 - SC13	27,229,379	27,162,503	28,858,794	35,165,722	45,971,162	46,602,195	47,461,003	47,418,510
SC14 Dual Fuel Electric Generators	58,660,455	43,158,427	30,905,126	24,938,734	32,945,367	43,003,894	59,865,263	26,505,665
TOTAL	98,234,798	83,617,320	79,277,223	111,896,695	168,906,687	197,161,885	217,720,286	184,941,602
Actual BDD (KALB)	1	12	176	521	819	926	1037	994
Normal BDD (KALB)	2	28	258	670	925	1022	1299	994

NMPC Historical Weather Normalized Billed Sales Data by Month and by Class
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(Therms)

	37	38	39	40	41	42	43	44	45	46	47	48
Class Name	Apr-2018	May-2018	Jun-2018	Jul-2018	Aug-2018	Sep-2018	Oct-2018	Nov-2018	Dec-2018	Jan-2019	Feb-2019	Mar-2019
SC1 Residential Heat - EAP	5,721,856	2,830,521	1,656,824	768,249	749,192	910,426	2,374,283	4,409,436	6,920,673	8,255,315	10,750,235	7,344,337
SC1 MB Residential Heat - EAP	906,833	417,033	222,515	95,489	88,170	103,881	267,987	450,023	703,261	828,161	1,089,011	689,758
SC1 Residential Non Heat - EAP	47,105	27,966	20,236	14,217	14,022	14,998	24,285	32,729	53,593	63,013	79,064	53,615
SC1 MB Residential Non-Heat - EAP	6,208	3,425	2,393	1,694	1,588	1,569	2,285	3,350	4,406	5,018	5,903	4,217
SC1 Residential Non Heat	358,174	213,971	152,739	106,870	106,001	115,198	193,506	281,067	428,976	484,578	650,649	453,484
SC1 Residential Heat	42,585,273	21,409,257	12,455,534	5,876,984	5,782,594	7,108,670	18,780,715	34,941,841	54,264,690	61,428,232	82,654,025	57,285,859
SC1 MB Residential Non-Heat	45,700	31,192	24,899	20,185	20,392	21,094	29,033	36,998	52,068	56,814	73,179	52,723
SC1 MB Residential Heat	9,119,947	4,538,966	2,605,600	1,195,478	1,170,504	1,443,412	3,879,655	7,172,109	11,075,578	12,464,128	16,749,914	11,509,243
Total SC1	58,791,096	29,472,330	17,140,740	8,079,167	7,932,463	9,719,249	25,551,749	47,327,553	73,503,246	83,585,259	112,051,979	77,393,238
SC2 Residential Non Heat	1,221	946	765	667	666	681	814	1,481	2,032	2,307	2,923	2,167
SC2 Residential Heat	179,925	94,630	57,905	30,975	30,432	35,705	81,496	146,062	226,899	260,627	347,023	241,705
SC2 Commercial Non Heat	278,693	182,683	142,198	112,231	111,179	117,322	169,654	228,599	313,117	346,654	437,941	327,216
SC2 Commercial Heat	10,403,181	5,352,070	3,195,913	1,628,917	1,598,341	1,901,473	4,612,287	8,963,240	13,661,655	15,521,863	20,637,585	14,500,768
SC2 Industrial	108,354	50,630	24,731	6,320	5,984	9,603	41,261	100,122	151,244	172,613	235,949	161,107
SC2 MB Residential Non Heat	2,665	1,734	1,343	1,056	1,051	1,108	1,613	3,747	4,495	4,780	5,281	4,340
SC2 MB Residential Heat	127,455	69,120	45,042	27,576	27,406	31,066	61,565	104,033	154,847	175,472	234,447	161,861
SC2 MB Commercial Non Heat	378,702	244,620	188,476	146,811	147,288	155,625	227,444	281,612	389,054	432,314	554,193	402,775
SC2 MB Commercial Heat	9,390,859	4,977,010	3,162,317	1,811,513	1,793,796	2,062,798	4,422,516	7,867,072	11,800,333	13,268,967	17,542,429	12,245,345
SC2 MB Industrial	108,449	51,224	30,362	15,457	15,436	19,151	46,783	97,858	154,556	171,582	223,107	152,517
Total SC2	20,979,503	11,024,666	6,849,052	3,781,522	3,731,579	4,334,533	9,665,433	17,793,827	26,858,231	30,357,178	40,220,878	28,199,802
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	6,051,411	4,724,587	4,226,782	3,886,707	3,854,738	3,927,348	4,569,660	5,712,825	7,055,138	7,417,306	8,687,903	7,117,440
SC6 Interruptible	4,577,152	4,659,748	4,694,423	4,719,942	4,720,332	4,715,267	4,670,462	5,101,838	4,720,402	4,575,307	4,160,963	4,669,544
SC7 Small Volume Firm Sales	9,055,812	5,199,248	3,529,089	2,302,150	2,276,599	2,514,785	4,653,775	9,204,263	11,703,238	12,800,773	15,408,502	12,007,029
SC8 Firm Sales and Transportation	22,393,288	18,764,414	17,240,972	16,119,787	15,930,544	16,150,717	18,098,407	12,567,675	19,061,999	21,512,284	28,587,007	19,927,909
SC9 Negotiated Transportation Service	7,217,603	6,622,178	6,372,212	6,188,249	6,185,440	6,221,952	6,544,942	6,726,837	6,875,083	6,931,475	7,092,511	6,894,849
SC9 NYSEG Transportation	359,465	176,729	100,015	43,556	42,694	53,900	153,025	166,467	352,485	423,246	625,313	377,288
SC10 Natural Gas Vehicles	16,332	13,252	11,960	11,008	10,994	11,182	12,853	16,914	15,494	14,954	13,411	22,957
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	1,183,026	1,125,163	1,100,871	1,082,993	1,082,720	1,086,268	1,117,655	1,129,475	1,252,820	1,299,740	1,433,727	1,269,266
SC13 Residential Distributed Generation	259	184	99	36	35	47	158	335	512	579	772	535
Total SC5 - SC13	50,854,346	41,285,505	37,276,422	34,354,429	34,104,097	34,681,467	39,820,937	40,626,628	51,037,172	54,975,663	66,010,109	52,286,818
SC14 Dual Fuel Electric Generators	40,639,011	39,299,312	38,736,891	38,322,974	38,316,655	38,398,806	39,125,530	34,613,495	38,726,595	40,291,186	44,759,142	39,275,008
TOTAL	171,263,956	121,081,813	100,003,105	84,538,092	84,084,793	87,134,054	114,163,649	140,361,502	190,125,244	209,209,287	263,042,108	197,154,866

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(Therms)

	49	50	51	52	53	54	55	56	57	58	59	60
Class Name	Apr-2019	May-2019	Jun-2019	Jul-2019	Aug-2019	Sep-2019	Oct-2019	Nov-2019	Dec-2019	Jan-2020	Feb-2020	Mar-2020
SC1 Residential Heat - EAP	6,095,255	3,077,535	1,753,515	785,763	774,439	947,010	2,543,128	5,148,559	7,418,487	8,568,459	10,669,181	7,925,576
SC1 MB Residential Heat - EAP	557,551	268,464	145,672	59,630	41,355	48,338	125,820	242,209	335,143	402,698	528,400	394,205
SC1 Residential Non Heat - EAP	49,890	30,476	21,859	15,611	15,611	15,988	25,425	35,068	47,764	52,779	60,068	47,334
SC1 MB Residential Non-Heat - EAP	3,097	1,861	1,383	1,025	664	596	855	1,213	1,763	1,981	2,557	1,927
SC1 Residential Non Heat	365,152	215,733	152,873	106,709	105,380	111,919	190,864	300,490	406,053	446,152	563,861	436,786
SC1 Residential Heat	44,118,392	22,064,188	12,847,723	6,067,880	5,978,147	7,362,605	19,438,354	40,714,636	57,058,120	63,088,376	81,093,265	61,880,813
SC1 MB Residential Non-Heat	47,834	31,299	24,289	19,052	18,848	19,296	28,022	37,693	48,920	51,598	64,033	50,309
SC1 MB Residential Heat	8,965,232	4,434,527	2,543,358	1,156,173	1,127,243	1,391,678	3,764,228	7,864,509	11,017,496	12,126,143	15,559,841	11,701,348
Total SC1	60,202,404	30,124,083	17,490,672	8,211,842	8,061,686	9,897,430	26,116,696	54,344,376	76,333,746	84,738,184	108,541,205	82,438,296
SC2 Residential Non Heat	2,222	1,480	1,201	1,018	936	1,227	1,730	3,064	3,976	4,252	5,293	4,147
SC2 Residential Heat	191,989	101,448	62,580	34,523	34,040	39,756	88,887	174,090	250,115	279,064	357,524	270,523
SC2 Commercial Non Heat	270,107	177,743	138,880	110,026	109,506	116,138	165,354	247,999	300,100	320,658	379,702	319,513
SC2 Commercial Heat	10,661,983	5,489,825	3,335,131	1,754,158	1,724,966	2,039,861	4,814,624	10,026,356	14,398,985	16,169,029	20,909,109	15,799,717
SC2 Industrial	116,780	52,304	26,530	7,642	7,349	11,546	45,942	122,648	170,235	187,917	234,155	182,813
SC2 MB Residential Non Heat	2,377	1,630	1,316	1,018	1,014	1,057	1,533	3,548	4,063	4,259	5,120	4,465
SC2 MB Residential Heat	126,045	68,006	44,578	27,124	26,770	29,773	59,745	113,719	157,090	171,099	217,537	165,800
SC2 MB Commercial Non Heat	356,351	227,953	172,804	131,759	131,158	134,483	203,442	305,576	406,040	447,980	542,626	422,310
SC2 MB Commercial Heat	9,517,241	5,076,336	3,179,982	1,786,952	1,764,120	2,020,500	4,378,429	8,872,357	12,232,190	13,387,799	17,020,375	12,923,914
SC2 MB Industrial	122,569	60,934	33,357	14,532	13,831	16,521	48,257	110,544	157,325	176,339	223,752	170,850
Total SC2	21,367,664	11,257,660	6,996,359	3,868,750	3,813,692	4,410,863	9,807,943	19,979,900	28,080,120	31,148,396	39,895,192	30,264,053
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	5,670,405	4,630,231	4,172,761	3,866,760	3,836,536	3,928,666	4,488,878	5,959,761	6,861,039	7,095,165	7,996,974	6,985,905
SC6 Interruptible	3,625,071	3,986,377	4,138,058	4,249,688	4,251,392	4,229,236	4,033,245	3,702,122	4,153,184	4,324,764	4,814,741	4,275,236
SC7 Small Volume Firm Sales	9,153,687	5,149,990	3,556,450	2,302,705	2,284,843	2,516,952	4,722,945	9,095,074	11,659,301	12,903,162	15,605,711	12,498,038
SC8 Firm Sales and Transportation	20,500,072	17,453,524	16,174,549	15,233,280	15,218,910	15,405,727	17,058,335	20,228,660	26,092,873	22,927,724	28,077,594	22,407,159
SC9 Negotiated Transportation Service	5,681,908	8,176,381	5,831,016	6,110,749	6,115,019	6,059,500	5,568,366	6,265,171	6,768,944	6,960,576	7,507,812	6,905,260
SC9 NYSEG Transportation	362,866	174,746	95,771	37,649	36,761	48,297	150,343	241,592	399,340	459,346	630,703	442,024
SC10 Natural Gas Vehicles	13,841	10,573	9,201	8,192	8,176	8,377	10,149	7,203	8,804	6,276	7,435	6,158
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	1,228,810	1,065,366	996,751	946,253	945,482	955,505	1,044,165	1,043,070	1,101,709	1,124,015	1,187,714	1,117,577
SC13 Residential Distributed Generation	386	189	106	45	44	56	163	459	515	537	599	531
Total SC5 - SC13	46,237,046	40,647,378	34,974,662	32,755,321	32,697,164	33,152,315	37,076,589	46,543,113	57,045,710	55,801,564	65,829,282	54,637,887
SC14 Dual Fuel Electric Generators	19,314,798	23,218,426	29,828,655	31,275,944	31,298,040	31,010,792	28,469,751	28,075,356	36,223,860	39,323,486	48,174,998	38,428,749
TOTAL	147,121,912	105,247,547	89,290,348	76,111,857	75,870,581	78,471,400	101,470,979	148,942,745	197,683,435	211,011,631	262,440,677	205,768,985

NMPC Historical Weather Normalized Billed Sales Data by Month and by Class
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(Therms)

	61	62	63	64	65	66	67	68	69	70	71	72
Class Name	Apr-2020	May-2020	Jun-2020	Jul-2020	Aug-2020	Sep-2020	Oct-2020	Nov-2020	Dec-2020	Jan-2021	Feb-2021	Mar-2021
SC1 Residential Heat - EAP	5,838,210	2,931,056	1,663,737	733,084	716,602	902,356	2,543,658	4,883,613	7,028,833	7,929,967	9,871,884	6,973,605
SC1 MB Residential Heat - EAP	273,642	127,871	67,313	24,918	22,175	26,345	70,534	129,939	190,880	220,831	279,228	203,513
SC1 Residential Non Heat - EAP	41,750	25,818	18,621	13,363	13,020	13,891	22,456	31,495	43,967	48,716	57,127	43,369
SC1 MB Residential Non-Heat - EAP	1,747	1,205	896	471	425	435	648	891	1,227	1,521	1,551	1,299
SC1 Residential Non Heat	314,731	187,559	134,786	95,606	94,165	102,202	170,491	265,402	358,561	394,074	499,631	374,446
SC1 Residential Heat	42,037,640	21,038,292	12,262,835	5,791,008	5,710,071	7,020,787	18,548,121	35,938,475	50,929,043	56,701,908	73,517,428	53,791,138
SC1 MB Residential Non-Heat	38,349	26,199	19,840	14,656	13,863	14,577	21,227	29,033	37,172	39,696	48,139	36,959
SC1 MB Residential Heat	7,843,069	3,920,015	2,231,774	1,011,244	968,849	1,189,228	3,190,885	6,249,818	8,807,524	9,697,463	12,387,371	8,926,184
Total SC1	56,389,139	28,258,015	16,399,803	7,684,350	7,539,170	9,269,819	24,568,021	47,528,667	67,397,207	75,034,175	96,662,360	70,350,513
SC2 Residential Non Heat	2,727	1,959	1,637	1,368	1,396	1,509	1,902	2,191	2,928	3,170	3,946	3,147
SC2 Residential Heat	168,198	88,439	55,043	30,757	30,389	35,229	77,644	158,101	220,100	243,151	308,957	231,358
SC2 Commercial Non Heat	201,699	136,214	108,952	89,141	88,025	91,949	127,059	210,893	274,041	300,988	370,442	287,530
SC2 Commercial Heat	9,354,084	4,698,624	2,751,113	1,334,019	1,294,850	1,578,812	4,092,938	8,732,167	12,693,870	14,274,494	18,617,962	13,444,447
SC2 Industrial	128,464	58,483	29,860	8,478	8,218	12,663	51,344	101,625	160,109	178,835	242,451	169,268
SC2 MB Residential Non Heat	2,541	1,441	979	640	634	661	1,298	984	1,213	1,301	1,550	1,244
SC2 MB Residential Heat	104,581	55,176	34,754	19,652	19,423	22,231	48,328	96,228	139,865	156,599	205,144	140,873
SC2 MB Commercial Non Heat	286,132	178,568	133,024	97,583	97,400	102,755	161,051	247,826	321,634	348,156	428,554	324,584
SC2 MB Commercial Heat	8,215,273	4,335,311	2,698,281	1,438,331	1,450,798	1,681,916	3,748,420	7,468,189	10,516,945	11,663,125	14,951,715	10,837,257
SC2 MB Industrial	104,522	53,150	29,396	12,464	12,034	15,564	40,071	93,540	129,912	149,533	196,620	139,512
Total SC2	18,568,221	9,607,365	5,843,040	3,032,432	3,003,168	3,543,288	8,350,055	17,111,744	24,460,618	27,319,353	35,327,341	25,579,220
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	5,285,291	4,312,198	3,822,109	3,629,667	3,620,707	3,685,203	4,246,776	5,661,113	6,511,925	6,773,488	7,611,656	6,232,640
SC6 Interruptible	4,523,571	3,782,416	3,471,271	3,242,282	3,238,786	3,284,234	3,686,276	4,049,927	4,242,014	4,315,083	4,523,742	4,267,626
SC7 Small Volume Firm Sales	8,158,903	4,607,833	2,928,169	2,003,877	2,033,027	2,207,673	4,129,880	8,700,153	10,839,886	11,657,731	13,856,616	11,216,369
SC8 Firm Sales and Transportation	19,893,960	15,457,747	13,595,375	12,224,753	12,203,827	12,475,859	14,882,295	17,330,689	19,422,850	19,912,724	22,151,338	19,403,581
SC9 Negotiated Transportation Service	5,835,248	5,619,919	5,529,521	5,462,993	5,461,977	5,475,181	5,591,987	6,622,036	6,735,720	6,778,965	6,902,457	6,750,878
SC9 NYSEG Transportation	302,556	148,952	84,467	37,010	36,285	45,704	129,027	208,568	330,246	376,531	508,706	346,469
SC10 Natural Gas Vehicles	8,856	8,338	8,121	7,961	7,958	7,990	8,271	3,362	3,044	2,922	2,576	3,001
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	1,143,126	1,060,100	1,025,246	999,594	999,202	1,051,540	1,090,948	1,245,776	1,316,947	1,344,020	1,421,331	1,326,436
SC13 Residential Distributed Generation	404	195	108	44	43	55	168	307	467	529	703	489
Total SC5 - SC13	45,151,914	34,997,700	30,464,388	27,608,179	27,601,813	28,233,439	33,765,628	43,821,932	49,403,099	51,161,992	56,979,125	49,547,490
SC14 Dual Fuel Electric Generators	17,526,708	26,857,140	30,774,161	39,266,398	33,700,924	33,128,775	28,067,455	25,092,450	28,265,871	29,473,015	32,920,222	28,688,994
TOTAL	137,635,983	99,720,220	83,481,391	77,591,359	71,845,075	74,175,321	94,751,159	133,554,793	169,526,795	182,988,535	221,889,048	174,166,217

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(Therms)

	73	74	75	76	77	78	79	80	81	82	83	84
Class Name	Apr-2021	May-2021	Jun-2021	Jul-2021	Aug-2021	Sep-2021	Oct-2021	Nov-2021	Dec-2021	Jan-2022	Feb-2022	Mar-2022
SC1 Residential Heat - EAP	5,751,356	2,849,684	1,569,459	618,260	603,004	788,710	2,427,931	5,180,759	7,632,758	8,566,830	10,487,960	7,518,750
SC1 MB Residential Heat - EAP	166,539	82,386	41,831	15,454	14,600	18,475	58,957	128,694	193,016	217,736	267,213	191,690
SC1 Residential Non Heat - EAP	39,925	24,943	18,642	13,101	12,786	13,618	22,391	33,154	44,857	48,671	56,188	42,093
SC1 MB Residential Non-Heat - EAP	1,074	666	494	346	340	367	541	807	1,028	1,101	1,275	950
SC1 Residential Non Heat	307,384	176,366	122,351	82,009	80,679	88,388	158,063	258,541	358,123	397,180	511,964	378,474
SC1 Residential Heat	41,009,326	20,137,858	11,549,300	5,065,871	4,981,874	6,294,185	17,845,190	38,963,536	56,353,461	63,103,015	82,815,166	59,562,810
SC1 MB Residential Non-Heat	31,362	21,627	15,642	11,572	10,847	11,018	15,365	20,698	27,519	29,529	36,046	26,664
SC1 MB Residential Heat	6,799,986	3,319,839	1,696,067	701,354	671,140	832,527	2,397,178	5,391,727	7,739,574	8,574,793	11,017,736	7,772,128
Total SC1	54,106,952	26,613,368	15,013,785	6,507,967	6,375,270	8,047,287	22,925,617	49,977,915	72,350,336	80,938,853	105,193,550	75,493,559
SC2 Residential Non Heat	3,003	2,220	1,904	1,636	1,496	1,509	1,930	2,040	2,078	2,110	2,201	2,089
SC2 Residential Heat	186,856	99,047	61,852	34,479	34,204	39,771	88,537	169,123	254,625	288,891	377,104	268,370
SC2 Commercial Non Heat	250,937	162,030	128,148	100,613	100,709	106,746	155,475	232,451	302,129	331,195	408,787	313,388
SC2 Commercial Heat	10,040,785	5,044,443	2,976,677	1,408,571	1,386,256	1,694,772	4,453,635	9,396,852	14,158,111	16,039,506	21,223,442	14,958,851
SC2 Industrial	157,959	123,633	112,688	102,242	100,393	104,156	122,525	244,743	226,674	224,332	211,799	233,913
SC2 MB Residential Non Heat	684	463	404	361	360	369	445	1,095	1,398	1,485	1,735	1,429
SC2 MB Residential Heat	116,934	61,179	37,412	20,790	20,616	23,554	52,184	102,015	142,021	154,094	195,879	142,640
SC2 MB Commercial Non Heat	310,536	197,987	139,686	105,890	105,193	110,585	169,532	257,989	402,358	453,488	621,196	428,981
SC2 MB Commercial Heat	8,184,722	4,330,923	2,623,369	1,458,436	1,435,212	1,654,650	3,639,966	7,590,470	11,220,629	12,517,605	16,397,071	11,408,260
SC2 MB Industrial	86,141	46,736	27,260	16,196	15,746	17,782	38,813	96,050	139,747	138,995	191,117	140,952
Total SC2	19,338,557	10,068,662	6,109,400	3,249,214	3,200,185	3,753,894	8,723,044	18,092,828	26,849,770	30,151,702	39,630,332	27,898,871
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	5,655,053	4,380,198	3,940,438	3,618,965	3,691,063	3,637,572	4,382,353	5,780,351	6,876,558	7,186,133	7,790,990	6,685,597
SC6 Interruptible	4,578,216	4,189,107	4,025,755	3,905,536	3,903,700	3,927,561	4,138,633	4,336,291	4,052,328	4,317,230	4,302,230	4,320,642
SC7 Small Volume Firm Sales	8,585,391	4,638,388	3,210,336	2,196,983	2,157,676	2,362,740	4,191,599	8,463,551	10,960,283	12,002,305	15,628,890	12,444,275
SC8 Firm Sales and Transportation	19,747,484	15,802,305	14,146,074	12,927,162	12,908,553	13,150,474	15,290,548	17,455,901	18,412,261	19,148,041	21,948,173	20,270,563
SC9 Negotiated Transportation Service	7,111,179	6,366,911	6,054,460	5,824,509	5,820,998	5,866,637	6,270,367	6,339,512	6,540,558	6,617,034	6,835,426	6,567,364
SC9 NYSEG Transportation	357,788	164,713	83,658	24,006	23,095	34,935	139,668	211,165	352,957	406,893	560,917	371,862
SC10 Natural Gas Vehicles	2,725	2,670	2,648	2,631	2,631	2,634	2,663	2,558	2,349	2,270	2,043	2,322
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	990,710	1,036,219	1,055,324	1,069,384	1,069,599	1,066,808	1,042,122	1,273,765	1,223,324	1,253,836	1,340,969	1,241,287
SC13 Residential Distributed Generation	303	154	92	46	45	54	135	355	491	542	689	509
Total SC5 - SC13	47,028,847	36,580,666	32,518,784	29,569,222	29,577,361	30,049,415	35,458,089	43,863,449	48,421,109	50,934,284	58,410,328	51,904,420
SC14 Dual Fuel Electric Generators	0	18,564,860	37,611,386	35,305,855	35,414,211	34,005,583	21,544,648	28,944,476	38,249,499	41,789,057	51,896,867	39,490,169
TOTAL	120,474,357	91,827,556	91,253,356	74,632,258	74,567,027	75,856,180	88,651,399	140,878,669	185,870,714	203,813,897	255,131,076	194,787,019

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For the Period April 2018 - March 2024 (FY2019 - FY2024)
(Therms)

	85	86	87	88	89	90	91	92	93	94	95	96
Class Name	Apr-2022	May-2022	Jun-2022	Jul-2022	Aug-2022	Sep-2022	Oct-2022	Nov-2022	Dec-2022	Jan-2023	Feb-2023	Mar-2023
SC1 Residential Heat - EAP	6,842,141	3,410,662	1,866,888	716,273	692,199	918,324	2,896,610	5,698,684	8,183,864	8,993,758	10,982,982	8,146,084
SC1 MB Residential Heat - EAP	176,904	91,732	48,080	17,543	16,589	17,437	38,919	74,100	110,378	121,041	148,838	101,084
SC1 Residential Non Heat - EAP	41,753	26,077	18,733	13,362	13,025	13,958	22,854	34,245	45,600	48,612	56,093	43,439
SC1 MB Residential Non-Heat - EAP	1,099	877	583	399	421	349	445	615	759	625	642	502
SC1 Residential Non Heat	328,109	183,730	122,739	79,133	78,804	88,220	166,538	271,633	365,253	403,288	509,684	382,790
SC1 Residential Heat	49,776,030	24,018,938	13,308,503	5,405,486	5,297,931	6,971,697	21,469,828	42,619,864	59,844,341	66,818,044	86,374,350	63,108,649
SC1 MB Residential Non-Heat	23,830	16,220	11,431	8,767	8,178	7,733	10,086	13,543	17,113	17,445	20,786	16,019
SC1 MB Residential Heat	6,502,364	3,124,532	1,643,536	625,343	596,361	673,035	1,745,153	3,550,633	4,953,969	5,246,331	6,621,411	4,740,299
Total SC1	63,692,231	30,872,769	17,020,494	6,866,304	6,703,510	8,690,751	26,350,432	52,263,316	73,521,278	81,649,145	104,714,786	76,538,866
SC2 Residential Non Heat	1,622	1,445	1,371	1,317	1,255	1,265	1,422	1,851	2,102	2,197	2,525	2,278
SC2 Residential Heat	227,697	119,654	73,536	40,191	39,411	46,552	106,558	188,906	269,947	303,004	393,283	286,402
SC2 Commercial Non Heat	280,144	181,138	139,829	110,479	109,860	117,003	173,703	255,957	315,634	340,567	410,591	327,752
SC2 Commercial Heat	12,551,004	6,143,373	3,463,245	1,490,816	1,459,568	1,877,497	5,466,392	10,838,924	15,356,024	17,305,283	22,255,346	16,204,800
SC2 Industrial	146,672	61,815	27,718	2,735	2,317	7,711	54,756	131,670	211,514	228,907	327,415	218,099
SC2 MB Residential Non Heat	762	597	527	447	476	455	575	1,073	1,247	1,149	1,315	1,112
SC2 MB Residential Heat	125,836	63,385	37,607	18,480	18,038	21,183	50,297	104,445	143,938	149,987	187,764	138,959
SC2 MB Commercial Non Heat	304,445	203,079	156,847	121,039	118,941	120,467	176,174	301,369	392,909	405,642	499,848	388,557
SC2 MB Commercial Heat	10,146,278	5,215,561	3,109,887	1,596,589	1,557,388	1,770,556	4,044,238	8,427,574	11,757,176	12,540,462	16,028,129	11,781,724
SC2 MB Industrial	104,580	52,737	33,511	17,454	16,934	19,510	46,457	97,315	133,284	154,439	192,344	140,420
Total SC2	23,889,039	12,042,783	7,044,080	3,399,547	3,324,188	3,982,200	10,120,573	20,349,083	28,583,776	31,431,637	40,298,559	29,490,102
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	5,490,560	4,343,308	3,897,490	3,602,815	3,622,799	3,631,678	4,179,626	5,682,114	6,514,493	6,774,700	7,673,223	6,617,458
SC6 Interruptible	4,950,011	4,280,179	3,998,976	3,792,023	3,788,864	3,829,938	4,193,291	4,278,056	4,186,136	4,151,170	4,051,319	4,173,880
SC7 Small Volume Firm Sales	8,757,981	5,062,403	3,360,197	2,136,343	2,087,981	2,334,214	4,514,188	8,554,426	10,508,383	11,254,567	13,388,016	10,737,530
SC8 Firm Sales and Transportation	18,531,098	14,525,416	13,599,362	11,606,408	11,588,879	11,816,754	13,832,574	16,341,643	17,995,359	18,624,419	20,420,808	18,215,854
SC9 Negotiated Transportation Service	6,879,454	6,268,540	6,012,071	5,823,321	5,820,440	5,857,901	6,189,294	6,658,804	6,602,735	6,581,407	6,520,501	6,595,259
SC9 NYSEG Transportation	371,066	174,584	92,099	31,394	30,467	42,515	149,097	149,967	274,226	321,494	456,473	290,794
SC10 Natural Gas Vehicles	2,258	2,111	2,050	2,004	2,003	2,012	2,092	1,441	1,291	1,851	1,071	1,271
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	1,399,398	1,201,803	1,118,850	1,057,800	1,056,868	1,068,985	1,176,171	1,308,131	1,414,427	1,454,862	1,570,329	1,428,600
SC13 Residential Distributed Generation	387	183	97	34	33	45	156	333	493	555	729	686
Total SC5 - SC13	46,382,214	35,858,527	32,081,192	28,052,142	27,998,334	28,584,044	34,236,489	42,974,915	47,497,543	49,165,024	54,082,468	48,061,333
SC14 Dual Fuel Electric Generators	12,297,955	22,687,614	27,049,311	30,259,323	30,308,331	29,671,229	24,035,329	20,502,037	29,657,675	33,140,407	43,085,942	30,878,426
TOTAL	146,261,439	101,461,694	83,195,076	68,577,317	68,334,363	70,928,223	94,742,823	136,089,351	179,260,272	195,386,213	242,181,756	184,968,728

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For the Period April 2018 - March 2024 (FY2019 - FY2024)
(Therms)

	97	98	99	100	101	102	103	104	105	106	107	108
Class Name	Apr-2023	May-2023	Jun-2023	Jul-2023	Aug-2023	Sep-2023	Oct-2023	Nov-2023	Dec-2023	Jan-2024	Feb-2024	Mar-2024
SC1 Residential Heat - EAP	7,092,670	3,480,041	1,858,292	664,414	632,806	837,424	2,733,459	5,228,459	7,689,808	8,707,212	11,005,632	8,222,283
SC1 MB Residential Heat - EAP	83,808	41,926	21,072	7,299	6,385	8,106	18,344	40,804	82,548	109,807	161,369	183,598
SC1 Residential Non Heat - EAP	40,450	25,081	17,619	12,126	11,809	12,476	20,362	28,760	41,350	45,391	53,993	44,699
SC1 MB Residential Non-Heat - EAP	471	345	283	202	189	182	180	223	423	473	662	1,051
SC1 Residential Non Heat	323,317	181,550	122,413	80,151	79,762	88,755	164,810	268,025	371,317	410,275	527,064	395,774
SC1 Residential Heat	50,887,749	24,505,207	13,497,646	5,401,391	5,290,427	6,929,487	21,343,132	42,404,200	60,308,171	67,143,147	86,991,601	64,090,350
SC1 MB Residential Non-Heat	14,598	9,320	6,858	5,060	4,978	4,840	6,840	10,891	17,077	19,395	25,830	27,960
SC1 MB Residential Heat	3,792,653	1,772,958	938,531	337,068	322,591	429,711	1,409,772	3,095,857	5,056,652	5,745,313	7,769,576	7,918,713
Total SC1	62,235,717	30,016,429	16,462,713	6,507,710	6,348,947	8,310,982	25,696,900	51,077,218	73,567,346	82,181,011	106,535,728	80,884,428
SC2 Residential Non Heat	2,436	1,804	1,517	1,306	1,303	1,345	1,750	2,375	3,466	3,974	4,854	2,581
SC2 Residential Heat	231,138	117,932	68,421	32,209	31,615	38,233	100,678	182,167	261,339	293,950	379,165	283,988
SC2 Commercial Non Heat	274,334	173,188	132,422	100,318	99,564	105,177	160,080	239,179	309,049	335,995	414,363	320,308
SC2 Commercial Heat	17,361,074	8,307,125	4,485,066	1,684,316	1,632,173	2,182,100	7,026,407	10,785,557	15,533,374	17,393,596	22,504,681	16,149,971
SC2 Industrial	150,964	65,862	27,958	2,019	1,576	6,744	51,912	121,922	191,020	213,396	288,332	186,547
SC2 MB Residential Non Heat	672	500	397	348	347	357	444	823	991	1,055	1,150	1,092
SC2 MB Residential Heat	113,528	61,847	39,023	21,900	21,761	25,111	55,913	102,423	147,157	154,628	197,080	158,177
SC2 MB Commercial Non Heat	364,811	212,372	147,126	102,838	102,555	112,122	196,482	282,279	390,902	429,722	535,046	457,356
SC2 MB Commercial Heat	9,884,575	5,013,910	2,971,524	1,479,119	1,461,987	1,753,687	4,391,445	8,332,058	11,471,468	12,641,577	16,010,707	12,418,055
SC2 MB Industrial	108,559	55,540	31,788	14,989	14,487	18,066	46,671	80,837	126,881	143,335	183,979	154,924
Total SC2	28,492,091	14,010,081	7,905,241	3,439,362	3,367,368	4,242,943	12,031,782	20,129,620	28,435,648	31,611,229	40,519,358	30,132,999
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0	0	0	0	0	0	0
SC5 Firm Sales	5,531,127	4,388,641	3,925,946	3,548,967	3,543,812	3,637,835	4,263,242	5,580,746	6,287,571	6,505,768	7,183,282	6,093,688
SC6 Interruptible	4,786,593	3,626,103	3,138,916	2,780,368	2,774,894	2,668,178	3,258,344	3,241,906	3,565,787	3,688,988	4,310,198	3,750,474
SC7 Small Volume Firm Sales	8,376,977	4,698,732	3,224,991	2,083,115	2,066,462	2,271,487	4,196,798	8,511,978	10,670,975	11,473,352	13,824,994	12,126,506
SC8 Firm Sales and Transportation	20,476,289	14,922,026	12,590,283	10,874,225	10,848,026	11,188,618	14,084,377	15,291,505	17,707,331	18,626,293	21,564,713	19,188,638
SC9 Negotiated Transportation Service	7,084,343	6,378,780	6,082,576	5,864,583	5,861,255	5,904,521	6,287,256	6,053,744	8,747,915	9,772,757	6,349,683	4,354,812
SC9 NYSEG Transportation	397,578	181,389	90,630	23,836	22,816	36,073	153,345	212,197	385,939	452,029	640,761	457,005
SC10 Natural Gas Vehicles	1,139	1,814	1,239	1,261	1,261	1,257	1,218	849	1,778	495	651	2,504
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	0	0	0	0
SC12 Distributed Generation	1,616,836	1,438,937	1,378,056	1,333,250	1,332,566	1,341,458	1,420,125	1,262,145	1,420,879	1,481,260	1,653,689	1,444,287
SC13 Residential Distributed Generation	593	262	123	20	19	39	273	471	622	679	843	596
Total SC5 - SC13	48,271,474	35,636,682	30,432,760	26,509,625	26,451,111	27,049,465	33,664,980	40,155,541	48,788,797	52,001,622	55,528,814	47,418,510
SC14 Dual Fuel Electric Generators	0	20,131,564	31,284,200	39,492,038	39,617,349	37,988,312	23,577,603	29,337,445	40,262,242	44,417,950	56,285,279	26,505,665
TOTAL	138,999,283	99,794,756	86,084,914	75,948,737	75,784,774	77,591,702	94,971,264	140,699,824	191,054,033	210,211,811	258,869,180	184,941,602

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(Therms)

Class Name	FY19	FY20	FY21	FY22	FY23	FY24	FY19-FY24 Change	FY19-FY24 PA Change	FY19-FY24 PPA Change
SC1 Residential Heat - EAP	52,691,348	55,706,906	52,016,604	53,995,461	59,348,471	58,152,499	5,461,151	1,092,230	2.0%
SC1 MB Residential Heat - EAP	5,862,122	3,149,485	1,637,188	1,396,591	962,646	765,066	-5,097,056	-1,019,411	-33.5%
SC1 Residential Non Heat - EAP	444,841	417,871	373,594	370,368	377,751	354,117	-90,725	-18,145	-4.5%
SC1 MB Residential Non-Heat - EAP	42,056	18,920	12,319	8,989	7,315	4,684	-37,372	-7,474	-35.5%
SC1 Residential Non Heat	3,545,213	3,401,971	2,991,654	2,919,522	2,979,921	3,013,214	-532,000	-106,400	-3.2%
SC1 Residential Heat	404,573,675	421,712,498	383,286,746	407,681,592	445,013,660	448,792,509	44,218,834	8,843,767	2.1%
SC1 MB Residential Non-Heat	464,278	441,192	339,711	257,890	171,152	153,646	-310,632	-62,126	-19.8%
SC1 MB Residential Heat	82,924,533	81,651,776	66,423,424	56,914,047	40,022,967	38,589,393	-44,335,139	-8,867,028	-14.2%
Total SC1	550,548,067	566,500,620	507,081,240	523,544,461	548,883,883	549,825,128	-722,939	-144,588	0.0%
SC2 Residential Non Heat	16,669	30,548	27,879	24,217	20,650	28,712	12,042	2,408	11.5%
SC2 Residential Heat	1,733,382	1,884,539	1,647,366	1,902,859	2,095,140	2,020,835	287,453	57,491	3.1%
SC2 Commercial Non Heat	2,767,487	2,655,725	2,286,933	2,592,609	2,762,657	2,663,976	-103,512	-20,702	-0.8%
SC2 Commercial Heat	101,977,293	107,123,744	92,867,382	102,781,902	114,412,271	125,045,439	23,068,146	4,613,629	4.2%
SC2 Industrial	1,067,919	1,165,862	1,149,799	1,965,056	1,421,330	1,308,252	240,333	48,067	4.1%
SC2 MB Residential Non Heat	33,214	31,401	14,485	10,228	9,735	8,178	-25,036	-5,007	-24.4%
SC2 MB Residential Heat	1,219,888	1,207,285	1,042,855	1,069,319	1,059,919	1,098,550	-121,339	-24,268	-2.1%
SC2 MB Commercial Non Heat	3,548,913	3,482,482	2,727,267	3,303,420	3,189,317	3,333,610	-215,303	-43,061	-1.2%
SC2 MB Commercial Heat	90,344,957	92,160,196	79,005,561	82,461,314	87,975,561	87,830,114	-2,514,844	-502,969	-0.6%
SC2 MB Industrial	1,086,482	1,148,809	976,318	955,535	1,008,987	980,056	-106,426	-21,285	-2.0%
Total SC2	203,796,205	210,890,592	181,745,845	197,066,459	213,955,566	224,317,720	20,521,515	4,104,303	1.9%
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	-
SC3 Commercial Heat	0	0	0	0	0	0	0	0	-
SC3 Industrial	0	0	0	0	0	0	0	0	-
Total SC3	0	0	0	0	0	0	0	0	-
SC5 Firm Sales	67,231,844	65,493,081	61,392,772	63,625,270	62,030,264	60,490,625	-6,741,219	-1,348,244	-2.1%
SC6 Interruptible	55,985,381	49,783,114	46,627,228	49,997,229	49,673,844	41,590,749	-14,394,632	-2,878,926	-5.8%
SC7 Small Volume Firm Sales	90,655,264	91,448,858	82,340,116	86,842,418	82,696,229	83,526,368	-7,128,896	-1,425,779	-1.6%
SC8 Firm Sales and Transportation	226,355,003	236,778,407	198,955,001	201,207,538	187,098,574	187,362,323	-38,992,680	-7,798,536	-3.7%
SC9 Negotiated Transportation Service	79,873,331	77,950,701	72,766,881	76,214,956	75,809,726	78,742,225	-1,131,106	-226,221	-0.3%
SC9 NYSEG Transportation	2,874,183	3,079,438	2,554,523	2,731,657	2,384,177	3,053,599	179,416	35,883	1.2%
SC10 Natural Gas Vehicles	171,310	104,386	72,400	30,143	21,456	15,465	-155,845	-31,169	-38.2%
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	-
SC12 Distributed Generation	14,163,724	12,756,418	14,024,266	13,663,348	15,256,225	17,123,487	2,959,763	591,953	3.9%
SC13 Residential Distributed Generation	3,551	3,629	3,513	3,415	3,730	4,540	989	198	5.0%
Total SC5 - SC13	537,313,592	537,398,031	478,736,698	494,315,975	474,974,226	471,909,382	-65,404,210	-13,080,842	-2.6%
SC14 Dual Fuel Electric Generators	470,504,604	384,642,853	353,762,112	382,816,611	333,573,580	388,899,648	-81,604,956	-16,320,991	-3.7%
TOTAL	1,762,162,468	1,699,432,096	1,521,325,896	1,597,743,506	1,571,387,255	1,634,951,878	-127,210,590	-25,442,118	-1.5%

NMPC Fiscal Year Actual Use Per Customer by Service and Revenue Class for the Period April 2018 - March 2024 (FY2019 - FY2024)
(Therms/Customer)

	4	5	6	7	8	9
Class Name	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024
SC1 Residential Heat - EAP	1,047	966	973	933	866	840
SC1 MB Residential Heat - EAP	1,177	1,070	1,021	921	1,119	1,059
SC1 Residential Non Heat - EAP	208	183	165	154	142	133
SC1 MB Residential Non-Heat - EAP	201	159	147	121	176	144
SC1 Residential Non Heat	164	148	145	136	127	128
SC1 Residential Heat	987	901	901	873	819	814
SC1 MB Residential Non-Heat	174	167	168	165	172	181
SC1 MB Residential Heat	1,138	1,047	1,074	1,091	1,196	1,179
Average SC1	975	892	894	866	815	805
SC2 Residential Non Heat	484	647	605	562	415	523
SC2 Residential Heat	2,666	2,524	2,423	2,525	2,417	2,320
SC2 Commercial Non Heat	2,142	1,913	1,744	1,860	1,800	1,721
SC2 Commercial Heat	3,499	3,182	3,046	3,048	2,891	3,161
SC2 Industrial	9,936	9,463	10,457	16,137	9,563	9,406
SC2 MB Residential Non Heat	1,978	1,771	873	632	662	581
SC2 MB Residential Heat	4,370	4,051	4,117	4,313	4,567	4,874
SC2 MB Commercial Non Heat	5,437	5,324	4,733	5,798	6,160	6,029
SC2 MB Commercial Heat	6,416	6,159	6,109	6,650	7,496	7,460
SC2 MB Industrial	16,113	15,498	15,776	15,213	14,922	14,436
Total SC2	4,399	4,059	3,910	3,995	3,914	4,094
SC3 Commercial Non Heat	0	0	0	0	0	0
SC3 Commercial Heat	0	0	0	0	0	0
SC3 Industrial	0	0	0	0	0	0
Total SC3	0	0	0	0	0	0
SC5 Firm Sales	512,947	487,976	500,222	509,800	464,705	464,228
SC6 Interruptible	3,488,234	3,065,740	2,929,735	3,118,772	3,100,813	2,518,524
SC7 Small Volume Firm Sales	101,905	94,471	94,199	93,798	93,617	94,636
SC8 Firm Sales and Transportation	2,693,938	3,267,478	2,951,318	2,765,357	2,627,078	2,538,337
SC9 Negotiated Transportation Service	15,992,415	19,209,157	18,217,432	19,009,067	18,921,083	36,252,385
SC9 NYSEG Transportation	2,964,240	2,725,791	2,649,371	2,642,418	1,985,607	2,484,924
SC10 Natural Gas Vehicles	42,244	33,233	24,111	10,079	10,760	5,190
SC11 Load Aggregation Service	0	0	0	0	0	0
SC12 Distributed Generation	2,031,579	1,799,406	787,128	756,858	827,911	926,247
SC13 Residential Distributed Generation	1,204	1,154	1,213	1,111	810	1,007
Total SC5 - SC13	469,164	454,222	427,811	427,011	435,139	428,746
SC14 Dual Fuel Electric Generators	94,478,791	62,055,296	58,694,907	61,685,857	52,509,357	64,752,814

NMPC Fiscal Year Normalized Use Per Customer by Service and Revenue Class for the Period April 2018 - March 2024 (FY2019 - FY2024)
(Therms/Customer)

	4	5	6	7	8	9	FY19-FY24	FY19-FY24	FY19-FY24
Class Name	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	Change	PA Change	PPA Change
SC1 Residential Heat - EAP	1,023	1,057	943	958	984	961	-62	-12	-1.2%
SC1 MB Residential Heat - EAP	1,141	1,159	980	944	1,253	1,389	248	50	4.0%
SC1 Residential Non Heat - EAP	203	193	161	157	154	147	-56	-11	-6.2%
SC1 MB Residential Non-Heat - EAP	197	167	143	123	183	187	-10	-2	-1.0%
SC1 Residential Non Heat	161	160	142	139	142	144	-17	-3	-2.2%
SC1 Residential Heat	965	989	873	896	935	935	-30	-6	-0.6%
SC1 MB Residential Non-Heat	172	177	165	168	184	218	47	9	4.9%
SC1 MB Residential Heat	1,112	1,149	1,040	1,120	1,352	1,501	390	78	6.2%
Average SC1	953	979	867	889	929	930	-23	-5	-0.5%
SC2 Residential Non Heat	476	694	593	563	430	552	76	15	3.0%
SC2 Residential Heat	2,607	2,767	2,353	2,592	2,739	2,662	56	11	0.4%
SC2 Commercial Non Heat	2,111	2,009	1,709	1,892	1,937	1,873	-237	-47	-2.4%
SC2 Commercial Heat	3,422	3,496	2,949	3,132	3,302	3,618	196	39	1.1%
SC2 Industrial	9,703	10,404	10,081	16,114	11,371	11,182	1,478	296	2.9%
SC2 MB Residential Non Heat	1,954	1,847	852	639	695	629	-1,325	-265	-20.3%
SC2 MB Residential Heat	4,280	4,406	3,996	4,419	5,145	5,577	1,296	259	5.4%
SC2 MB Commercial Non Heat	5,354	5,691	4,631	5,943	6,729	6,776	1,422	284	4.8%
SC2 MB Commercial Heat	6,282	6,717	5,931	6,835	8,466	8,478	2,196	439	6.2%
SC2 MB Industrial	15,746	17,146	15,255	15,665	16,816	17,194	1,448	290	1.8%
Total SC2	4,305	4,441	3,791	4,104	4,443	4,670	365	73	1.6%
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	-
SC3 Commercial Heat	0	0	0	0	0	0	0	0	-
SC3 Industrial	0	0	0	0	0	0	0	0	-
Total SC3	0	0	0	0	0	0	0	0	-
SC5 Firm Sales	508,198	502,543	495,406	513,231	484,611	479,948	-28,250	-5,650	-1.1%
SC6 Interruptible	3,499,086	3,111,445	2,914,202	3,124,827	3,104,615	2,599,422	-899,664	-179,933	-5.8%
SC7 Small Volume Firm Sales	100,447	101,327	92,137	95,702	101,717	105,208	4,760	952	0.9%
SC8 Firm Sales and Transportation	2,658,532	3,426,322	2,922,739	2,782,623	2,711,574	2,676,605	18,073	3,615	0.1%
SC9 Negotiated Transportation Service	15,974,666	19,487,675	18,191,720	19,053,739	18,952,431	39,371,112	23,396,446	4,679,289	19.8%
SC9 NYSEG Transportation	2,874,183	3,079,438	2,554,523	2,731,657	2,384,177	3,053,599	179,416	35,883	1.2%
SC10 Natural Gas Vehicles	42,828	34,795	24,133	10,048	10,728	5,155	-37,673	-7,535	-34.5%
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	-
SC12 Distributed Generation	2,023,389	1,822,345	779,126	759,075	847,568	951,305	-1,072,084	-214,417	-14.0%
SC13 Residential Distributed Generation	1,184	1,210	1,171	1,138	933	1,135	-49	-10	-0.8%
Total SC5 - SC13	464,822	473,085	423,410	430,325	450,213	456,412	-8,411	-1,682	-0.4%
SC14 Dual Fuel Electric Generators	94,100,921	64,107,142	58,960,352	63,802,769	55,595,597	64,816,608	-29,284,313	-5,856,863	-7.2%
TOTAL									

NMPC Forecast Fiscal Year Use Per Customer by Service and Revenue Class for the Period FY2024 - FY2029
(Therms/Customer)

	9	10	11	12	13	14	FY24-FY29	FY24-FY29	FY24-FY29
Class Name	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	Change	PA Change	PPA Change
SC1 Residential Heat - EAP	840	952	948	946	948	941	101	20	2.3%
SC1 MB Residential Heat - EAP	1,059	1,868	1,859	1,856	1,862	1,848	789	158	11.8%
SC1 Residential Non Heat - EAP	133	156	155	155	156	155	23	5	3.2%
SC1 MB Residential Non-Heat - EAP	144	283	284	287	291	279	134	27	14.1%
SC1 Residential Non Heat	128	142	142	142	142	141	13	3	2.0%
SC1 Residential Heat	814	911	908	905	907	900	86	17	2.0%
SC1 MB Residential Non-Heat	181	278	278	278	279	278	98	20	9.0%
SC1 MB Residential Heat	1,179	1,753	1,747	1,743	1,749	1,733	554	111	8.0%
Total SC1	805	923	921	919	923	916	111	22	2.6%
SC2 Residential Non Heat	523	518	513	520	517	511	-11	-2	-0.4%
SC2 Residential Heat	2,320	2,665	2,653	2,648	2,653	2,634	315	63	2.6%
SC2 Commercial Non Heat	1,721	1,940	1,953	1,963	1,982	1,986	266	53	2.9%
SC2 Commercial Heat	3,161	3,241	3,263	3,286	3,323	3,330	169	34	1.0%
SC2 Industrial	9,406	10,256	10,363	10,401	10,576	10,559	1,154	231	2.3%
SC2 MB Residential Non Heat	581	722	751	724	762	730	148	30	4.7%
SC2 MB Residential Heat	4,874	5,553	5,550	5,519	5,543	5,510	636	127	2.5%
SC2 MB Commercial Non Heat	6,029	6,660	6,691	6,748	6,806	6,817	789	158	2.5%
SC2 MB Commercial Heat	7,460	8,300	8,357	8,418	8,513	8,532	1,073	215	2.7%
SC2 MB Industrial	14,436	15,332	15,456	15,594	15,824	15,881	1,445	289	1.9%
Total SC2	4,094	4,357	4,386	4,417	4,466	4,475	381	76	1.8%
SC3 Commercial Non Heat	0	0	0	0	0	0	0	0	-
SC3 Commercial Heat	0	0	0	0	0	0	0	0	-
SC3 Industrial	0	0	0	0	0	0	0	0	-
Total SC3	0	0	0	0	0	0	0	0	-
SC5 Firm Sales	464,228	505,819	505,819	505,819	506,114	505,819	41,590	8,318	1.7%
SC6 Interruptible	2,518,524	3,239,652	3,239,652	3,239,652	3,241,209	3,239,652	721,128	144,226	5.2%
SC7 Small Volume Firm Sales	94,636	109,118	109,701	110,392	111,804	112,098	17,462	3,492	3.4%
SC8 Firm Sales and Transportation	2,538,337	2,816,007	2,816,007	2,816,007	2,817,934	2,816,007	277,669	55,534	2.1%
SC9 Negotiated Transportation Service	36,252,385	36,872,389	36,872,389	36,872,389	36,874,962	36,872,389	620,005	124,001	0.3%
SC9 NYSEG Transportation	2,484,924	2,409,554	2,409,554	2,409,554	2,414,798	2,409,554	-75,370	-15,074	-0.6%
SC10 Natural Gas Vehicles	5,190	8,243	8,312	8,381	8,477	8,517	3,327	665	10.4%
SC11 Load Aggregation Service	0	0	0	0	0	0	0	0	-
SC12 Distributed Generation	926,247	871,449	871,449	871,449	872,175	871,449	-54,797	-10,959	-1.2%
SC13 Residential Distributed Generation	1,007	985	989	993	1,002	1,001	-6	-1	-0.1%
Total SC5 - SC13	428,746	473,700	472,447	471,628	472,246	471,271	42,524	8,505	1.9%
SC14 Dual Fuel Electric Generators	64,752,814	61,933,109	61,933,109	61,933,109	61,941,386	61,933,109	-2,819,705	-563,941	-0.9%

Niagara Mohawk Power Corporation d/b/a National Grid
Electric Sales and Customer forecast Comparison
Case 24-E-0322

	Sales			
Rate Year	**Company C&U**	**Staff**	**Difference**	**% Difference**
Residential	11,788	11,851	63	0.53%
Commercial	12,354	12,374	20	0.16%
Industrial	9,847	9,891	43	0.44%
Total	33,989	34,115	126	0.37%

	Customer			
Rate Year	**Company C&U**	**Staff**	**Difference**	**% Difference**
Residential	1,537,018	1,537,831	812	0.05%
Commercial	182,567	182,791	223	0.12%
Industrial	1,512	1,504	(8)	-0.52%
Total	1,721,098	1,722,126	1,028	0.06%

Niagara Mohawk Power Corporation d/b/a National Grid
Gas Sales and Customer forecast Comparison
Case 24-G-0323

	Sales			
Rate Year	**Company C&U**	**Staff**	**Difference**	**% Difference**
Residential Non Heat	3,339,315.00	3,508,617.79	169,303	5.07%
Residential Heat	550,903,961	576,822,949	25,918,988	4.70%
Commercial	295,361,066	280,815,563	(14,545,503)	-4.92%
Industrial	2,108,894	2,108,894	-	0.00%
Other	776,145,226	776,145,226	-	0.00%
Total	1,627,858,462	1,639,401,250	11,542,788	0.71%

	Customer Count			
Rate Year	**Company C&U**	**Staff**	**Difference**	**% Difference**
Residential Non Heat	22,647.00	22,796.11	149	0.66%
Residential Heat	573,062	574,282	1,220	0.21%
Commercial	47,711	48,284	573	1.20%
Industrial	175	175	-	0.00%
Other	239	239	-	0.00%
Total	643,834	645,776	1,942	0.30%

Model Statistics

Residential Use Per Customer
Dependent Variable: U_10_R
Method: ARMA Maximum Likelihood (BFGS)
Date: 08/22/24 Time: 13:57
Sample: 2004M01 2024M05
Included observations: 245
Convergence achieved after 7 iterations
Coefficient covariance computed using outer product of gradients

Variable		Coefficient	Std. Error	t-Statistic	Prob.
C		1.023505	69.32901	0.014763	0.9882
IDX_RPI_HH(-1)		0.753953	0.281978	2.673804	0.008
CDD_10		1.008575	0.034152	29.53204	0
HDD_10		0.199564	0.010857	18.38172	0
BDAYS		13.42571	1.976549	6.792499	0
	Jul-12	-138.9444	35.93658	-3.866378	0.0001
AR(12)		0.79988	0.03334	23.99152	0
MA(2)		0.176139	0.058033	3.035178	0.0027
SIGMASQ		436.8335	30.92312	14.12644	0

R-squared	0.944185	Mean dependent var	652.9737
Adjusted R-squared	0.942292	S.D. dependent var	88.64795
S.E. of regression	21.29536	Akaike info criterion	9.041169
Sum squared resid	107024.2	Schwarz criterion	9.169787
Log likelihood	-1098.543	Hannan-Quinn criter	9.092964
F-statistic	499.027	Durbin-Watson stat	1.844786
Prob(F-statistic)	0		

Inverted AR Roots	0.98	.85+.49i	.85-.49i	.49+.85i
	.49-.85i	-.00-.98i	-.00+.98i	-.49-.85i
	-.49+.85i	-.85+.49i	-.85-.49i	-0.98
Inverted MA Roots	-.00+.42i	-.00-.42i		

Residential Customer
Dependent Variable: LOG(C_10_R)
Method: ARMA Maximum Likelihood (BFGS)
Date: 07/21/24 Time: 22:26
Sample: 2004M02 2024M05
Included observations: 244
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.20956	0.046617	304.8143	0
DLOG(IDX_HHOLDS(-1),0,12	0.110253	0.03824	2.88315	0.0043
Jun-12	0.177539	0.000187	951.7171	0
Oct-21	-0.001252	9.57E-05	-13.08049	0
Nov-14	0.000415	0.000144	2.873979	0.0044
Jul-12	0.180588	0.000203	887.4359	0
May-21	0.001231	0.000114	10.75753	0
AR(1)	0.998336	0.007066	141.281	0
SAR(12)	0.76934	0.038485	19.99077	0
MA(1)	0.28577	0.061919	4.615237	0
SIGMASQ	1.72E-07	1.57E-08	10.91593	0

R-squared	0.999743	Mean dependent var	14.20733
Adjusted R-squared	0.999732	S.D. dependent var	0.025878
S.E. of regression	0.000424	Akaike info criterion	-12.56893
Sum squared resid	4.19E-05	Schwarz criterion	-12.41127
Log likelihood	1544.409	Hannan-Quinn criter	-12.50543
F-statistic	90555.34	Durbin-Watson stat	1.954366
Prob(F-statistic)	0		

Inverted AR Roots	1	0.98	.85+.49i	.85-.49i
	.49+.85i	.49-.85i	-.00-.98i	-.00+.98i
	-.49-.85i	-.49+.85i	-.85+.49i	-.85-.49i
	-0.98			
Inverted MA Roots	-0.29			

Commercial Use Per Customer
Dependent Variable: D(U_10_C)
Method: ARMA Maximum Likelihood (BFGS)
Date: 08/12/24 Time: 13:51
Sample: 2004M01 2024M05
Included observations: 245

Convergence achieved after 25 iterations
Coefficient covariance computed using observed Hessian

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-3976.233	882.3135	-4.506599	0
D(IDX_EMPPERCAP)	4556.234	1259.943	3.616222	0.0004
D(P_10_C(-1))	-68.59354	34.06432	-2.013648	0.0452
HDD_10	0.164493	0.074191	2.217145	0.0276
CDD_10	1.473363	0.372615	3.954114	0.0001
Feb-04	791.4068	249.0404	3.177825	0.0017
BDAYS	124.8491	28.68979	4.351691	0
AR(1)	-0.579115	0.070796	-8.180081	0
AR(2)	-0.30089	0.071647	-4.199616	0
SAR(24)	0.592958	0.071332	8.312645	0
MA(12)	0.652919	0.07869	8.297349	0
MA(13)	-0.125981	0.059058	-2.133165	0.034
SIGMASQ	72289.76	6575.719	10.99344	0

R-squared	0.679926	Mean dependent va	-5.176038
Adjusted R-squared	0.66337	S.D. dependent var	476.2128
S.E. of regression	276.2978	Akaike info criterion	14.17783
Sum squared resid	17710992	Schwarz criterion	14.36361
Log likelihood	-1723.784	Hannan-Quinn criter	14.25264
F-statistic	41.06929	Durbin-Watson stat	2.033275
Prob(F-statistic)	0		

Inverted AR Roots	0.98	.95-.25i	.95+.25i	.85-.49i
	.85+.49i	.69+.69i	.69-.69i	.49-.85i
	.49+.85i	.25+.95i	.25-.95i	.00+.98i
	-.00-.98i	-.25+.95i	-.25-.95i	-.29-.47i
	-.29+.47i	-.49+.85i	-.49-.85i	-.69-.69i
	-.69+.69i	-.85-.49i	-.85+.49i	-.95+.25i
	-.95-.25i	-0.98		
Inverted MA Roots	.91+.25i	.91-.25i	.67-.68i	.67+.68i
	.23-.93i	.23+.93i	0.19	-.27-.93i
	-.27+.93i	-.70-.68i	-.70+.68i	-.95+.25i
	-.95-.25i			

Commercial Customer
Dependent Variable: DLOG(C_10_C)
Method: ARMA Conditional Least Squares (Marquardt - EViews legacy)
Date: 08/12/24 Time: 13:50
Sample: 2006M01 2024M05
Included observations: 221
Convergence achieved after 13 iterations
Huber-White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance
MA Backcast: 2005M01 2005M12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000571	9.84E-05	5.8057	0
DLOG(GDP(-2))	0.00801	0.003149	2.543368	0.0117
Jun-12	0.030619	0.000285	107.3621	0
Jul-12	-0.029223	0.000293	-99.88912	0
AR(1)	0.292244	0.059275	4.930298	0
SAR(6)	-0.161568	0.059308	-2.724217	0.007
MA(12)	0.958703	0.007707	124.394	0

R-squared	0.956489	Mean dependent va	0.000547
Adjusted R-squared	0.95527	S.D. dependent var	0.003105
S.E. of regression	0.000657	Akaike info criterion	-11.78785
Sum squared resid	9.23E-05	Schwarz criterion	-11.68021
Log likelihood	1309.557	Hannan-Quinn criter	-11.74439
F-statistic	784.0586	Durbin-Watson stat	1.900715
Prob(F-statistic)	0		

Inverted AR Roots	.64-.37i	.64+.37i	0.29	.00+.74i
	-.00-.74i	-.64-.37i	-.64+.37i	
Inverted MA Roots	.96+.26i	.96-.26i	.70-.70i	.70+.70i
	.26-.96i	.26+.96i	-.26+.96i	-.26-.96i
	-.70-.70i	-.70-.70i	-.96-.26i	-.96+.26i

Industrial Sales
Dependent Variable: K_10_I
Method: ARMA Maximum Likelihood (BFGS)

Date: 08/08/24 Time: 16:27
Sample: 2004M01 2024M05
Included observations: 245
Convergence achieved after 10 iterations
Coefficient covariance computed using observed Hessian

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	207.8953	119.2437	1.743448	0.0826
IDX_EMPL_MANUF(-1)	6.414325	1.225933	5.232199	0
P_10_I(-3)	-6.97903	2.315551	-3.013982	0.0029
CDD_10	0.238017	0.02766	8.605164	0
MAYJUN2015	272.4421	26.74426	10.18694	0
MAYJUN2019	256.606	25.6884	9.989178	0
JANAPR2022	-133.2292	21.16338	-6.295271	0
APRMAY2012	217.0678	25.88646	8.385381	0
MARAPR2014	160.8124	25.68662	6.260552	0
JULAUG2010	209.5862	26.19594	8.000714	0
Jan-04	-195.5138	38.06601	-5.136179	0
Nov-11	-127.2641	34.68249	-3.669406	0.0003
Jun-18	122.2461	34.24709	3.569532	0.0004
Mar-04	143.4908	37.57373	3.818913	0.0002
Jul-12	-147.1107	35.52729	-4.140779	0
Feb-22	-92.01229	41.66964	-2.208137	0.0283
@SEAS(7)	25.87764	9.806526	2.638818	0.0089
AR(2)	0.188908	0.062615	3.016994	0.0028
AR(3)	0.199987	0.062607	3.194322	0.0016
AR(4)	0.297431	0.060515	4.915005	0
AR(5)	0.113554	0.06314	1.798446	0.0735
SIGMASQ	1359.632	122.8582	11.06667	0

R-squared	0.795667	Mean dependent var	803.0288
Adjusted R-squared	0.776425	S.D. dependent var	81.73905
S.E. of regression	38.64927	Akaike info criterion	10.23667
Sum squared resid	333109.8	Schwarz criterion	10.55107
Log likelihood	-1231.992	Hannan-Quinn criter	10.36328
F-statistic	41.3503	Durbin-Watson stat	2.090768
Prob(F-statistic)	0		

Inverted AR Roots	0.94	.02-.68i	.02+.68i	-.49-.15i
	-.49+.15i			

Industrial Customers
Dependent Variable: LOG(C_10_I)
Method: ARMA Maximum Likelihood (BFGS)
Date: 07/22/24 Time: 14:01
Sample: 2006M01 2024M05
Included observations: 221
Convergence achieved after 8 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.244994	0.093844	77.20284	0
@TREND	-0.000632	9.63E-05	-6.55866	0
LOG(@MOVAV(IDX_EMPL_M	0.050764	0.02	2.538141	0.0119
Oct-09	-0.010007	0.000497	-20.13028	0
Nov-09	-0.004047	0.00051	-7.940994	0
AR(1)	0.984906	0.017768	55.43266	0
MA(7)	0.15072	0.070011	2.152812	0.0325
SMA(14)	0.173856	0.08501	2.04511	0.0421
SIGMASQ	2.21E-06	1.94E-07	11.38857	0

R-squared	0.998811	Mean dependent var	7.379796
Adjusted R-squared	0.998767	S.D. dependent var	0.043266
S.E. of regression	0.00152	Akaike info criterion	-10.08032
Sum squared resid	0.00049	Schwarz criterion	-9.941935
Log likelihood	1122.876	Hannan-Quinn criter	-10.02444
F-statistic	22268.49	Durbin-Watson stat	2.066092
Prob(F-statistic)	0		

Inverted AR Roots	0.98			
Inverted MA Roots	.86-.20i	.86+.20i	.69-.55i	.69+.55i
	.69-.33i	.69+.33i	.38+.80i	.38-.80i
	.17-.74i	.17+.74i	.00+.88i	-.00-.88i
	-.38-.80i	-.38+.80i	-.48-.60i	-.48+.60i
	-.69+.55i	-.69-.55i	-0.76	-.86+.20i
	-.86-.20i			

Model Statistics

East Gate Meter Count:

Dependent Variable: LOG(EG_2023_COMPANYFORECAST_MC_RN)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2008M09 2024M02
Included observations: 186
Convergence achieved after 16 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.09592	0.046457	217.3183	0
LOG(@MOVAV(EG_PRICE_D	-0.05099	0.013778	-3.70075	0.0003
@TREND	-0.00201	0.000111	-18.0219	0
AR(1)	0.939613	0.031346	29.97553	0
MA(1)	0.501017	0.050884	9.846252	0
MA(12)	0.241718	0.044618	5.417481	0
SIGMASQ	1.18E-05	9.57E-07	12.33326	0

R-squared	0.998909	Mean dependent va	9.727888
Adjusted R-squared	0.998872	S.D. dependent var	0.104312
S.E. of regression	0.003503	Akaike info criterion	-8.40993
Sum squared resid	0.002196	Schwarz criterion	-8.28853
Log likelihood	789.1235	Hannan-Quinn criter	-8.36073
F-statistic	27311.87	Durbin-Watson stat	1.927116
Prob(F-statistic)	0		

Inverted AR Roots	0.94			
Inverted MA Roots	.82+.23i	.82-.23i	.59+.62i	.59-.62i
	.19+.85i	.19-.85i	-.27-.85i	-.27+.85i
	-.68+.62i	-.68-.62i	-.91+.22i	-.91-.22i

Dependent Variable: EG_2023_COMPANYFORECAST_MC_RH
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2007M03 2024M02
Included observations: 204
Convergence achieved after 14 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EG_SERVICE_AREA_M_NUM	146.6651	79.1486	1.853035	0.0655
@TREND	238.6831	18.95714	12.59067	0
JAN	161334.7	32946.58	4.896857	0
FEB	161596.3	32947.05	4.904726	0
MAR	161722.5	32938.68	4.909806	0
APR	161628.9	32940.2	4.906736	0
MAY	161389.8	32943.76	4.898948	0
JUN	160785.6	32943.35	4.88067	0
JUL	159906.3	3.29E+04	4.854486	0
AUG	159519.8	32943.64	4.842203	0
SEP	159384	32937.11	4.83904	0
OCT	159619.7	32931.61	4.847006	0
NOV	160154.1	32941.76	4.861734	0
DEC	160818.8	32945.69	4.881331	0
AR(1)	0.975857	0.022466	43.43635	0
MA(1)	3.20E-01	6.51E-02	4.916395	0
SIGMASQ	39894.85	3199.241	12.4701	0

R-squared	0.999855	Mean dependent va	248546.4
Adjusted R-squared	0.999842	S.D. dependent var	16602.09
S.E. of regression	2.09E+02	Akaike info criterion	13.61666
Sum squared resid	8138549	Schwarz criterion	13.89317
Log likelihood	-1371.9	Hannan-Quinn criter	13.72851
Durbin-Watson stat	1.916375		

Inverted AR Roots	0.98
Inverted MA Roots	-0.32

Dependent Variable: LOG(EG_2023_COMPANYFORECAST_MC_COM)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2007M03 2024M02
Included observations: 204
Convergence achieved after 6 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
JAN	2.098857	1.555717	1.349125	0.1789

FEB	2.101045	1.55588	1.35039	0.1785
MAR	2.101972	1.555805	1.351051	0.1783
APR	2.101326	1.555806	1.350635	0.1784
MAY	2.099097	1.555811	1.349198	0.1789
JUN	2.095215	1.555782	1.346728	0.1797
JUL	2.090871	1.555754	1.34396	0.1806
AUG	2.087771	1.555721	1.341995	0.1812
SEP	2.08611	1.555709	1.340938	0.1815
OCT	2.085927	1.555687	1.34084	0.1816
NOV	2.08902	1.555681	1.342834	0.1809
DEC	2.094608	1.55567	1.346435	0.1798
LOG(EG_SERVICE_AREA_M_	1.275734	0.250879	5.085057	0
AR(1)	0.975537	0.022958	42.49132	0
SIGMASQ	1.67E-06	1.59E-07	10.48903	0

R-squared	0.998492	Mean dependent va	9.991187
Adjusted R-squared	0.99838	S.D. dependent var	0.033318
S.E. of regression	0.001341	Akaike info criterion	-10.3055
Sum squared resid	0.00034	Schwarz criterion	-10.0615
Log likelihood	1066.159	Hannan-Quinn criter	-10.2068
Durbin-Watson stat	1.636204		

Inverted AR Roots	0.98

West Gate Meter Count:

Dependent Variable: LOG(WG_2023_COMPANYFORECAST_MC_RN)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2016M03 2024M02
Included observations: 96
Convergence achieved after 24 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.

LOG(WG_SERVICE_AREAM_	1.372271	0.003979	344.8794	0
JAN	0.000144	0.003263	0.044089	0.9649
FEB	-0.00047	0.003303	-0.14313	0.8865
JUN	-0.00242	0.001843	-1.31302	0.1928
JUL	-0.00596	0.002944	-2.02308	0.0463
AUG	-0.00943	0.003428	-2.75052	0.0073
SEP	-0.01061	0.004036	-2.62976	0.0102
OCT	-0.00889	0.004752	-1.87134	0.0648
NOV	-0.00504	0.003426	-1.47211	0.1448
@TREND	-0.00253	0.000191	-13.2082	0
AR(1)	0.856105	0.076911	11.13115	0
MA(1)	0.324507	0.13033	2.489888	0.0148
SIGMASQ	2.84E-05	4.58E-06	6.186135	0

R-squared	0.99502	Mean dependent va	9.287937
Adjusted R-squared	0.9943	S.D. dependent var	0.075867
S.E. of regression	0.005728	Akaike info criterion	-7.34169
Sum squared resid	0.002723	Schwarz criterion	-6.99444
Log likelihood	365.4012	Hannan-Quinn criter	-7.20133
Durbin-Watson stat	1.956965		

Inverted AR Roots	0.86
Inverted MA Roots	-0.32

Dependent Variable: WG_2023_COMPANYFORECAST_MC_RH
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2007M03 2024M02
Included observations: 204
Convergence achieved after 14 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
JAN	184899.6	36025.57	5.132455	0
FEB	185258.4	36032.62	5.141406	0
MAR	185473.9	36033.06	5.147325	0
APR	185442.6	36041.03	5.145318	0
MAY	185187.7	36043.93	5.137834	0
JUN	184399.9	36044.51	5.115895	0
JUL	183585.4	36040.77	5.093826	0
AUG	183068.4	36040.54	5.079512	0
SEP	182982.8	36038.06	5.077487	0
OCT	183117	36035.41	5.081586	0
NOV	183508.1	36033.86	5.092657	0
DEC	184281.5	36032.26	5.114349	0

@TREND	127.724	6.955309	18.36353	0
WG_SERVICE_AREAM_NUM	174.7822	76.70591	2.278601	0.0238
AR(1)	0.942512	0.026526	35.53165	0
MA(1)	0.44373	0.060418	7.344336	0
SIGMASQ	37126.91	3748.494	9.904487	0

R-squared	0.999499	Mean dependent va	279983.9
Adjusted R-squared	0.999456	S.D. dependent var	8628.413
S.E. of regression	201.2513	Akaike info criterion	13.54189
Sum squared resid	7573890	Schwarz criterion	13.8184
Log likelihood	-1364.27	Hannan-Quinn criter	13.65374
Durbin-Watson stat	1.93498		

Inverted AR Roots	0.94
Inverted MA Roots	-0.44

Dependent Variable: LOG(WG_2023_COMPANYFORECAST_MC_COM)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2007M03 2024M02
Included observations: 204
Convergence achieved after 29 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
JAN	9.605552	0.057642	166.6425	0
FEB	9.607842	0.057518	167.0406	0
MAR	9.610431	0.057651	166.7006	0
APR	9.610298	0.058114	165.3706	0
MAY	9.608408	0.05831	164.7806	0
JUN	9.603726	0.058274	164.8035	0
JUL	9.598806	0.05811	165.1823	0
AUG	9.595547	0.058099	165.1579	0
SEP	9.593657	0.058174	164.9121	0
OCT	9.593706	5.80E-02	165.4444	0
NOV	9.59609	0.057562	166.7099	0
DEC	9.601585	0.057617	166.6439	0
LOG(WG_SERVICE_AREAM_	0.078768	0.009187	8.574294	0
@TREND	0.000116	3.50E-05	3.304655	0.0011

AR(12)	0.829595	0.056601	14.65681	0
MA(13)	0.639078	0.087335	7.317564	0
SIGMASQ	1.12E-05	1.34E-06	8.397338	0

R-squared	0.949152	Mean dependent va	10.10193
Adjusted R-squared	0.944802	S.D. dependent var	0.014897
S.E. of regression	0.0035	Akaike info criterion	-8.29041
Sum squared resid	0.002291	Schwarz criterion	-8.0139
Log likelihood	862.6217	Hannan-Quinn criter	-8.17856
Durbin-Watson stat	0.177656		

Inverted AR Roots	0.98	.85+.49i	.85-.49i	.49+.85i
	.49-.85i	.00-.98i	-.00+.98i	-.49-.85i
	-.49+.85i	-.85-.49i	-.85+.49i	-0.98
Inverted MA Roots	.94-.23i	.94+.23i	.72-.64i	.72+.64i
	.34-.90i	.34+.90i	-.12-.96i	-.12+.96i
	-.55-.80i	-.55+.80i	-.86+.45i	-.86-.45i
	-0.97			

East Gate Use Per Customer:

Dependent Variable: RN_EG_UPC
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2016M01 2024M02
Included observations: 98
Convergence achieved after 16 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.882847	0.610331	6.361867	0
EG_BDD10YR	0.016212	0.000826	19.63753	0
AR(1)	0.349567	0.09567	3.653895	0.0004
MA(12)	0.476868	0.121523	3.924085	0.0002
SIGMASQ	1.804716	0.20091	8.982699	0

R-squared	0.967435	Mean dependent va	12.12281
Adjusted R-squared	0.966035	S.D. dependent var	7.482716
S.E. of regression	1.379037	Akaike info criterion	3.563243
Sum squared resid	176.8622	Schwarz criterion	3.695129
Log likelihood	-169.599	Hannan-Quinn criter	3.616588
F-statistic	690.7172	Durbin-Watson stat	2.020799

Prob(F-statistic)	0			
Inverted AR Roots	0.35			
Inverted MA Roots	.91+.24i	.91-.24i	.66+.66i	.66-.66i
	.24-.91i	.24+.91i	-.24-.91i	-.24+.91i
	-.66-.66i	-.66-.66i	-.91-.24i	-.91+.24i

Dependent Variable: LOG(RH_EG_UPC)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2007M08 2024M02
Included observations: 199
Convergence achieved after 39 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.228438	0.251641	16.80342	0
LOG(@MOVAV(EG_PRICE_D	-0.41696	0.088893	-4.69064	0
EG_BDD10YR	0.001724	5.03E-05	34.31048	0
AR(1)	0.432974	0.072671	5.958036	0
MA(12)	0.506995	0.074505	6.804868	0
SIGMASQ	0.022021	0.002815	7.821884	0

R-squared	0.973533	Mean dependent va	3.95742
Adjusted R-squared	0.972847	S.D. dependent var	0.914448
S.E. of regression	0.150684	Akaike info criterion	-0.89862
Sum squared resid	4.382168	Schwarz criterion	-0.79933
Log likelihood	95.41294	Hannan-Quinn criter	-0.85844
F-statistic	1419.816	Durbin-Watson stat	1.901248
Prob(F-statistic)	0		

Inverted AR Roots	0.43			
Inverted MA Roots	.91-.24i	.91+.24i	.67+.67i	.67-.67i
	.24-.91i	.24+.91i	-.24-.91i	-.24+.91i
	-.67-.67i	-.67-.67i	-.91+.24i	-.91-.24i

Dependent Variable: LOG(COM_EG_UPC)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2007M08 2024M02
Included observations: 199
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.300607	0.145442	36.44487	0
LOG(@MOVAV(EG_PRICE_D	-0.12362	0.057737	-2.14108	0.0335
EG_BDD10YR	0.001593	3.64E-05	43.7853	0
AR(1)	0.317954	0.076544	4.153887	0
MA(12)	0.487135	0.07131	6.831275	0
SIGMASQ	0.014358	0.001598	8.985679	0

R-squared	0.975774	Mean dependent va	5.81476
Adjusted R-squared	0.975147	S.D. dependent var	0.771799
S.E. of regression	0.121674	Akaike info criterion	-1.32839
Sum squared resid	2.85726	Schwarz criterion	-1.2291
Log likelihood	138.1751	Hannan-Quinn criter	-1.28821
F-statistic	1554.749	Durbin-Watson stat	1.953983
Prob(F-statistic)	0		

Inverted AR Roots	0.32			
Inverted MA Roots	.91+.24i	.91-.24i	.67-.67i	.67+.67i
	.24-.91i	.24+.91i	-.24+.91i	-.24-.91i
	-.67-.67i	-.67-.67i	-.91-.24i	-.91+.24i

West Gate Use Per Customer:

Dependent Variable: RN_WG_UPC
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2016M03 2024M02
Included observations: 96
Convergence achieved after 33 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.530272	0.637205	10.24831	0
WG_BDD10YR	0.013478	0.000592	22.76142	0
AR(1)	0.626153	0.065645	9.538532	0
SIGMASQ	1.95591	0.273809	7.143329	0

R-squared	0.951989	Mean dependent va	13.34009
Adjusted R-squared	0.950424	S.D. dependent var	6.416232
S.E. of regression	1.428618	Akaike info criterion	3.59725
Sum squared resid	187.7673	Schwarz criterion	3.704098
Log likelihood	-168.668	Hannan-Quinn criter	3.64044
F-statistic	608.0824	Durbin-Watson stat	2.171599
Prob(F-statistic)	0		

Inverted AR Roots	0.63

Dependent Variable: LOG(RH_WG_UPC)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2007M08 2024M02
Included observations: 199
Convergence achieved after 74 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.539958	0.347021	13.08267	0
LOG(@MOVAV(WG_PRICE_I	-0.4609	0.122459	-3.76367	0.0002
WG_BDD10YR	0.001439	6.14E-05	23.43418	0
AR(1)	0.549583	0.065708	8.364049	0
MA(12)	0.77444	0.068236	11.34946	0
MA(24)	0.502873	0.080102	6.277932	0
SIGMASQ	0.018925	0.002353	8.044224	0

R-squared	0.977807	Mean dependent va	4.017177
Adjusted R-squared	0.977114	S.D. dependent var	0.925784
S.E. of regression	0.140054	Akaike info criterion	-1.00345
Sum squared resid	3.766109	Schwarz criterion	-0.88761
Log likelihood	106.8434	Hannan-Quinn criter	-0.95657
F-statistic	1409.922	Durbin-Watson stat	1.942969

Prob(F-statistic)	0			
Inverted AR Roots	0.55			
Inverted MA Roots	.96+.17i	.96-.17i	.91+.33i	.91-.33i
	.74-.63i	.74+.63i	.63-.74i	.63+.74i
	.33-.91i	.33+.91i	.17-.96i	.17+.96i
	-.17-.96i	-.17+.96i	-.33-.91i	-.33+.91i
	-.63+.74i	-.63-.74i	-.74+.63i	-.74-.63i
	-.91+.33i	-.91-.33i	-.96+.17i	-.96-.17i

Dependent Variable: LOG(COM_WG_UPC)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 09/09/24 Time: 13:10
Sample: 2007M08 2024M02
Included observations: 199
Convergence achieved after 30 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.333322	0.183366	29.08567	0
LOG(@MOVAV(WG_PRICE_I	-0.09519	0.074307	-1.28105	0.2017
WG_BDD10YR	0.001583	4.44E-05	35.65077	0
AR(1)	0.360498	0.060806	5.928706	0
MA(12)	0.500653	0.071895	6.963695	0
SIGMASQ	0.020635	0.002289	9.013171	0

R-squared	0.967566	Mean dependent va	5.926172
Adjusted R-squared	0.966726	S.D. dependent var	0.79964
S.E. of regression	0.145863	Akaike info criterion	-0.96451
Sum squared resid	4.106271	Schwarz criterion	-0.86522
Log likelihood	101.9688	Hannan-Quinn criter	-0.92432
F-statistic	1151.527	Durbin-Watson stat	1.887264
Prob(F-statistic)	0		

Inverted AR Roots	0.36			
Inverted MA Roots	.91+.24i	.91-.24i	.67+.67i	.67-.67i
	.24-.91i	.24+.91i	-.24-.91i	-.24+.91i
	-.67-.67i	-.67-.67i	-.91-.24i	-.91+.24i

year	month	ee_r_cum	pv_r_cum	eh_r_cum	ev_r_cum	Res_Total	ee_c_cum_m	pv_c_cum_m	eh_c_cum_m	ev_c_cum_m	Com_Total	ee_i_cum_m	pv_i_cum_m	eh_i_cum_m	ev_i_cum_m	Ind_Total	Total	
year	month	Cumulative Residential EE (GWh)	Cumulative Residential PV (GWh)	Cumulative Residential EHP (GWh)	Cumulative Residential EV (GWh)	Res_Total	Cumulative Commercial EE (GWh)	Cumulative Commercial PV (GWh)	Cumulative Commercial EHP (GWh)	Cumulative Commercial EV (GWh)	Com_Total	Cumulative Industrial EE (GWh)	Cumulative Industrial PV (GWh)	Cumulative Industrial EHP (GWh)	Cumulative Industrial EV (GWh)	Ind_Total	Total	Check
2003	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2003	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2003	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2004	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2004	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2004	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2004	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2005	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(0.00)
2005	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(0.00)
2005	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2006	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2006	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2006	3	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-
2006	4	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	-
2006	5	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	-0.03	-
2006	6	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2006	7	0.00	0.03	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2006	8	0.00	0.03	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2006	9	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2006	10	0.00	0.02	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.03	-
2006	11	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.02	-
2006	12	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.02	-
2007	1	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.02	-
2007	2	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2007	3	0.00	0.04	0.00	0.00	-0.04	0.00	0.02	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.06	-
2007	4	0.00	0.06	0.00	0.00	-0.05	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.08	-
2007	5	0.00	0.07	0.00	0.00	-0.07	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.10	-
2007	6	0.00	0.08	0.00	0.00	-0.08	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.12	-
2007	7	0.00	0.08	0.00	0.00	-0.08	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.12	-
2007	8	0.00	0.08	0.00	0.00	-0.08	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.11	-
2007	9	0.00	0.06	0.00	0.00	-0.06	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.09	-
2007	10	0.00	0.05	0.00	0.00	-0.05	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.08	-
2007	11	0.00	0.03	0.00	0.00	-0.03	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.05	-
2007	12	0.00	0.03	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2008	1	0.00	0.03	0.00	0.00	-0.03	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2008	2	0.00	0.06	0.00	0.00	-0.05	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.08	-
2008	3	0.00	0.09	0.00	0.00	-0.09	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.13	-
2008	4	0.00	0.12	0.00	0.00	-0.12	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.16	-
2008	5	0.00	0.14	0.00	0.00	-0.14	0.00	0.03	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.18	-
2008	6	0.00	0.17	0.00	0.00	-0.16	0.00	0.03	0.00	0.00	-0.03	0.00	0.02	0.00	0.00	-0.02	-0.21	-
2008	7	0.00	0.16	0.00	0.00	-0.16	0.00	0.03	0.00	0.00	-0.03	0.00	0.02	0.00	0.00	-0.02	-0.20	-
2008	8	0.00	0.15	0.00	0.00	-0.15	0.00	0.03	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.19	-
2008	9	0.00	0.12	0.00	0.00	-0.12	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.16	-
2008	10	0.00	0.09	0.00	0.00	-0.09	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.01	-0.12	-
2008	11	0.00	0.06	0.00	0.00	-0.06	0.00	0.02	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.08	-
2008	12	0.00	0.05	0.00	0.00	-0.04	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.07	-
2009	1	0.00	0.05	0.00	0.00	-0.05	0.03	0.01	0.00	0.00	-0.04	0.02	0.01	0.00	0.00	-0.03	-0.12	-
2009	2	0.01	0.10	0.00	0.00	-0.10	0.05	0.02	0.00	0.00	-0.07	0.04	0.02	0.00	0.00	-0.05	-0.23	-
2009	3	0.01	0.17	0.00	0.00	-0.18	0.08	0.04	0.00	0.00	-0.12	0.06	0.03	0.00	0.00	-0.08	-0.38	-
2009	4	0.01	0.22	0.00	0.00	-0.23	0.11	0.04	0.00	0.00	-0.15	0.07	0.03	0.00	0.00	-0.10	-0.48	-
2009	5	0.02	0.26	0.00	0.00	-0.27	0.14	0.05	0.00	0.00	-0.19	0.09	0.04	0.00	0.00	-0.13	-0.59	-
2009	6	0.03	0.30	0.00	0.00	-0.33	0.16	0.06	0.00	0.00	-0.22	0.11	0.04	0.00	0.00	-0.15	-0.70	-
2009	7	0.04	0.29	0.00	0.00	-0.33	0.20	0.06	0.00	0.00	-0.25	0.13	0.04	0.00	0.00	-0.18	-0.76	-
2009	8	0.04	0.28	0.00	0.00	-0.32	0.23	0.06	0.00	0.00	-0.29	0.16	0.04	0.00	0.00	-0.20	-0.80	-
2009	9	0.04	0.22	0.00	0.00	-0.26	0.25	0.05	0.00	0.00	-0.30	0.17	0.04	0.00	0.00	-0.21	-0.77	-
2009	10	0.03	0.17	0.00	0.00	-0.20	0.29	0.05	0.00	0.00	-0.34	0.20	0.04	0.00	0.00	-0.23	-0.77	-
2009	11	0.03	0.11	0.00	0.00	-0.14	0.31	0.04	0.00	0.00	-0.35	0.21	0.03	0.00	0.00	-0.24	-0.73	-
2009	12	0.04	0.09	0.00	0.00	-0.12	0.35	0.04	0.00	0.00	-0.39	0.24	0.03	0.00	0.00	-0.26	-0.77	-
2010	1	0.10	0.09	0.00	0.00	-0.19	0.87	0.04	0.00	0.00	-0.91	0.61	0.03	0.00	0.00	-0.64	-1.73	-
2010	2	0.14	0.17	0.00	0.00	-0.31	1.24	0.08	0.00	0.00	-1.32	0.87	0.06	0.00	0.00	-0.93	-2.56	-
2010	3	0.21	0.30	0.00	0.00	-0.51	1.87	0.13	0.00	0.00	-2.00	1.31	0.09	0.00	0.00	-1.40	-3.91	-
2010	4	0.26	0.38	0.00	0.00	-0.64	2.28	0.16	0.00	0.00	-2.43	1.60	0.11	0.00	0.00	-1.71	-4.79	-
2010	5	0.38	0.45	0.00	0.00	-0.83	2.85	0.19	0.00	0.00	-3.04	2.01	0.14	0.00	0.00	-2.14	-6.01	-
2010	6	0.54	0.53	0.00	0.00	-1.07	3.26	0.24	0.00	0.00	-3.49	2.29	0.17	0.00	0.00	-2.46	-7.02	-
2010	7	0.82	0.51	0.00	0.00	-1.33	3.91	0.24	0.00	0.00	-4.15	2.75	0.17	0.00	0.00	-2.92	-8.40	-
2010	8	0.90	0.48	0.00	0.00	-1.37	4.50	0.25	0.00	0.00	-4.75	3.17	0.18	0.00	0.00	-3.35	-9.47	-
2010	9	0.72	0.38	0.00	0.00	-1.10	4.90	0.23	0.00	0.00	-5.13	3.45	0.16	0.00	0.00	-3.61	-9.83	-
2010	10	0.62	0.29	0.00	0.00	-0.91	5.57	0.23	0.00	0.00	-5.79	3.92	0.16	0.00	0.00	-4.08	-10.78	-
2010	11	0.63	0.19	0.00	0.00	-0.82	5.93	0.18	0.00	0.00	-6.11	4.17	0.13	0.00	0.00	-4.30	-11.23	-
2010	12	0.74	0.15	0.00	0.00	-0.88	6.68	0.17	0.00	0.00	-6.85	4.71	0.12	0.00	0.00	-4.83	-12.56	-
2011	1	0.93	0.15	0.00	0.01	-1.08	7.75	0.17	0.00	0.00	-7.92	5.48	0.12	0.00	0.00	-5.59	-14.59	-
2011	2	1.02	0.28	0.00	0.01	-1.29	7.90	0.29	0.00	0.00	-8.18	5.59	0.21	0.00	0.00	-5.79	-15.27	-
2011	3	1.29	0.48	0.00	0.01	-1.76	9.73	0.43	0.00	0.00	-10.15	6.90	0.30	0.00	0.00	-7.20	-19.11	-
2011	4	1.44	0.60	0.00	0.01	-2.03	10.35	0.48	0.00	0.00	-10.83	7.35	0.34	0.00	0.00	-7.69	-20.55	-
2011	5	1.95	0.70	0.00	0.01	-2.64	11.76	0.55	0.00	0.00	-12.31	8.36	0.39	0.00	0.00	-8.75	-23.70	-
2011	6	2.64	0.79	0.00	0.01	-3.42	12.45	0.66	0.00	0.00	-13.11	8.86	0.47	0.00	0.00	-9.32	-25.86	-
2011	7	3.82	0.76	0.00	0.01	-4.57	14.07	0.66	0.00	0.00	-14.72	10.02	0.47	0.00	0.00	-10.48	-29.77	-

2011	8	4.03	0.70	0.00	0.01	-4.72	15.46	0.65	0.00	0.01	-16.11	11.01	0.46	0.00	0.00	-11.47	-32.30	-
2011	9	3.13	0.56	0.00	0.01	-3.67	16.15	0.59	0.00	0.01	-16.73	11.51	0.42	0.00	0.00	-11.93	-32.33	-
2011	10	2.64	0.42	0.00	0.01	-3.05	17.75	0.56	0.00	0.01	-18.31	12.66	0.40	0.00	0.00	-13.06	-34.41	-
2011	11	2.64	0.27	0.00	0.02	-2.89	18.37	0.44	0.00	0.01	-18.81	13.10	0.32	0.00	0.00	-13.42	-35.12	-
2011	12	3.03	0.21	0.00	0.02	-3.22	20.20	0.40	0.00	0.01	-20.59	14.41	0.29	0.00	0.00	-14.70	-38.51	-
2012	1	3.20	0.22	0.00	0.03	-3.40	20.66	0.38	0.00	0.01	-21.03	14.75	0.27	0.00	0.00	-15.01	-39.44	-
2012	2	3.04	0.42	0.00	0.03	-3.43	18.93	0.65	0.00	0.02	-19.57	13.51	0.47	0.00	0.00	-13.97	-36.97	-
2012	3	3.45	0.70	0.00	0.04	-4.11	21.30	0.89	0.00	0.02	-22.17	15.20	0.64	0.00	0.00	-15.84	-42.12	-
2012	4	3.52	0.89	0.00	0.04	-4.37	20.94	0.98	0.00	0.02	-21.91	14.95	0.70	0.00	0.00	-15.65	-41.92	-
2012	5	4.41	1.05	0.00	0.05	-5.41	22.19	1.10	0.00	0.02	-23.26	15.85	0.78	0.00	0.00	-16.63	-45.30	-
2012	6	5.58	1.21	0.00	0.05	-6.74	22.10	1.27	0.00	0.03	-23.35	15.78	0.91	0.00	0.00	-16.69	-46.78	-
2012	7	7.64	1.16	0.00	0.05	-8.75	23.63	1.24	0.00	0.03	-24.84	16.88	0.89	0.00	0.00	-17.76	-51.35	-
2012	8	7.66	1.09	0.00	0.06	-8.68	24.69	1.21	0.00	0.03	-25.87	17.64	0.86	0.00	0.00	-18.50	-53.05	-
2012	9	5.69	0.87	0.00	0.07	-6.49	24.65	1.08	0.00	0.04	-25.69	17.61	0.77	0.00	0.01	-18.37	-50.56	-
2012	10	4.61	0.67	0.00	0.09	-5.19	26.00	1.00	0.00	0.05	-26.96	18.58	0.72	0.00	0.01	-19.29	-51.44	-
2012	11	4.45	0.42	0.00	0.09	-4.78	25.90	0.78	0.00	0.05	-26.64	18.51	0.56	0.00	0.01	-19.06	-50.48	-
2012	12	4.94	0.33	0.00	0.11	-5.17	27.50	0.70	0.00	0.06	-28.14	19.65	0.50	0.00	0.01	-20.15	-53.46	-
2013	1	4.99	0.35	0.00	0.12	-5.21	27.97	0.67	0.00	0.06	-28.58	20.03	0.48	0.00	0.01	-20.51	-54.30	-
2013	2	4.52	0.64	0.00	0.11	-5.06	25.49	1.13	0.00	0.06	-26.56	18.29	0.82	0.00	0.01	-19.09	-50.71	-
2013	3	4.92	1.10	0.00	0.13	-5.89	28.53	1.61	0.00	0.07	-30.08	20.51	1.17	0.00	0.01	-21.67	-57.64	-
2013	4	4.81	1.38	0.00	0.12	-6.08	27.92	1.79	0.00	0.06	-29.65	20.11	1.30	0.00	0.01	-21.40	-57.13	-
2013	5	5.81	1.62	0.00	0.12	-7.30	29.45	2.01	0.00	0.06	-31.40	21.25	1.47	0.00	0.01	-22.71	-61.41	-
2013	6	7.07	1.86	0.00	0.11	-8.82	29.20	2.35	0.00	0.06	-31.48	21.10	1.72	0.00	0.01	-22.81	-63.12	-
2013	7	9.34	1.77	0.00	0.11	-11.00	31.09	2.30	0.00	0.06	-33.33	22.50	1.70	0.00	0.01	-24.19	-68.52	-
2013	8	9.04	1.65	0.00	0.12	-10.58	32.36	2.25	0.00	0.06	-34.55	23.46	1.66	0.00	0.01	-25.11	-70.24	-
2013	9	6.51	1.31	0.00	0.13	-7.69	32.18	2.02	0.00	0.07	-34.13	23.36	1.49	0.00	0.01	-24.84	-66.66	-
2013	10	5.10	1.01	0.00	0.16	-5.95	33.82	1.89	0.00	0.08	-35.63	24.58	1.40	0.00	0.01	-25.97	-67.55	-
2013	11	4.78	0.64	0.00	0.16	-5.26	33.57	1.48	0.00	0.09	-34.97	24.43	1.10	0.00	0.01	-25.53	-65.75	-
2013	12	5.15	0.50	0.00	0.18	-5.48	35.52	1.33	0.00	0.09	-36.76	25.89	0.99	0.00	0.01	-26.87	-69.10	-
2014	1	5.31	0.54	0.00	0.20	-5.65	36.03	1.24	0.00	0.11	-37.16	26.31	0.92	0.00	0.01	-27.21	-70.03	-
2014	2	4.92	1.05	0.00	0.19	-5.78	32.74	2.03	0.00	0.10	-34.67	23.94	1.52	0.00	0.01	-25.45	-65.90	-
2014	3	5.46	1.86	0.00	0.22	-7.09	36.56	2.83	0.00	0.12	-39.28	26.78	2.12	0.00	0.02	-28.89	-75.26	-
2014	4	5.44	2.41	0.00	0.21	-7.65	35.69	3.08	0.00	0.11	-38.66	26.19	2.31	0.00	0.02	-28.49	-74.79	-
2014	5	6.69	2.91	0.00	0.23	-9.38	37.55	3.39	0.00	0.11	-40.83	27.60	2.56	0.00	0.02	-30.14	-80.35	-
2014	6	8.31	3.43	0.00	0.21	-11.52	37.15	3.90	0.00	0.11	-40.93	27.34	2.94	0.00	0.02	-30.27	-82.72	-
2014	7	11.17	3.36	0.00	0.21	-14.31	39.46	3.76	0.00	0.11	-43.12	29.09	2.85	0.00	0.02	-31.92	-89.35	-
2014	8	11.01	3.20	0.00	0.24	-13.97	40.99	3.63	0.00	0.12	-44.50	30.26	2.75	0.00	0.02	-32.99	-91.46	-
2014	9	8.05	2.60	0.00	0.25	-10.40	40.68	3.21	0.00	0.14	-43.75	30.06	2.43	0.00	0.02	-32.48	-86.63	-
2014	10	6.42	2.03	0.00	0.31	-8.14	42.67	2.97	0.00	0.16	-45.48	31.58	2.25	0.00	0.02	-33.81	-87.43	-
2014	11	6.12	1.30	0.00	0.33	-7.10	42.28	2.31	0.00	0.17	-44.41	31.33	1.75	0.00	0.03	-33.05	-84.56	-
2014	12	6.70	1.04	0.00	0.37	-7.38	44.66	2.04	0.00	0.19	-46.51	33.13	1.55	0.00	0.03	-34.65	-88.54	-
2015	1	7.37	1.13	0.00	0.39	-8.11	45.35	1.87	0.00	0.20	-47.01	33.70	1.42	0.00	0.03	-35.09	-90.21	-
2015	2	7.23	2.18	0.00	0.34	-9.08	41.25	3.01	0.00	0.18	-44.08	30.71	2.29	0.00	0.03	-32.97	-86.13	-
2015	3	8.45	3.86	0.00	0.38	-11.93	46.12	4.12	0.00	0.20	-50.04	34.38	3.15	0.00	0.03	-37.51	-99.48	-
2015	4	8.84	5.00	0.00	0.34	-13.51	45.06	4.41	0.00	0.18	-49.30	33.65	3.37	0.00	0.03	-37.00	-99.81	-
2015	5	11.36	6.03	0.00	0.34	-17.04	47.47	4.79	0.00	0.17	-52.09	35.50	3.67	0.00	0.02	-39.14	-108.27	-
2015	6	14.67	7.10	0.00	0.31	-21.46	47.00	5.43	0.00	0.16	-52.26	35.20	4.16	0.00	0.02	-39.33	-113.06	-
2015	7	20.46	6.95	0.00	0.30	-27.11	49.97	5.17	0.00	0.15	-55.00	37.48	3.97	0.00	0.02	-41.42	-123.53	-
2015	8	20.86	6.62	0.00	0.32	-27.17	51.96	4.93	0.00	0.16	-56.72	39.02	3.79	0.00	0.02	-42.78	-126.67	-
2015	9	15.75	5.37	0.00	0.32	-20.80	51.60	4.31	0.00	0.18	-55.73	38.80	3.31	0.00	0.03	-42.09	-118.62	-
2015	10	12.93	4.19	0.00	0.39	-16.74	54.18	3.94	0.00	0.20	-57.91	40.79	3.03	0.00	0.03	-43.79	-118.43	-
2015	11	12.66	2.69	0.00	0.39	-14.97	53.72	3.02	0.00	0.21	-56.54	40.49	2.33	0.00	0.03	-42.79	-114.29	-
2015	12	14.24	2.15	0.00	0.43	-15.96	56.79	2.65	0.00	0.22	-59.22	42.85	2.04	0.00	0.03	-44.86	-120.04	-
2016	1	14.35	2.22	0.00	0.45	-16.12	56.87	2.46	0.00	0.23	-59.10	42.93	1.89	0.00	0.03	-44.79	-120.00	-
2016	2	13.00	4.25	0.00	0.39	-16.87	51.05	4.15	0.00	0.21	-54.99	38.54	3.20	0.00	0.03	-41.71	-113.57	-
2016	3	14.13	6.99	0.00	0.44	-20.68	56.34	5.56	0.00	0.23	-61.67	42.55	4.29	0.00	0.03	-46.80	-129.15	-
2016	4	13.81	8.76	0.00	0.39	-22.17	54.36	6.02	0.00	0.20	-60.18	41.07	4.64	0.00	0.03	-45.68	-128.04	-
2016	5	16.64	10.22	0.00	0.40	-26.46	56.57	6.61	0.00	0.20	-62.98	42.74	5.10	0.00	0.03	-47.81	-137.25	-
2016	6	20.26	11.69	0.00	0.35	-31.60	55.35	7.56	0.00	0.19	-62.72	41.83	5.84	0.00	0.03	-47.64	-141.96	-
2016	7	26.73	11.14	0.00	0.34	-37.54	58.17	7.27	0.00	0.17	-65.28	43.98	5.62	0.00	0.02	-49.57	-152.38	-
2016	8	25.86	10.36	0.00	0.36	-35.86	59.81	6.99	0.00	0.19	-66.62	45.23	5.40	0.00	0.03	-50.60	-153.08	-
2016	9	18.59	8.21	0.00	0.37	-26.43	58.76	6.16	0.00	0.20	-64.72	44.44	4.76	0.00	0.03	-49.17	-140.32	-
2016	10	14.56	6.28	0.00	0.44	-20.40	61.04	5.68	0.00	0.23	-66.49	46.17	4.39	0.00	0.03	-50.53	-137.42	-
2016	11	13.63	3.96	0.00	0.44	-17.15	59.90	4.40	0.00	0.24	-64.06	45.33	3.40	0.00	0.03	-48.69	-129.90	-
2016	12	14.69	3.11	0.00	0.48	-17.31	62.68	3.89	0.00	0.25	-66.32	47.44	3.00	0.00	0.04	-50.41	-134.04	-
2017	1	14.92	3.14	0.00	0.53	-17.53	62.68	3.68	0.00	0.27	-66.09	47.47	2.85	0.00	0.04	-50.28	-133.89	-
2017	2	13.62	5.68	0.00	0.47	-18.83	56.18	6.11	0.00	0.25	-62.05	42.56	4.75	0.00	0.04	-47.28	-128.16	-
2017	3	14.91	9.49	0.00	0.55	-23.85	61.91	8.64	0.00	0.28	-70.27	46.93	6.73	0.00	0.04	-53.61	-147.73	-
2017	4	14.68	11.66	0.00	0.50	-25.84	59.66	9.50	0.00	0.26	-68.90	45.24	7.42	0.00	0.04	-52.62	-147.36	-
2017	5	17.83	13.37	0.00	0.53	-30.67	61.99	10.59	0.00	0.26	-72.31	47.03	8.28	0.00	0.04	-55.27	-158.25	-
2017	6	21.87	15.03	0.00	0.48	-36.42	60.56	12.29	0.00	0.25	-72.60	45.97	9.62	0.00	0.04	-55.55	-164.57	-
2017	7	29.05	14.10	0.00	0.48	-42.67	63.57	11.97	0.00	0.24	-75.31	48.27	9.39	0.00	0.03	-57.63	-175.61	-
2017	8	28.30	12.91	0.00	0.52	-40.69	65.27	11.66	0.00	0.27	-76.66	49.59	9.15	0.00	0.04	-58.70	-176.05	-
2017	9	20.48	10.08	0.00	0.54	-30.02	64.04	10.39	0.00	0.30	-74.12	48.67	8.16	0.00	0.04	-56.79	-160.94	-
2017	10	16.16	7.60	0.00	0.67	-23.09	66.43	9.68	0.00	0.35	-75.76	50.51	7.61	0.00	0.05	-58.08	-156.93	-
2017	11	15.23	4.73	0.00	0.69	-19.27	65.11	7.56	0.00	0.37	-72.31	49.53	5.96	0.00	0.05	-55.43	-147.01	-
2017	12	16.52	3.66	0.00	0.76	-19.42	68.05	6.74	0.00	0.40	-74.40	51.79	5.32	0.00	0.06	-57.05	-150.86	-
2018	1	16.85	3.68	0.00	0.84	-19.70	68.11	6.28	0.00	0.43	-73.96	51.89	4.97	0.00	0.06	-56.80	-150.45	-
2018	2	15.45	6.63	0.00	0.74	-21.34	61.09	10.29	0.00	0.39	-70.99	46.59	8.18	0.00	0.06	-54.72	-147.05	-
2018	3	16.98	11.00	0.00	0.85	-27.14	67.37	14.36	0.00	0.44	-81.29	51.44	11.46	0.00	0.06	-62.83	-171.25	-
2018	4	16.79	13.47	0.00	0.78	-29.48	64.97	15.61	0.00	0.41	-80.17	49.65	12.50	0.00	0.06	-62.09	-171.74	-
2018	5	20.47	15.36	0.00	0.81	-35.02	67.55	17.21	0.00	0.41	-84.36	51.68	13.82	0.00	0.06	-65.44	-184.82	-
2018	6	25.20	17.20	0.00	0.74	-41.66	66.05	19.77	0.00	0.39	-85.43	50.59	15.92	0.00	0.06	-66.45	-193.53	-
2018	7	33.60	16.06	0.00	0.73	-48.94	69.38	19.08	0.00	0.37	-88.10	53.19	15.41	0.00	0.05	-68.54	-205.58	-
2018	8	32.86	14.65	0.00	0.79	-46.71	71.29	18.42	0.00	0.41	-89.30	54.71	14.91	0.00	0.06	-69.55	-205.56	-
2018	9	23.86	11.39	0.00	0.82	-34.43	69.99	16.28	0.00	0.45	-85.82	53.76	13.21	0.00	0.07	-66.90	-187.14	-
2018	10	18.89	8.55	0.00	1.01	-26.43	72.66	15.06	0.00	0.53	-87.19	55.86	12.24	0.00	0.08	-68.02	-181.64	-
2018	11	17.87	5.30	0.00	1.04	-22.12	71.27	11.68	0.00	0.56	-82.39	54.84	9.52	0.00	0.08	-64.28	-168.79	-
2018	12	19.45	4.08	0.00	1.15	-22.37	74.53	10.35	0.00	0.60	-84.28	57.41	8.45	0.00	0.09	-65.77	-172.43	-
2019	1	19.90	4.10	0.00	1.24	-22.76	74.77	9.37	0.00	0.63	-83.50	57.62	7.64	0.00	0.09	-65.16	-171.43	-
2019	2	18.31	7.36	0.00	1.08	-24.59	67.23	14.95	0.00	0.58	-81.60	51.82	12.19	0.00	0.09	-63.93	-170.12	-
2019	3	20.19	12.21	0.00	1.23	-31.17	74.31	20.32	0.00	0.63	-94.00	57.30	16.57	0.00	0.09	-73.78	-198.94	-
2019	4	20.02	14.91	0.00	1.10	-33.82	71.82	21.56	0.00	0.58	-92.81	55.40	17.58	0.00	0.09	-72.89	-199.52	-
2019	5	24.48	16.97	0.00	1.14	-40.31	74.85	23.23	0.00	0.57	-97.50	57.76	18.93	0.00	0.08	-76.60	-214.41	-
2019	6	30.22	18.96	0.00	1.03	-48.16	73.34	26.10	0.00	0.54	-98.90	56.62	21.26	0.00	0.08	-77.80	-224.86	-
2019	7	40.41	17.67	0.00	1.00	-57.09	77.21	24.68	0.00	0.50	-101.39	59.62	20.10	0.00	0.07	-79.65	-238.12	-
2019	8	39.62	16.08	0.00	1.07	-54.63	79.50	23.35	0.00	0.56	-102.29	61.41	19.01	0.00	0.08	-80.34	-237.26	-
2019	9	28.85	12.48	0.00	1.10	-40.23	78.21	20.25	0.00	0.61	-97.85	60.44	16.49	0.00	0.09	-76.83	-214.92	-
2019	10	22.89	9.35	0.00	1.34	-30.91	81.36	18.39	0.00	0.70	-99.05	62.89	14.97	0.00	0.10	-77.76	-207.71	-
2019	11	21.71	5.78	0.00	1.37	-26.13	79.96	14.03	0.00	0.73	-93.25	61.83	11.41	0.00	0.11	-73.13	-192.51	-
2019	12	23.69	4.45	0.00	1.50	-26.63	83.79	12.22	0.00	0.78	-95.23	64.81	9.94	0.00	0.12	-74.64	-196.50	-
2020	1	25.17	4.47	0.15	1.41	-28.09	84.07	11.36	0.00	0.72	-94.71	65.05	9.24	0.00	0.11	-74.18	-196.98	-
2020	2	23.98	8.32	0.23	1.22	-30.84	75.59	19.25	0.00	0.65	-94.20	58.52	15.65	0.00	0.10	-74.07	-199.11	-
2020	3	27.32	13.31	0.29	1.38	-38.97	83.56	25.89	0.00	0.71	-108.74	64.71	21.03	0.00	0.11	-85.64	-233.34	-
2020	4	27.93	16.26	0.20	1.24	-42.75	80.77	28.10	0.00	0.64	-108.23	62.57	22.82	0.00	0.10	-85.30	-236.28	-
2020	5	35.14	18.52	0.06	1.27	-52.33	84.18	30.94	0.00	0.64	-114.48	65.24	25.12	0.00	0.09	-90.26	-257.07	-
2020	6	44.58	20.69	0.00	1.14	-64.13	82.50	35.49	0.00	0.60	-117.39	63.96	28.80	0.00	0.09	-92.67	-274.19	-
2020	7	61.14	19.29	0.00	1.11	-79.33	86.85	34.22	0.00	0.56	-120.52	67.36	27.76	0.00	0.08	-95.04	-294.89	-
2020	8	61.41	17.56	0.00	1.18	-77.78	89.44	32.99	0.00	0.62	-121.81	69.39	26.76	0.00	0.09	-96.05	-295.65	-

2020	9	45.75	13.63	0.04	1.21	-58.12	88.00	29.13	0.00	0.67	-116.46	68.29	23.62	0.00	0.10	-91.81	-266.40	-
2020	10	37.09	10.22	0.29	1.47	-45.54	91.55	26.91	0.00	0.77	-117.69	71.07	21.82	0.00	0.11	-92.77	-256.00	-
2020	11	35.90	6.32	0.81	1.50	-39.91	89.98	20.87	0.00	0.80	-110.05	69.88	16.91	0.00	0.12	-86.67	-236.62	-
2020	12	39.94	4.86	1.32	1.64	-41.84	94.29	18.48	0.00	0.85	-111.92	73.25	14.97	0.00	0.13	-88.09	-241.85	-
2021	1	41.16	4.88	1.96	2.04	-42.03	94.47	16.96	0.26	1.04	-110.13	73.42	13.74	0.00	0.15	-87.01	-239.17	-
2021	2	38.12	8.75	1.73	1.81	-43.33	84.83	27.43	0.39	0.96	-110.92	65.96	22.23	0.00	0.14	-88.04	-242.29	-
2021	3	42.29	14.49	1.54	2.07	-53.17	93.65	37.78	0.43	1.07	-129.94	72.84	30.62	0.00	0.16	-103.30	-286.40	-
2021	4	42.20	17.67	0.88	1.89	-57.10	90.40	40.60	0.24	0.99	-129.78	70.34	32.90	0.00	0.15	-103.10	-289.98	-
2021	5	51.90	20.10	0.22	1.98	-69.80	94.10	44.27	0.08	0.99	-137.31	73.25	35.88	0.00	0.15	-108.98	-316.08	-
2021	6	64.44	22.43	0.00	1.80	-85.07	92.10	50.33	0.00	0.95	-141.48	71.72	40.79	0.00	0.14	-112.36	-338.92	-
2021	7	86.64	20.89	0.00	1.77	-105.76	96.84	48.12	0.00	0.89	-144.08	75.43	39.00	0.00	0.13	-114.30	-364.14	-
2021	8	85.40	18.99	0.00	1.92	-102.46	99.60	46.02	0.00	1.00	-144.62	77.61	37.30	0.00	0.15	-114.76	-361.84	-
2021	9	62.50	14.72	0.10	2.00	-75.13	97.88	40.33	0.06	1.10	-137.05	76.29	32.69	0.00	0.16	-108.82	-321.00	-
2021	10	49.84	11.02	0.73	2.45	-57.68	101.71	36.99	0.32	1.28	-137.10	79.31	29.98	0.00	0.19	-109.10	-303.88	-
2021	11	47.49	6.81	1.95	2.52	-49.82	99.85	28.49	0.98	1.35	-126.01	77.88	23.09	0.00	0.20	-100.78	-276.60	-
2021	12	52.04	5.23	3.17	2.79	-51.31	104.52	25.06	1.94	1.45	-126.18	81.55	20.31	0.00	0.21	-101.65	-279.15	-
2022	1	53.29	5.27	4.57	3.12	-50.87	104.63	22.99	0.82	1.60	-125.20	81.58	18.57	0.00	0.24	-99.90	-275.98	-
2022	2	49.04	9.52	3.82	2.71	-52.02	93.88	37.19	0.77	1.47	-128.83	73.14	29.93	0.00	0.22	-102.84	-283.69	-
2022	3	54.08	15.84	3.21	3.07	-63.65	103.55	51.21	0.68	1.62	-152.47	80.61	41.07	0.00	0.25	-121.43	-337.55	-
2022	4	53.65	19.42	1.72	2.77	-68.58	99.88	55.02	0.34	1.48	-153.09	77.70	43.99	0.00	0.23	-121.45	-343.12	-
2022	5	65.63	22.20	0.42	2.86	-84.55	103.89	59.98	0.10	1.48	-162.29	80.75	47.80	0.00	0.23	-128.32	-375.16	-
2022	6	81.05	24.90	0.00	2.57	-103.38	101.60	68.18	0.00	1.40	-168.39	78.92	54.18	0.00	0.22	-132.87	-404.64	-
2022	7	108.42	23.30	0.00	2.50	-129.21	106.75	65.18	0.00	1.30	-170.63	82.86	51.65	0.00	0.21	-134.29	-434.14	-
2022	8	106.33	21.28	0.00	2.69	-124.93	109.71	62.32	0.00	1.45	-170.58	85.09	49.26	0.00	0.24	-134.11	-429.62	-
2022	9	77.46	16.57	0.17	2.76	-91.10	107.74	54.61	0.07	1.60	-160.67	83.50	43.05	0.00	0.26	-126.29	-378.06	-
2022	10	61.48	12.47	1.25	3.36	-69.33	111.87	50.08	0.34	1.86	-159.75	86.65	39.39	0.00	0.30	-125.73	-354.81	-
2022	11	58.32	7.74	3.32	3.43	-59.31	109.75	38.57	1.00	1.96	-145.35	84.94	30.26	0.00	0.32	-114.88	-319.53	-
2022	12	63.64	5.97	5.35	3.76	-60.50	114.80	33.92	1.94	2.09	-144.68	88.79	26.55	0.00	0.36	-114.99	-320.17	-
2023	1	64.67	6.02	7.75	4.23	-58.71	114.88	30.90	1.95	2.43	-141.40	88.79	24.14	0.00	0.46	-112.48	-312.59	-
2023	2	59.08	10.87	6.48	3.81	-59.66	103.03	49.64	1.57	2.36	-148.74	79.58	38.70	0.00	0.47	-117.81	-326.21	-
2023	3	64.69	18.10	5.42	4.45	-72.92	113.60	67.93	1.24	2.69	-177.59	87.69	52.85	0.00	0.56	-139.97	-390.49	-
2023	4	63.72	22.20	2.88	4.13	-78.92	109.53	72.53	0.56	2.56	-178.95	84.49	56.32	0.00	0.55	-140.27	-398.13	-
2023	5	77.42	25.38	0.70	4.38	-97.71	113.88	78.61	0.15	2.64	-189.70	87.79	60.93	0.00	0.58	-148.14	-435.56	-
2023	6	94.98	28.48	0.00	4.04	-119.42	111.33	88.86	0.00	2.55	-197.64	85.77	68.75	0.00	0.58	-153.95	-471.01	-
2023	7	126.24	26.65	0.00	4.03	-148.86	116.93	84.49	0.00	2.50	-198.93	90.03	65.26	0.00	0.60	-154.70	-502.49	-
2023	8	123.03	24.35	0.00	4.42	-142.97	120.13	80.38	0.00	2.84	-197.67	92.43	61.98	0.00	0.68	-153.74	-494.38	-
2023	9	89.08	18.97	0.28	4.64	-103.13	117.92	70.09	0.09	3.22	-184.71	90.68	53.96	0.00	0.76	-143.88	-431.71	-
2023	10	70.28	14.27	2.08	5.75	-76.72	122.41	63.97	0.41	3.85	-182.12	94.07	49.18	0.00	0.93	-142.32	-401.16	-
2023	11	66.29	8.86	5.54	5.98	-63.63	120.04	49.04	1.19	4.18	-163.71	92.20	37.64	0.00	1.05	-128.79	-356.13	-
2023	12	71.93	6.84	9.05	6.67	-63.05	125.52	42.94	2.24	4.66	-161.56	96.36	32.92	0.00	1.26	-128.01	-352.62	-
2024	1	73.00	6.89	12.86	7.50	-59.53	125.54	38.96	3.63	5.45	-155.42	96.29	29.80	0.00	1.54	-124.55	-339.50	-
2024	2	66.61	12.86	10.55	6.70	-62.22	112.53	64.55	2.85	5.24	-168.99	86.24	49.28	0.00	1.52	-134.00	-365.22	-
2024	3	72.86	20.64	8.63	7.69	-77.18	124.02	84.95	2.20	5.82	-200.94	94.96	64.73	0.00	1.70	-157.99	-436.11	-
2024	4	71.69	25.28	4.48	7.34	-85.15	119.51	90.36	0.97	5.59	-203.32	91.44	68.73	0.00	1.61	-158.55	-447.03	-
2024	5	87.01	28.86	1.09	7.65	-107.13	124.19	97.58	0.26	5.64	-215.87	94.94	74.08	0.00	1.63	-167.39	-490.39	-
2024	6.0	106.63	32.34	0.00	6.95	-132.02	121.35	109.91	0.00	5.35	-225.91	92.70	83.29	0.00	1.58	-174.40	-532.34	-
2024	7.0	141.58	30.22	0.00	7.11	-164.70	127.39	104.15	0.00	5.37	-226.17	97.23	78.79	0.00	1.65	-174.37	-565.24	-
2024	8.0	137.85	27.58	0.00	7.62	-157.80	130.81	98.75	0.00	5.94	-223.62	99.76	74.59	0.00	1.82	-172.53	-553.96	-
2024	9.0	99.70	21.45	0.40	8.04	-112.71	128.35	85.83	0.14	6.79	-207.25	97.81	64.73	0.00	2.02	-160.51	-480.47	-
2024	10.0	78.59	16.12	3.07	10.02	-81.62	133.16	78.11	0.64	8.16	-202.47	101.40	58.81	0.00	2.47	-157.75	-441.84	-
2024	11.0	74.05	10.00	8.07	10.26	-65.71	130.53	59.70	1.81	8.87	-179.55	99.32	44.88	0.00	2.77	-141.43	-386.68	-
2024	12.0	80.28	7.71	13.18	11.60	-63.20	136.43	52.12	3.36	10.06	-175.13	103.74	39.13	0.00	3.36	-139.51	-377.83	-
2025	1.0	81.39	7.75	18.66	12.88	-57.61	136.39	47.15	5.40	11.59	-166.55	103.60	35.33	0.00	3.89	-135.04	-359.19	-
2025	2.0	74.20	13.96	15.16	11.45	-61.54	122.20	75.23	4.19	10.92	-182.31	92.73	56.25	0.00	3.64	-145.34	-389.19	-
2025	3.0	81.07	23.18	12.26	13.09	-78.90	134.61	102.25	3.21	11.77	-221.88	102.05	76.32	0.00	3.88	-174.50	-475.27	-
2025	4.0	79.70	28.36	6.29	12.46	-89.31	129.66	108.49	1.39	11.03	-225.72	98.21	80.83	0.00	3.53	-175.51	-490.54	-
2025	5.0	96.64	32.34	1.52	12.90	-114.56	134.68	116.86	0.37	10.96	-240.21	101.92	86.91	0.00	3.44	-185.38	-540.15	-
2025	6.0	118.33	36.20	0.00	11.78	-142.74	131.54	131.31	0.00	10.13	-252.72	99.45	97.48	0.00	3.27	-193.66	-589.12	-
2025	7.0	156.96	33.80	0.00	11.95	-178.81	138.03	124.13	0.00	10.08	-252.08	104.26	92.00	0.00	3.35	-192.91	-623.81	-
2025	8.0	152.69	30.81	0.00	12.70	-170.80	141.67	117.43	0.00	10.95	-248.16	106.92	86.89	0.00	3.59	-190.22	-609.17	-
2025	9.0	110.35	23.94	0.56	13.54	-120.19	138.95	101.84	0.19	12.73	-227.86	104.77	75.23	0.00	3.93	-176.07	-524.12	-
2025	10.0	86.90	17.97	4.16	16.73	-83.98	144.10	92.47	0.88	15.11	-220.58	108.56	68.20	0.00	4.70	-172.06	-476.63	-
2025	11.0	81.81	11.13	10.90	16.97	-65.08	141.19	70.53	2.48	16.31	-192.94	106.27	51.94	0.00	5.21	-153.00	-411.01	-
2025	12.0	88.62	8.58	17.80	19.43	-59.97	147.51	61.45	4.57	18.38	-186.01	110.94	45.19	0.00	6.27	-149.85	-395.83	-
2026	1.0	89.69	8.62	25.57	21.13	-51.61	147.42	55.48	7.49	21.36	-174.04	110.74	40.72	0.00	7.13	-144.33	-369.98	-
2026	2.0	81.61	15.50	21.02	18.73	-57.36	132.04	88.34	5.81	20.22	-194.35	99.08	64.71	0.00	6.58	-157.21	-408.92	-
2026	3.0	89.01	25.72	17.12	21.40	-76.21	145.40	119.85	4.41	21.47	-239.36	108.99	87.63	0.00	6.90	-189.72	-505.29	-
2026	4.0	87.36	31.43	8.78	20.07	-89.93	140.01	126.92	1.88	19.93	-245.12	104.84	92.63	0.00	6.18	-191.29	-526.34	-
2026	5.0	105.73	35.82	2.12	20.58	-118.85	145.38	136.46	0.50	19.78	-261.56	108.75	99.42	0.00	5.95	-202.21	-582.62	-
2026	6.0	129.24	40.05	0.00	18.86	-150.44	141.95	153.06	0.00	17.35	-277.65	106.07	111.32	0.00	5.60	-211.79	-639.87	-
2026	7.0	171.15	37.37	0.00	18.90	-189.62	148.90	144.44	0.00	17.16	-276.18	111.15	104.88	0.00	5.68	-210.35	-676.15	-
2026	8.0	166.22	34.03	0.00	19.99	-180.26	152.79	136.41	0.00	18.51	-270.69	113.94	98.88	0.00	6.04	-206.78	-657.73	-
2026	9.0	119.92	26.43	0.83	21.20	-124.32	149.80	118.11	0.25	22.84	-244.82	111.60	85.48	0.00	6.55	-190.53	-559.66	-
2026	10.0	94.29	19.82	6.02	25.92	-82.18	155.31	107.07	1.14	26.95	-234.29	115.59	77.37	0.00	7.77	-185.18	-501.65	-
2026	11.0	88.63	12.27	15.95	26.54	-58.41	152.13	81.53	3.23	29.53	-200.90	113.11	58.82	0.00	8.60	-163.33	-422.63	-
2026	12.0	95.85	9.44	26.73	30.04	-48.53	158.89	70.94	6.13	31.60	-192.10	118.03	51.10	0.00	10.28	-158.84	-399.47	-
2027	1.0	96.98	9.48	38.62	32.30	-35.54	158.74	63.94	10.08	38.19	-174.41	117.77	45.97	0.00	11.62	-152.12	-362.08	-
2027	2.0	88.22	17.04	31.52	28.61	-45.13	142.14	101.66	7.84	36.03	-199.93	105.33	72.96	0.00	10.67	-167.62	-412.68	-
2027	3.0	96.20	28.26	25.30	32.73	-66.43	156.47	137.72	5.92	37.06	-251.22	115.82	98.65	0.00	11.13	-203.34	-520.98	-
2027	4.0	94.38	34.51	12.63	30.32	-85.94	150.63	145.65	2.48	33.87	-259.92	111.36	104.14	0.00	9.90	-205.61	-551.46	-
2027	5.0	114.20	39.30	3.01	30.93	-119.56	156.36	156.37	0.66	33.45	-278.63	115.47	111.61	0.00	9.49	-217.60	-615.78	-
2027	6.0	139.56	43.91	0.00	28.21	-155.26	152.63	175.16	0.00	27.72	-300.06	112.59	124.81	0.00	8.89	-228.51	-683.83	-
2027	7.0	184.77	40.94	0.00	27.94	-197.76	160.06	165.08	0.00	27.22	-297.92	117.94	117.43	0.00	8.98	-226.39	-722.07	-
2027	8.0	179.39	37.26	0.00	29.83	-186.82	164.19	155.70	0.00	29.44	-290.45	120.85	110.57	0.00	9.53	-221.89	-699.16	-
2027	9.0	129.40	28.91	1.16	31.31	-125.83	160.94	134.64	0.34	37.42	-257.82	118.32	95.46	0.00	10.27	-203.51	-587.15	-
2027	10.0	101.71	21.67	8.40	37.91	-77.08	166.81	121.91	1.56	43.76	-243.40	122.51	86.29	0.00	12.16	-196.65	-517.12	-
2027	11.0	95.58	13.40	22.42	39.23	-47.34	163.35	92.72	4.47	48.20	-203.40	119.84	65.53	0.00	13.47	-171.90	-422.65	-
2027	12.0	103.35	10.31	38.20	43.91	-31.56	170.57	80.57	8.59	50.16	-192.39	125.00	56.86	0.00	16.05	-165.81	-389.75	-
2028	1.0	104.54	10.35	55.98	47.00	-11.91	170.36	72.54	14.29	61.45	-167.16	124.69	51.09	0.00	18.05	-157.73	-336.80	-
2028	2.0	95.06	19.25	45.64	41.41	-27.26	152.50	119.31	11.17	57.53	-203.11	111.48	83.88	0.00	16.47	-178.89	-409.26	-
2028	3.0	103.63	30.79	36.27	47.15	-51.01	167.84	155.88	8.45	58.02	-257.26	122.54	109.39	0.00	17.07	-214.86	-523.13	-
2028	4.0	101.65	37.59	17.69	42.77	-78.78	161.53	164.67	3.55	52.13	-270.51	117.78	115.35	0.00	15.03	-218.10	-567.39	-
2028	5.0	122.97	42.78	4.21	44.45	-117.08	167.63	176.61	0.94	51.62	-291.67	122.09	123.49	0.00	14.40	-231.19	-639.93	-
2028	6.0	150.23	47.77	0.00	40.12	-157.88	163.59	197.61	0.00	41.69	-319.51	119.00	137.94	0.00	13.40	-243.54	-720.93	-
2028	7.0	198.84	44.51	0.00	39.31	-204.04	171.51	186.05	0.00	40.66	-316.90	124.61	129.65	0.00	13.48	-240.79	-761.73	-
2028	8.0	193.01	40.48	0.00	42.39	-191.10	175.89	175.30	0.00	44.06	-307.13	127.64	121.96	0.00	14.28	-235.32	-733.55	-
2028	9.0	139.18	31.40	1.61	43.81	-125.15	172.36	151.43	0.51	55.80	-267.49	124.94	105.18	0.00	15.27	-214.84	-607.48	-
2028	10.0	109.38	23.53	11.70	53.50	-67.70	178.61	136.98	2.29	65.32	-247.98	129.32	94.98	0.00	18.07	-206.23	-521.91	-
2028	11.0	102.76	14.54	31.69	54.86	-30.76	174.86	104.08	6.61	71.50	-200.83	126.46	72.06	0.00	19.95	-178.57	-410.15	-
2028	12.0	111.08	11.18	55.11	60.41	-6.75	182.55	90.36	12.80	73.54	-186.57	131.86	62.46	0.00	23.69	-170.64	-363.96	-
2029	1.0	112.33	11.21	82.00	66.02	24.48	182.28	81.27	21.50	90.75	-151.30	131.49	56.08	0.00	26.59	-160.98	-287.80	-
2029	2.0	102.12	20.13	66.59	57.45	1.80	163.13	128.95	16.93	84.19	-190.97	117.52	88.81	0.00	24.10	-182.23	-371.41	-
2029	3.0	111.30	33.33	52.26	64.86	-27.51	179.49	174.33	12.87	84.08	-256.87	129.14	119.84	0.00	24.80	-224.19	-508.58	-
2029	4.0	109.14	40.67	24.91	59.67	-65.23	172.71	183.99	5.41	75.61	-275.69	124.10	126.26	0.00	21.78	-228.57	-569.48	-
2029	5.0	131.99	46.25	5.91	61.43	-110.91	179.19	197.16	1.45	74.22	-300.68	128.59	135.06	0.00	20.73	-242.92	-654.51	-
2029	6.0	161.21	51.63	0.00	55.05	-157.80	174.83	220.41	0.00	59.66	-335.58	125.30	150.72	0.00	19.19	-256.83	-750.21	-
2029	7.0	213.33	48.08	0.00	54.60	-206.81	183.26	207.34	0.00	58.48	-332.12	131.17	141.55	0.00	19.29	-253.43	-792.36	-
2029	8.0	207.02	43.71	0.00	58.39	-192.34	187.89	195.20	0.00	62.88	-320.21	134.32	133.03	0.00	20.33	-247.03	-759.59	-
2029	9.0	149.25	33.88	2.23	59.94	-120.96	184.08	168.48	0.79	78.69	-273.09	131.44	114.64	0.00	21.63	-224.44	-618.49	-

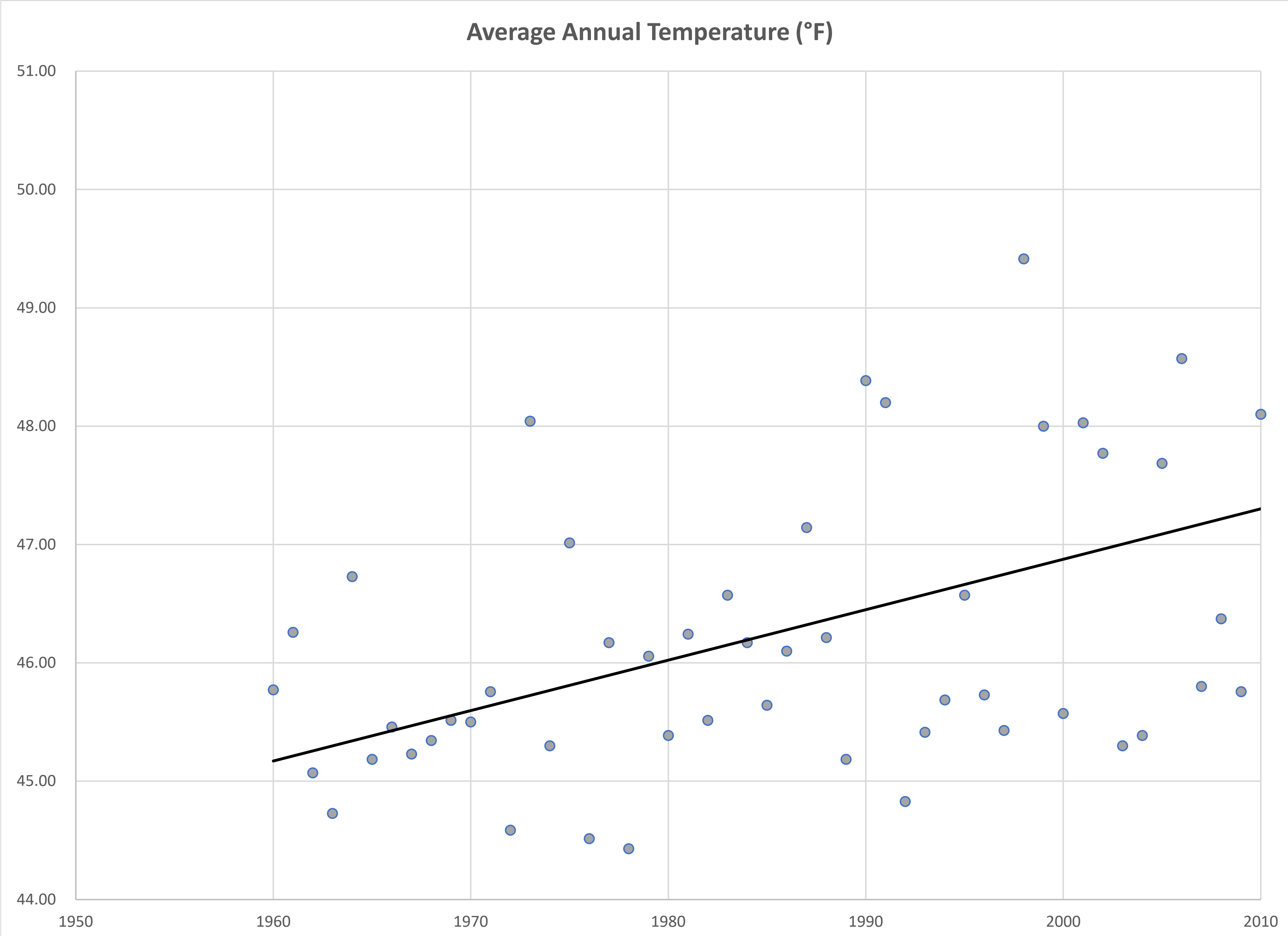
2029	10.0	117.26	25.38	16.46	74.00	-52.18	190.72	152.28	3.61	92.43	-246.96	136.00	103.44	0.00	25.58	-213.87	-513.01	-
2029	11.0	110.14	15.68	44.81	75.34	-5.67	186.67	115.61	10.45	100.65	-191.19	132.96	78.41	0.00	28.14	-183.23	-380.09	-
2029	12.0	119.03	12.05	79.34	82.89	31.15	194.84	100.30	20.31	103.87	-170.95	138.61	67.91	0.00	33.35	-173.17	-312.97	-
2030	1.0	120.33	12.09	119.39	90.30	77.26	194.51	90.22	34.35	126.97	-123.40	138.18	60.96	0.00	37.26	-161.88	-208.02	-
2030	2.0	109.38	21.70	96.62	78.29	43.84	174.04	143.15	27.16	117.10	-172.93	123.46	96.54	0.00	33.60	-186.40	-315.49	-
2030	3.0	119.17	35.93	75.06	87.45	7.40	191.45	193.54	20.74	116.31	-247.95	135.63	130.26	0.00	34.36	-231.54	-472.08	-
2030	4.0	116.83	43.85	35.22	81.43	-44.03	184.17	204.28	8.75	104.69	-275.01	130.30	137.22	0.00	30.11	-237.41	-556.45	-
2030	5.0	141.26	49.88	8.37	82.88	-99.89	191.05	218.90	2.35	101.89	-305.71	134.98	146.76	0.00	28.48	-253.26	-658.86	-
2030	6.0	172.49	55.68	0.00	73.60	-154.57	186.36	244.73	0.00	82.09	-349.00	131.49	163.77	0.00	26.24	-269.02	-772.59	-
2030	7.0	228.20	51.86	0.00	73.76	-206.30	195.30	230.24	0.00	80.75	-344.78	137.62	153.78	0.00	26.36	-265.04	-816.12	-
2030	8.0	221.40	47.15	0.00	77.60	-190.95	200.20	216.76	0.00	85.84	-331.12	140.88	144.52	0.00	27.59	-257.81	-779.89	-
2030	9.0	159.57	36.56	3.10	80.43	-112.59	196.10	187.10	1.29	106.84	-275.07	137.82	124.52	0.00	29.33	-233.00	-620.67	-
2030	10.0	125.34	27.38	23.31	98.49	-30.93	203.13	169.12	5.94	124.70	-241.60	142.57	112.35	0.00	34.52	-220.40	-492.92	-
2030	11.0	117.71	16.92	63.61	99.26	28.24	198.78	128.40	17.23	134.93	-175.03	139.35	85.15	0.00	37.83	-186.67	-333.45	-
2030	12.0	127.18	13.00	113.67	110.55	84.04	207.43	111.40	33.58	140.82	-144.43	145.23	73.75	0.00	44.85	-174.13	-234.51	-

year	month	ee r cum	pv r cum	eh r cum	ev r cum	Res_Total	ee_c_cum_m	pv_c_cum_m	eh_c_cum_m	ev_c_cum_m	Com_Total	ee_i_cum_m	pv_i_cum_m	eh_i_cum_m	ev_i_cum_m	Ind_Total	Total	
year	month	Cumulative Residential EE (GWh)	Cumulative Residential PV (GWh)	Cumulative Residential EHP (GWh)	Cumulative Residential EV (GWh)	Res_Total	Cumulative Commercial EE (GWh)	Cumulative Commercial PV (GWh)	Cumulative Commercial EHP (GWh)	Cumulative Commercial EV (GWh)	Com_Total	Cumulative Industrial EE (GWh)	Cumulative Industrial PV (GWh)	Cumulative Industrial EHP (GWh)	Cumulative Industrial EV (GWh)	Ind_Total	Total	Check
2003	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2003	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2003	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2003	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2004	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2004	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2004	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2004	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2004	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-
2005	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(0.00)
2005	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(0.00)
2005	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2005	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2006	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2006	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
2006	3	0.00	0.01	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-
2006	4	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	-
2006	5	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	0.00	-0.03	-
2006	6	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2006	7	0.00	0.03	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2006	8	0.00	0.03	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2006	9	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2006	10	0.00	0.02	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.03	-
2006	11	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.02	-
2006	12	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.02	-
2007	1	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.02	-
2007	2	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2007	3	0.00	0.04	0.00	0.00	-0.04	0.00	0.02	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.06	-
2007	4	0.00	0.06	0.00	0.00	-0.05	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.08	-
2007	5	0.00	0.07	0.00	0.00	-0.07	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.10	-
2007	6	0.00	0.08	0.00	0.00	-0.08	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.12	-
2007	7	0.00	0.08	0.00	0.00	-0.08	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.12	-
2007	8	0.00	0.08	0.00	0.00	-0.08	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.11	-
2007	9	0.00	0.06	0.00	0.00	-0.06	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.09	-
2007	10	0.00	0.05	0.00	0.00	-0.05	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.08	-
2007	11	0.00	0.03	0.00	0.00	-0.03	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.05	-
2007	12	0.00	0.03	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2008	1	0.00	0.03	0.00	0.00	-0.03	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.04	-
2008	2	0.00	0.06	0.00	0.00	-0.05	0.00	0.02	0.00	0.00	-0.02	0.00	0.01	0.00	0.00	-0.01	-0.08	-
2008	3	0.00	0.09	0.00	0.00	-0.09	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.13	-
2008	4	0.00	0.12	0.00	0.00	-0.12	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.16	-
2008	5	0.00	0.14	0.00	0.00	-0.14	0.00	0.03	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.18	-
2008	6	0.00	0.17	0.00	0.00	-0.16	0.00	0.03	0.00	0.00	-0.03	0.00	0.02	0.00	0.00	-0.02	-0.21	-
2008	7	0.00	0.16	0.00	0.00	-0.16	0.00	0.03	0.00	0.00	-0.03	0.00	0.02	0.00	0.00	-0.02	-0.20	-
2008	8	0.00	0.15	0.00	0.00	-0.15	0.00	0.03	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.19	-
2008	9	0.00	0.12	0.00	0.00	-0.12	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.02	-0.16	-
2008	10	0.00	0.09	0.00	0.00	-0.09	0.00	0.02	0.00	0.00	-0.02	0.00	0.02	0.00	0.00	-0.01	-0.12	-
2008	11	0.00	0.06	0.00	0.00	-0.06	0.00	0.02	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.08	-
2008	12	0.00	0.05	0.00	0.00	-0.04	0.00	0.01	0.00	0.00	-0.01	0.00	0.01	0.00	0.00	-0.01	-0.07	-
2009	1	0.00	0.05	0.00	0.00	-0.05	0.03	0.01	0.00	0.00	-0.04	0.02	0.01	0.00	0.00	-0.03	-0.12	-
2009	2	0.01	0.10	0.00	0.00	-0.10	0.05	0.02	0.00	0.00	-0.07	0.04	0.02	0.00	0.00	-0.05	-0.23	-
2009	3	0.01	0.17	0.00	0.00	-0.18	0.08	0.04	0.00	0.00	-0.12	0.06	0.03	0.00	0.00	-0.08	-0.38	-
2009	4	0.01	0.22	0.00	0.00	-0.23	0.11	0.04	0.00	0.00	-0.15	0.07	0.03	0.00	0.00	-0.10	-0.48	-
2009	5	0.02	0.26	0.00	0.00	-0.27	0.14	0.05	0.00	0.00	-0.19	0.09	0.04	0.00	0.00	-0.13	-0.59	-
2009	6	0.03	0.30	0.00	0.00	-0.33	0.16	0.06	0.00	0.00	-0.22	0.11	0.04	0.00	0.00	-0.15	-0.70	-
2009	7	0.04	0.29	0.00	0.00	-0.33	0.20	0.06	0.00	0.00	-0.25	0.13	0.04	0.00	0.00	-0.18	-0.76	-
2009	8	0.04	0.28	0.00	0.00	-0.32	0.23	0.06	0.00	0.00	-0.29	0.16	0.04	0.00	0.00	-0.20	-0.80	-
2009	9	0.04	0.22	0.00	0.00	-0.26	0.25	0.05	0.00	0.00	-0.30	0.17	0.04	0.00	0.00	-0.21	-0.77	-
2009	10	0.03	0.17	0.00	0.00	-0.20	0.29	0.05	0.00	0.00	-0.34	0.20	0.04	0.00	0.00	-0.23	-0.77	-
2009	11	0.03	0.11	0.00	0.00	-0.14	0.31	0.04	0.00	0.00	-0.35	0.21	0.03	0.00	0.00	-0.24	-0.73	-
2009	12	0.04	0.09	0.00	0.00	-0.12	0.35	0.04	0.00	0.00	-0.39	0.24	0.03	0.00	0.00	-0.26	-0.77	-
2010	1	0.10	0.09	0.00	0.00	-0.19	0.87	0.04	0.00	0.00	-0.91	0.61	0.03	0.00	0.00	-0.64	-1.73	-
2010	2	0.14	0.17	0.00	0.00	-0.31	1.24	0.08	0.00	0.00	-1.32	0.87	0.06	0.00	0.00	-0.93	-2.56	-
2010	3	0.21	0.30	0.00	0.00	-0.51	1.87	0.13	0.00	0.00	-2.00	1.31	0.09	0.00	0.00	-1.40	-3.91	-
2010	4	0.26	0.38	0.00	0.00	-0.64	2.28	0.16	0.00	0.00	-2.43	1.60	0.11	0.00	0.00	-1.71	-4.79	-
2010	5	0.38	0.45	0.00	0.00	-0.83	2.85	0.19	0.00	0.00	-3.04	2.01	0.14	0.00	0.00	-2.14	-6.01	-
2010	6	0.54	0.53	0.00	0.00	-1.07	3.26	0.24	0.00	0.00	-3.49	2.29	0.17	0.00	0.00	-2.46	-7.02	-
2010	7	0.82	0.51	0.00	0.00	-1.33	3.91	0.24	0.00	0.00	-4.15	2.75	0.17	0.00	0.00	-2.92	-8.40	-
2010	8	0.90	0.48	0.00	0.00	-1.37	4.50	0.25	0.00	0.00	-4.75	3.17	0.18	0.00	0.00	-3.35	-9.47	-
2010	9	0.72	0.38	0.00	0.00	-1.10	4.90	0.23	0.00	0.00	-5.13	3.45	0.16	0.00	0.00	-3.61	-9.83	-
2010	10	0.62	0.29	0.00	0.00	-0.91	5.57	0.23	0.00	0.00	-5.79	3.92	0.16	0.00	0.00	-4.08	-10.78	-
2010	11	0.63	0.19	0.00	0.00	-0.82	5.93	0.18	0.00	0.00	-6.11	4.17	0.13	0.00	0.00	-4.30	-11.23	-
2010	12	0.74	0.15	0.00	0.00	-0.88	6.68	0.17	0.00	0.00	-6.85	4.71	0.12	0.00	0.00	-4.83	-12.56	-
2011	1	0.93	0.15	0.00	0.01	-1.08	7.75	0.17	0.00	0.00	-7.92	5.48	0.12	0.00	0.00	-5.59	-14.59	-
2011	2	1.02	0.28	0.00	0.01	-1.29	7.90	0.29	0.00	0.00	-8.18	5.59	0.21	0.00	0.00	-5.79	-15.27	-
2011	3	1.29	0.48	0.00	0.01	-1.76	9.73	0.43	0.00	0.00	-10.15	6.90	0.30	0.00	0.00	-7.20	-19.11	-
2011	4	1.44	0.60	0.00	0.01	-2.03	10.35	0.48	0.00	0.00	-10.83	7.35	0.34	0.00	0.00	-7.69	-20.55	-
2011	5	1.95	0.70	0.00	0.01	-2.64	11.76	0.55	0.00	0.00	-12.31	8.36	0.39	0.00	0.00	-8.75	-23.70	-
2011	6	2.64	0.79	0.00	0.01	-3.42	12.45	0.66	0.00	0.00	-13.11	8.86	0.47	0.00	0.00	-9.32	-25.86	-
2011	7	3.82	0.76	0.00	0.01	-4.57	14.07	0.66	0.00	0.00	-14.72	10.02	0.47	0.00	0.00	-10.48	-29.77	-

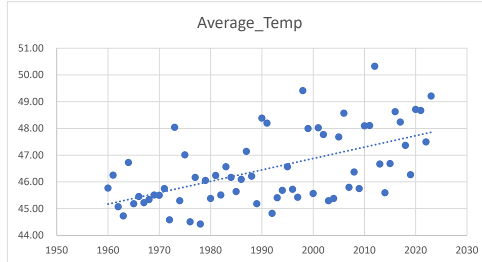
2011	8	4.03	0.70	0.00	0.01	-4.72	15.46	0.65	0.00	0.01	-16.11	11.01	0.46	0.00	0.00	-11.47	-32.30	-
2011	9	3.13	0.56	0.00	0.01	-3.67	16.15	0.59	0.00	0.01	-16.73	11.51	0.42	0.00	0.00	-11.93	-32.33	-
2011	10	2.64	0.42	0.00	0.01	-3.05	17.75	0.56	0.00	0.01	-18.31	12.66	0.40	0.00	0.00	-13.06	-34.41	-
2011	11	2.64	0.27	0.00	0.02	-2.89	18.37	0.44	0.00	0.01	-18.81	13.10	0.32	0.00	0.00	-13.42	-35.12	-
2011	12	3.03	0.21	0.00	0.02	-3.22	20.20	0.40	0.00	0.01	-20.59	14.41	0.29	0.00	0.00	-14.70	-38.51	-
2012	1	3.20	0.22	0.00	0.03	-3.40	20.66	0.38	0.00	0.01	-21.03	14.75	0.27	0.00	0.00	-15.01	-39.44	-
2012	2	3.04	0.42	0.00	0.03	-3.43	18.93	0.65	0.00	0.02	-19.57	13.51	0.47	0.00	0.00	-13.97	-36.97	-
2012	3	3.45	0.70	0.00	0.04	-4.11	21.30	0.89	0.00	0.02	-22.17	15.20	0.64	0.00	0.00	-15.84	-42.12	-
2012	4	3.52	0.89	0.00	0.04	-4.37	20.94	0.98	0.00	0.02	-21.91	14.95	0.70	0.00	0.00	-15.65	-41.92	-
2012	5	4.41	1.05	0.00	0.05	-5.41	22.19	1.10	0.00	0.02	-23.26	15.85	0.78	0.00	0.00	-16.63	-45.30	-
2012	6	5.58	1.21	0.00	0.05	-6.74	22.10	1.27	0.00	0.03	-23.35	15.78	0.91	0.00	0.00	-16.69	-46.78	-
2012	7	7.64	1.16	0.00	0.05	-8.75	23.63	1.24	0.00	0.03	-24.84	16.88	0.89	0.00	0.00	-17.76	-51.35	-
2012	8	7.66	1.09	0.00	0.06	-8.68	24.69	1.21	0.00	0.03	-25.87	17.64	0.86	0.00	0.00	-18.50	-53.05	-
2012	9	5.69	0.87	0.00	0.07	-6.49	24.65	1.08	0.00	0.04	-25.69	17.61	0.77	0.00	0.01	-18.37	-50.56	-
2012	10	4.61	0.67	0.00	0.09	-5.19	26.00	1.00	0.00	0.05	-26.96	18.58	0.72	0.00	0.01	-19.29	-51.44	-
2012	11	4.45	0.42	0.00	0.09	-4.78	25.90	0.78	0.00	0.05	-26.64	18.51	0.56	0.00	0.01	-19.06	-50.48	-
2012	12	4.94	0.33	0.00	0.11	-5.17	27.50	0.70	0.00	0.06	-28.14	19.65	0.50	0.00	0.01	-20.15	-53.46	-
2013	1	4.99	0.35	0.00	0.12	-5.21	27.97	0.67	0.00	0.06	-28.58	20.03	0.48	0.00	0.01	-20.51	-54.30	-
2013	2	4.52	0.64	0.00	0.11	-5.06	25.49	1.13	0.00	0.06	-26.56	18.29	0.82	0.00	0.01	-19.09	-50.71	-
2013	3	4.92	1.10	0.00	0.13	-5.89	28.53	1.61	0.00	0.07	-30.08	20.51	1.17	0.00	0.01	-21.67	-57.64	-
2013	4	4.81	1.38	0.00	0.12	-6.08	27.92	1.79	0.00	0.06	-29.65	20.11	1.30	0.00	0.01	-21.40	-57.13	-
2013	5	5.81	1.62	0.00	0.12	-7.30	29.45	2.01	0.00	0.06	-31.40	21.25	1.47	0.00	0.01	-22.71	-61.41	-
2013	6	7.07	1.86	0.00	0.11	-8.82	29.20	2.35	0.00	0.06	-31.48	21.10	1.72	0.00	0.01	-22.81	-63.12	-
2013	7	9.34	1.77	0.00	0.11	-11.00	31.09	2.30	0.00	0.06	-33.33	22.50	1.70	0.00	0.01	-24.19	-68.52	-
2013	8	9.04	1.65	0.00	0.12	-10.58	32.36	2.25	0.00	0.06	-34.55	23.46	1.66	0.00	0.01	-25.11	-70.24	-
2013	9	6.51	1.31	0.00	0.13	-7.69	32.18	2.02	0.00	0.07	-34.13	23.36	1.49	0.00	0.01	-24.84	-66.66	-
2013	10	5.10	1.01	0.00	0.16	-5.95	33.82	1.89	0.00	0.08	-35.63	24.58	1.40	0.00	0.01	-25.97	-67.55	-
2013	11	4.78	0.64	0.00	0.16	-5.26	33.57	1.48	0.00	0.09	-34.97	24.43	1.10	0.00	0.01	-25.53	-65.75	-
2013	12	5.15	0.50	0.00	0.18	-5.48	35.52	1.33	0.00	0.09	-36.76	25.89	0.99	0.00	0.01	-26.87	-69.10	-
2014	1	5.31	0.54	0.00	0.20	-5.65	36.03	1.24	0.00	0.11	-37.16	26.31	0.92	0.00	0.01	-27.21	-70.03	-
2014	2	4.92	1.05	0.00	0.19	-5.78	32.74	2.03	0.00	0.10	-34.67	23.94	1.52	0.00	0.01	-25.45	-65.90	-
2014	3	5.46	1.86	0.00	0.22	-7.09	36.56	2.83	0.00	0.12	-39.28	26.78	2.12	0.00	0.02	-28.89	-75.26	-
2014	4	5.44	2.41	0.00	0.21	-7.65	35.69	3.08	0.00	0.11	-38.66	26.19	2.31	0.00	0.02	-28.49	-74.79	-
2014	5	6.69	2.91	0.00	0.23	-9.38	37.55	3.39	0.00	0.11	-40.83	27.60	2.56	0.00	0.02	-30.14	-80.35	-
2014	6	8.31	3.43	0.00	0.21	-11.52	37.15	3.90	0.00	0.11	-40.93	27.34	2.94	0.00	0.02	-30.27	-82.72	-
2014	7	11.17	3.36	0.00	0.21	-14.31	39.46	3.76	0.00	0.11	-43.12	29.09	2.85	0.00	0.02	-31.92	-89.35	-
2014	8	11.01	3.20	0.00	0.24	-13.97	40.99	3.63	0.00	0.12	-44.50	30.26	2.75	0.00	0.02	-32.99	-91.46	-
2014	9	8.05	2.60	0.00	0.25	-10.40	40.68	3.21	0.00	0.14	-43.75	30.06	2.43	0.00	0.02	-32.48	-86.63	-
2014	10	6.42	2.03	0.00	0.31	-8.14	42.67	2.97	0.00	0.16	-45.48	31.58	2.25	0.00	0.02	-33.81	-87.43	-
2014	11	6.12	1.30	0.00	0.33	-7.10	42.28	2.31	0.00	0.17	-44.41	31.33	1.75	0.00	0.03	-33.05	-84.56	-
2014	12	6.70	1.04	0.00	0.37	-7.38	44.66	2.04	0.00	0.19	-46.51	33.13	1.55	0.00	0.03	-34.65	-88.54	-
2015	1	7.37	1.13	0.00	0.39	-8.11	45.35	1.87	0.00	0.20	-47.01	33.70	1.42	0.00	0.03	-35.09	-90.21	-
2015	2	7.23	2.18	0.00	0.34	-9.08	41.25	3.01	0.00	0.18	-44.08	30.71	2.29	0.00	0.03	-32.97	-86.13	-
2015	3	8.45	3.86	0.00	0.38	-11.93	46.12	4.12	0.00	0.20	-50.04	34.38	3.15	0.00	0.03	-37.51	-99.48	-
2015	4	8.84	5.00	0.00	0.34	-13.51	45.06	4.41	0.00	0.18	-49.30	33.65	3.37	0.00	0.03	-37.00	-99.81	-
2015	5	11.36	6.03	0.00	0.34	-17.04	47.47	4.79	0.00	0.17	-52.09	35.50	3.67	0.00	0.02	-39.14	-108.27	-
2015	6	14.67	7.10	0.00	0.31	-21.46	47.00	5.43	0.00	0.16	-52.26	35.20	4.16	0.00	0.02	-39.33	-113.06	-
2015	7	20.46	6.95	0.00	0.30	-27.11	49.97	5.17	0.00	0.15	-55.00	37.48	3.97	0.00	0.02	-41.42	-123.53	-
2015	8	20.86	6.62	0.00	0.32	-27.17	51.96	4.93	0.00	0.16	-56.72	39.02	3.79	0.00	0.02	-42.78	-126.67	-
2015	9	15.75	5.37	0.00	0.32	-20.80	51.60	4.31	0.00	0.18	-55.73	38.80	3.31	0.00	0.03	-42.09	-118.62	-
2015	10	12.93	4.19	0.00	0.39	-16.74	54.18	3.94	0.00	0.20	-57.91	40.79	3.03	0.00	0.03	-43.79	-118.43	-
2015	11	12.66	2.69	0.00	0.39	-14.97	53.72	3.02	0.00	0.21	-56.54	40.49	2.33	0.00	0.03	-42.79	-114.29	-
2015	12	14.24	2.15	0.00	0.43	-15.96	56.79	2.65	0.00	0.22	-59.22	42.85	2.04	0.00	0.03	-44.86	-120.04	-
2016	1	14.35	2.22	0.00	0.45	-16.12	56.87	2.46	0.00	0.23	-59.10	42.93	1.89	0.00	0.03	-44.79	-120.00	-
2016	2	13.00	4.25	0.00	0.39	-16.87	51.05	4.15	0.00	0.21	-54.99	38.54	3.20	0.00	0.03	-41.71	-113.57	-
2016	3	14.13	6.99	0.00	0.44	-20.68	56.34	5.56	0.00	0.23	-61.67	42.55	4.29	0.00	0.03	-46.80	-129.15	-
2016	4	13.81	8.76	0.00	0.39	-22.17	54.36	6.02	0.00	0.20	-60.18	41.07	4.64	0.00	0.03	-45.68	-128.04	-
2016	5	16.64	10.22	0.00	0.40	-26.46	56.57	6.61	0.00	0.20	-62.98	42.74	5.10	0.00	0.03	-47.81	-137.25	-
2016	6	20.26	11.69	0.00	0.35	-31.60	55.35	7.56	0.00	0.19	-62.72	41.83	5.84	0.00	0.03	-47.64	-141.96	-
2016	7	26.73	11.14	0.00	0.34	-37.54	58.17	7.27	0.00	0.17	-65.28	43.98	5.62	0.00	0.02	-49.57	-152.38	-
2016	8	25.86	10.36	0.00	0.36	-35.86	59.81	6.99	0.00	0.19	-66.62	45.23	5.40	0.00	0.03	-50.60	-153.08	-
2016	9	18.59	8.21	0.00	0.37	-26.43	58.76	6.16	0.00	0.20	-64.72	44.44	4.76	0.00	0.03	-49.17	-140.32	-
2016	10	14.56	6.28	0.00	0.44	-20.40	61.04	5.68	0.00	0.23	-66.49	46.17	4.39	0.00	0.03	-50.53	-137.42	-
2016	11	13.63	3.96	0.00	0.44	-17.15	59.90	4.40	0.00	0.24	-64.06	45.33	3.40	0.00	0.03	-48.69	-129.90	-
2016	12	14.69	3.11	0.00	0.48	-17.31	62.68	3.89	0.00	0.25	-66.32	47.44	3.00	0.00	0.04	-50.41	-134.04	-
2017	1	14.92	3.14	0.00	0.53	-17.53	62.68	3.68	0.00	0.27	-66.09	47.47	2.85	0.00	0.04	-50.28	-133.89	-
2017	2	13.62	5.68	0.00	0.47	-18.83	56.18	6.11	0.00	0.25	-62.05	42.56	4.75	0.00	0.04	-47.28	-128.16	-
2017	3	14.91	9.49	0.00	0.55	-23.85	61.91	8.64	0.00	0.28	-70.27	46.93	6.73	0.00	0.04	-53.61	-147.73	-
2017	4	14.68	11.66	0.00	0.50	-25.84	59.66	9.50	0.00	0.26	-68.90	45.24	7.42	0.00	0.04	-52.62	-147.36	-
2017	5	17.83	13.37	0.00	0.53	-30.67	61.99	10.59	0.00	0.26	-72.31	47.03	8.28	0.00	0.04	-55.27	-158.25	-
2017	6	21.87	15.03	0.00	0.48	-36.42	60.56	12.29	0.00	0.25	-72.60	45.97	9.62	0.00	0.04	-55.55	-164.57	-
2017	7	29.05	14.10	0.00	0.48	-42.67	63.57	11.97	0.00	0.24	-75.31	48.27	9.39	0.00	0.03	-57.63	-175.61	-
2017	8	28.30	12.91	0.00	0.52	-40.69	65.27	11.66	0.00	0.27	-76.66	49.59	9.15	0.00	0.04	-58.70	-176.05	-
2017	9	20.48	10.08	0.00	0.54	-30.02	64.04	10.39	0.00	0.30	-74.12	48.67	8.16	0.00	0.04	-56.79	-160.94	-
2017	10	16.16	7.60	0.00	0.67	-23.09	66.43	9.68	0.00	0.35	-75.76	50.51	7.61	0.00	0.05	-58.08	-156.93	-
2017	11	15.23	4.73	0.00	0.69	-19.27	65.11	7.56	0.00	0.37	-72.31	49.53	5.96	0.00	0.05	-55.43	-147.01	-
2017	12	16.52	3.66	0.00	0.76	-19.42	68.05	6.74	0.00	0.40	-74.40	51.79	5.32	0.00	0.06	-57.05	-150.86	-
2018	1	16.85	3.68	0.00	0.84	-19.70	68.11	6.28	0.00	0.43	-73.96	51.89	4.97	0.00	0.06	-56.80	-150.45	-
2018	2	15.45	6.63	0.00	0.74	-21.34	61.09	10.29	0.00	0.39	-70.99	46.59	8.18	0.00	0.06	-54.72	-147.05	-
2018	3	16.98	11.00	0.00	0.85	-27.14	67.37	14.36	0.00	0.44	-81.29	51.44	11.46	0.00	0.06	-62.83	-171.25	-
2018	4	16.79	13.47	0.00	0.78	-29.48	64.97	15.61	0.00	0.41	-80.17	49.65	12.50	0.00	0.06	-62.09	-171.74	-
2018	5	20.47	15.36	0.00	0.81	-35.02	67.55	17.21	0.00	0.41	-84.36	51.68	13.82	0.00	0.06	-65.44	-184.82	-
2018	6	25.20	17.20	0.00	0.74	-41.66	66.05	19.77	0.00	0.39	-85.43	50.59	15.92	0.00	0.06	-66.45	-193.53	-
2018	7	33.60	16.06	0.00	0.73	-48.94	69.38	19.08	0.00	0.37	-88.10	53.19	15.41	0.00	0.05	-68.54	-205.58	-
2018	8	32.86	14.65	0.00	0.79	-46.71	71.29	18.42	0.00	0.41	-89.30	54.71	14.91	0.00	0.06	-69.55	-205.56	-
2018	9	23.86	11.39	0.00	0.82	-34.43	69.99	16.28	0.00	0.45	-85.82	53.76	13.21	0.00	0.07	-66.90	-187.14	-
2018	10	18.89	8.55	0.00	1.01	-26.43	72.66	15.06	0.00	0.53	-87.19	55.86	12.24	0.00	0.08	-68.02	-181.64	-
2018	11	17.87	5.30	0.00	1.04	-22.12	71.27	11.68	0.00	0.56	-82.39	54.84	9.52	0.00	0.08	-64.28	-168.79	-
2018	12	19.45	4.08	0.00	1.15	-22.37	74.53	10.35	0.00	0.60	-84.28	57.41	8.45	0.00	0.09	-65.77	-172.43	-
2019	1	19.90	4.10	0.00	1.24	-22.76	74.77	9.37	0.00	0.63	-83.50	57.62	7.64	0.00	0.09	-65.16	-171.43	-
2019	2	18.31	7.36	0.00	1.08	-24.59	67.23	14.95	0.00	0.58	-81.60	51.82	12.19	0.00	0.09	-63.93	-170.12	-
2019	3	20.19	12.21	0.00	1.23	-31.17	74.31	20.32	0.00	0.63	-94.00	57.30	16.57	0.00	0.09	-73.78	-198.94	-
2019	4	20.02	14.91	0.00	1.10	-33.82	71.82	21.56	0.00	0.58	-92.81	55.40	17.58	0.00	0.09	-72.89	-199.52	-
2019	5	24.48	16.97	0.00	1.14	-40.31	74.85	23.23	0.00	0.57	-97.50	57.76	18.93	0.00	0.08	-76.60	-214.41	-
2019	6	30.22	18.96	0.00	1.03	-48.16	73.34	26.10	0.00	0.54	-98.90	56.62	21.26	0.00	0.08	-77.80	-224.86	-
2019	7	40.41	17.67	0.00	1.00	-57.09	77.21	24.68	0.00	0.50	-101.39	59.62	20.10	0.00	0.07	-79.65	-238.12	-
2019	8	39.62	16.08	0.00	1.07	-54.63	79.50	23.35	0.00	0.56	-102.29	61.41	19.01	0.00	0.08	-80.34	-237.26	-
2019	9	28.85	12.48	0.00	1.10	-40.23	78.21	20.25	0.00	0.61	-97.85	60.44	16.49	0.00	0.09	-76.83	-214.92	-
2019	10	22.89	9.35	0.00	1.34	-30.91	81.36	18.39	0.00	0.70	-99.05	62.89	14.97	0.00	0.10	-77.76	-207.71	-
2019	11	21.71	5.78	0.00	1.37	-26.13	79.96	14.03	0.00	0.73	-93.25	61.83	11.41	0.00	0.11	-73.13	-192.51	-
2019	12	23.69	4.45	0.00	1.50	-26.63	83.79	12.22	0.00	0.78	-95.23	64.81	9.94	0.00	0.12	-74.64	-196.50	-
2020	1	25.17	4.47	0.15	1.41	-28.09	84.07	11.36	0.00	0.72	-94.71	65.05	9.24	0.00	0.11	-74.18	-196.98	-
2020	2	23.98	8.32	0.23	1.22	-30.84	75.59	19.25	0.00	0.65	-94.20	58.52	15.65	0.00	0.10	-74.07	-199.11	-
2020	3	27.32	13.31	0.29	1.38	-38.97	83.56	25.89	0.00	0.71	-108.74	64.71	21.03	0.00	0.11	-85.64	-233.34	-
2020	4	27.93	16.26	0.20	1.24	-42.75	80.77	28.10	0.00	0.64	-108.23	62.57	22.82	0.00	0.10	-85.30	-236.28	-
2020	5	35.14	18.52	0.06	1.27	-52.33	84.18	30.94	0.00	0.64	-114.48	65.24	25.12	0.00	0.09	-90.26	-257.07	-
2020	6	44.58	20.69	0.00	1.14	-64.13	82.50	35.49	0.00	0.60	-117.39	63.96	28.80	0.00	0.09	-92.67	-274.19	-
2020	7	61.14	19.29	0.00	1.11	-79.33	86.85	34.22	0.00	0.56	-120.52	67.36	27.76	0.00	0.08	-95.04	-294.89	-
2020	8	61.41	17.56	0.00	1.18	-77.78	89.44	32.99	0.00	0.62	-121.81	69.39	26.76	0.00	0.09	-96.05	-295.65	-

2020	9	45.75	13.63	0.04	1.21	-58.12	88.00	29.13	0.00	0.67	-116.46	68.29	23.62	0.00	0.10	-91.81	-266.40	-
2020	10	37.09	10.22	0.29	1.47	-45.54	91.55	26.91	0.00	0.77	-117.69	71.07	21.82	0.00	0.11	-92.77	-256.00	-
2020	11	35.90	6.32	0.81	1.50	-39.91	89.98	20.87	0.00	0.80	-110.05	69.88	16.91	0.00	0.12	-86.67	-236.62	-
2020	12	39.94	4.86	1.32	1.64	-41.84	94.29	18.48	0.00	0.85	-111.92	73.25	14.97	0.00	0.13	-88.09	-241.85	-
2021	1	41.16	4.88	1.96	2.04	-42.03	94.47	16.96	0.26	1.04	-110.13	73.42	13.74	0.00	0.15	-87.01	-239.17	-
2021	2	38.12	8.75	1.73	1.81	-43.33	84.83	27.43	0.39	0.96	-110.92	65.96	22.23	0.00	0.14	-88.04	-242.29	-
2021	3	42.29	14.49	1.54	2.07	-53.17	93.65	37.78	0.43	1.07	-129.94	72.84	30.62	0.00	0.16	-103.30	-286.40	-
2021	4	42.20	17.67	0.88	1.89	-57.10	90.40	40.60	0.24	0.99	-129.78	70.34	32.90	0.00	0.15	-103.10	-289.98	-
2021	5	51.90	20.10	0.22	1.98	-69.80	94.10	44.27	0.08	0.99	-137.31	73.25	35.88	0.00	0.15	-108.98	-316.08	-
2021	6	64.44	22.43	0.00	1.80	-85.07	92.10	50.33	0.00	0.95	-141.48	71.72	40.79	0.00	0.14	-112.36	-338.92	-
2021	7	86.64	20.89	0.00	1.77	-105.76	96.84	48.12	0.00	0.89	-144.08	75.43	39.00	0.00	0.13	-114.30	-364.14	-
2021	8	85.40	18.99	0.00	1.92	-102.46	99.60	46.02	0.00	1.00	-144.62	77.61	37.30	0.00	0.15	-114.76	-361.84	-
2021	9	62.50	14.72	0.10	2.00	-75.13	97.88	40.33	0.06	1.10	-137.05	76.29	32.69	0.00	0.16	-108.82	-321.00	-
2021	10	49.84	11.02	0.73	2.45	-57.68	101.71	36.99	0.32	1.28	-137.10	79.31	29.98	0.00	0.19	-109.10	-303.88	-
2021	11	47.49	6.81	1.95	2.52	-49.82	99.85	28.49	0.98	1.35	-126.01	77.88	23.09	0.00	0.20	-100.78	-276.60	-
2021	12	52.04	5.23	3.17	2.79	-51.31	104.52	25.06	1.94	1.45	-126.18	81.55	20.31	0.00	0.21	-101.65	-279.15	-
2022	1	53.29	5.27	4.57	3.12	-50.87	104.63	22.99	0.82	1.60	-125.20	81.58	18.57	0.00	0.24	-99.90	-275.98	-
2022	2	49.04	9.52	3.82	2.71	-52.02	93.88	37.19	0.77	1.47	-128.83	73.14	29.93	0.00	0.22	-102.84	-283.69	-
2022	3	54.08	15.84	3.21	3.07	-63.65	103.55	51.21	0.68	1.62	-152.47	80.61	41.07	0.00	0.25	-121.43	-337.55	-
2022	4	53.65	19.42	1.72	2.77	-68.58	99.88	55.02	0.34	1.48	-153.09	77.70	43.99	0.00	0.23	-121.45	-343.12	-
2022	5	65.63	22.20	0.42	2.86	-84.55	103.89	59.98	0.10	1.48	-162.29	80.75	47.80	0.00	0.23	-128.32	-375.16	-
2022	6	81.05	24.90	0.00	2.57	-103.38	101.60	68.18	0.00	1.40	-168.39	78.92	54.18	0.00	0.22	-132.87	-404.64	-
2022	7	108.42	23.30	0.00	2.50	-129.21	106.75	65.18	0.00	1.30	-170.63	82.86	51.65	0.00	0.21	-134.29	-434.14	-
2022	8	106.33	21.28	0.00	2.69	-124.93	109.71	62.32	0.00	1.45	-170.58	85.09	49.26	0.00	0.24	-134.11	-429.62	-
2022	9	77.46	16.57	0.17	2.76	-91.10	107.74	54.61	0.07	1.60	-160.67	83.50	43.05	0.00	0.26	-126.29	-378.06	-
2022	10	61.48	12.47	1.25	3.36	-69.33	111.87	50.08	0.34	1.86	-159.75	86.65	39.39	0.00	0.30	-125.73	-354.81	-
2022	11	58.32	7.74	3.32	3.43	-59.31	109.75	38.57	1.00	1.96	-145.35	84.94	30.26	0.00	0.32	-114.88	-319.53	-
2022	12	63.64	5.97	5.35	3.76	-60.50	114.80	33.92	1.94	2.09	-144.68	88.79	26.55	0.00	0.36	-114.99	-320.17	-
2023	1	11.38	6.02	3.18	1.12	-13.11	10.25	30.90	1.12	0.83	-39.19	7.22	24.14	0.00	0.21	-31.14	-83.45	-
2023	2	10.04	10.87	2.66	1.10	-17.15	9.15	49.64	0.80	0.89	-57.10	6.45	38.70	0.00	0.25	-44.90	-119.15	-
2023	3	10.60	18.10	2.21	1.38	-25.11	10.05	67.93	0.56	1.07	-76.34	7.08	52.85	0.00	0.31	-59.61	-161.07	-
2023	4	10.07	22.20	1.16	1.36	-29.75	9.65	72.53	0.22	1.08	-80.88	6.80	56.32	0.00	0.32	-62.80	-173.44	-
2023	5	11.79	25.38	0.28	1.52	-35.37	9.99	78.61	0.05	1.16	-87.39	7.04	60.93	0.00	0.34	-67.63	-190.38	-
2023	6	13.93	28.48	0.00	1.47	-40.94	9.73	88.86	0.00	1.16	-97.43	6.86	68.75	0.00	0.35	-75.25	-213.63	-
2023	7	17.82	3.35	0.00	1.52	-19.65	10.18	19.31	0.00	1.19	-28.30	7.18	13.61	0.00	0.38	-20.40	-68.35	-
2023	8	16.70	3.07	0.00	1.73	-18.04	10.42	18.05	0.00	1.39	-27.09	7.34	12.73	0.00	0.44	-19.63	-64.76	-
2023	9	11.62	2.40	0.11	1.87	-12.03	10.19	15.48	0.02	1.61	-24.03	7.18	10.91	0.00	0.50	-17.59	-53.65	-
2023	10	8.80	1.81	0.83	2.39	-7.39	10.54	13.89	0.08	1.98	-22.37	7.43	9.79	0.00	0.63	-16.59	-46.35	-
2023	11	7.97	1.12	2.22	2.55	-4.32	10.29	10.48	0.19	2.22	-18.36	7.26	7.39	0.00	0.73	-13.91	-36.60	-
2023	12	8.28	0.87	3.70	2.91	-2.54	10.72	9.03	0.30	2.57	-16.88	7.56	6.36	0.00	0.90	-13.03	-32.45	-
2024	1	19.72	0.87	8.29	4.38	-7.91	20.91	8.06	2.81	3.85	-22.31	14.71	5.66	0.00	1.30	-19.08	-49.29	-
2024	2	17.57	1.99	6.73	3.98	-8.84	18.66	14.91	2.08	3.77	-27.71	13.10	10.58	0.00	1.29	-22.39	-58.95	-
2024	3	18.77	2.54	5.42	4.62	-11.27	20.46	17.02	1.52	4.20	-31.76	14.35	11.88	0.00	1.44	-24.78	-67.82	-
2024	4	18.04	3.08	2.75	4.57	-13.79	19.63	17.83	0.63	4.11	-32.72	13.74	12.40	0.00	1.38	-24.76	-71.28	-
2024	5	21.38	3.48	0.66	4.79	-19.40	20.31	18.97	0.16	4.16	-34.95	14.19	13.15	0.00	1.39	-25.94	-80.29	-
2024	6.0	25.58	3.86	0.00	4.38	-25.06	19.75	21.05	0.00	3.95	-36.85	13.78	14.54	0.00	1.36	-26.96	-88.87	-
2024	7.0	33.16	6.93	0.00	4.60	-35.48	20.64	38.97	0.00	4.07	-55.54	14.38	27.14	0.00	1.44	-40.08	-131.10	-
2024	8.0	31.51	6.30	0.00	4.93	-32.88	21.10	36.43	0.00	4.49	-53.04	14.67	25.33	0.00	1.58	-38.42	-124.34	-
2024	9.0	22.24	4.88	0.24	5.28	-21.61	20.61	31.22	0.07	5.19	-46.57	14.31	21.68	0.00	1.76	-34.22	-102.40	-
2024	10.0	17.11	3.66	1.81	6.66	-12.29	21.29	28.02	0.30	6.30	-42.72	14.76	19.42	0.00	2.16	-32.02	-87.03	-
2024	11.0	15.73	2.26	4.75	6.83	-6.40	20.78	21.13	0.81	6.91	-34.20	14.38	14.62	0.00	2.45	-26.55	-67.15	-
2024	12.0	16.63	1.74	7.83	7.84	-2.70	21.63	18.21	1.42	7.97	-30.45	14.94	12.58	0.00	3.00	-24.52	-57.66	-
2025	1.0	28.11	1.73	14.09	9.76	-5.99	31.75	16.25	4.58	9.99	-33.44	22.02	11.19	0.00	3.65	-29.56	-68.99	-
2025	2.0	25.16	3.09	11.34	8.74	-8.17	28.32	25.58	3.42	9.46	-41.03	19.60	17.56	0.00	3.42	-33.73	-82.93	-
2025	3.0	26.99	5.08	9.05	10.02	-12.99	31.05	34.33	2.53	10.15	-52.70	21.44	23.47	0.00	3.63	-41.29	-106.98	-
2025	4.0	26.05	6.15	4.57	9.69	-17.94	29.78	35.96	1.06	9.55	-55.12	20.51	24.51	0.00	3.30	-41.72	-114.79	-
2025	5.0	31.01	6.96	1.09	10.04	-26.83	30.79	38.25	0.27	9.48	-59.29	21.17	25.98	0.00	3.21	-43.93	-130.05	-
2025	6.0	37.28	7.72	0.00	9.22	-35.78	29.94	42.45	0.00	8.73	-63.65	20.54	28.73	0.00	3.05	-46.22	-145.65	-
2025	7.0	48.55	10.50	0.00	9.45	-49.60	31.28	58.95	0.00	8.77	-81.46	21.41	40.35	0.00	3.14	-58.62	-189.67	-
2025	8.0	46.36	9.52	0.00	10.01	-45.87	31.96	55.11	0.00	9.49	-77.57	21.83	37.63	0.00	3.35	-56.10	-179.55	-
2025	9.0	32.89	7.37	0.39	10.77	-29.09	31.21	47.23	0.12	11.13	-67.19	21.27	32.18	0.00	3.67	-49.78	-146.06	-
2025	10.0	25.42	5.51	2.91	13.37	-14.65	32.23	42.39	0.55	13.24	-60.83	21.91	28.82	0.00	4.40	-46.33	-121.82	-
2025	11.0	23.49	3.39	7.58	13.53	-5.77	31.45	31.96	1.48	14.34	-47.59	21.33	21.68	0.00	4.89	-38.12	-91.48	-
2025	12.0	24.98	2.60	12.45	15.66	0.53	32.71	27.54	2.63	16.29	-41.33	22.14	18.64	0.00	5.92	-34.86	-75.66	-
2026	1.0	36.40	2.60	21.00	18.01	0.01	42.78	24.58	6.67	19.76	-40.93	29.17	16.58	0.00	6.89	-38.85	-79.77	-
2026	2.0	32.57	4.63	17.20	16.02	-3.98	38.16	38.70	5.03	18.75	-53.07	25.95	26.01	0.00	6.36	-45.60	-102.65	-
2026	3.0	34.93	7.62	13.92	18.33	-10.30	41.84	51.92	3.72	19.85	-70.19	28.38	34.78	0.00	6.65	-56.51	-137.00	-
2026	4.0	33.70	9.23	7.06	17.31	-18.57	40.12	54.39	1.54	18.45	-74.52	27.14	36.31	0.00	5.95	-57.51	-150.59	-
2026	5.0	40.11	10.44	1.70	17.72	-31.12	41.49	57.85	0.40	18.30	-80.64	28.00	38.49	0.00	5.72	-60.76	-172.52	-
2026	6.0	48.19	11.58	0.00	16.29	-43.48	40.35	64.20	0.00	15.96	-88.59	27.16	42.57	0.00	5.38	-64.34	-196.40	-
2026	7.0	62.73	14.07	0.00	16.40	-60.40	42.15	79.26	0.00	15.86	-105.56	28.30	53.23	0.00	5.47	-76.05	-242.01	-
2026	8.0	59.89	12.75	0.00	17.30	-55.34	43.07	74.09	0.00	17.06	-100.11	28.85	49.63	0.00	5.80	-72.67	-228.11	-
2026	9.0	42.46	9.85	0.66	18.44	-33.22	42.06	63.50	0.18	21.23	-84.14	28.10	42.42	0.00	6.29	-64.24	-181.60	-
2026	10.0	32.81	7.36	4.76	22.56	-12.85	43.44	56.99	0.81	25.09	-74.54	28.94	37.98	0.00	7.47	-59.45	-146.84	-
2026	11.0	30.31	4.53	12.63	23.11	0.90	42.38	42.97	2.23	27.57	-55.55	28.17	28.56	0.00	8.28	-48.45	-103.10	-
2026	12.0	32.21	3.47	21.38	26.28	11.97	44.09	37.02	4.19	29.51	-47.42	29.23	24.55	0.00	9.92	-43.86	-79.30	-
2027	1.0	43.69	3.46	34.05	29.18	16.08	54.11	33.04	9.26	36.59	-41.30	36.20	21.83	0.00	11.38	-46.65	-71.87	-
2027	2.0	39.18	6.17	27.70	25.90	8.24	48.26	52.02	7.06	34.57	-58.65	32.19	34.26	0.00	10.45	-56.01	-106.41	-
2027	3.0	42.11	10.15	22.09	29.66	-0.52	52.92	69.80	5.23	35.44	-82.04	35.21	45.81	0.00	10.88	-70.13	-152.69	-
2027	4.0	40.73	12.31	10.91	27.55	-14.57	50.74	73.11	2.15	32.39	-89.32	33.67	47.82	0.00	9.67	-71.82	-175.72	-
2027	5.0	48.58	13.91	2.59	28.07	-31.83	52.47	77.76	0.56	31.97	-97.71	34.72	50.68	0.00	9.26	-76.15	-205.69	-
2027	6.0	58.51	15.43	0.00	25.64	-48.30	51.03	86.30	0.00	26.33	-111.00	33.67	56.05	0.00	8.67	-81.06	-240.36	-
2027	7.0	76.35	17.64	0.00	25.44	-68.55	53.31	99.90	0.00	25.92	-127.29	35.08	65.78	0.00	8.77	-92.09	-287.93	-
2027	8.0	73.06	15.98	0.00	27.14	-61.90	54.48	93.38	0.00	27.99	-119.87	35.76	61.32	0.00	9.30	-87.78	-269.54	-
2027	9.0	51.94	12.34	0.99	28.55	-34.73	53.20	80.03	0.27	35.81	-97.14	34.82	52.41	0.00	10.01	-77.22	-209.09	-
2027	10.0	40.24	9.21	7.15	34.55	-7.75	54.94	71.82	1.22	41.89	-83.65	35.86	46.91	0.00	11.85	-70.92	-162.31	-
2027	11.0	37.26	5.67	19.10	35.80	11.96	53.60	54.15	3.47	46.24	-58.05	34.90	35.27	0.00	13.14	-57.02	-103.11	-
2027	12.0	39.70	4.34	32.85	40.14	28.95	55.77	46.65	6.64	48.07	-47.71	36.21	30.30	0.00	15.70	-50.82	-69.58	-
2028	1.0	51.25	4.33	51.41	43.88	39.71	65.73	41.64	13.47	59.85	-34.05	43.11	26.95	0.00	17.81	-52.26	-46.59	-
2028	2.0	46.03	8.38	41.82	38.70	26.12	58.62	69.67	10.40	56.06	-61.83	38.34	45.18	0.00	16.25	-67.28	-103.00	-
2028	3.0	49.55	12.69	33.06	44.08	14.90	64.28	87.96	7.76	56.40	-88.08	41.93	56.55	0.00	16.82	-81.66	-154.83	-
2028	4.0	48.00	15.39	15.97	40.00	-7.41	61.64	92.14	3.22	50.65	-99.91	40.09	59.03	0.00	14.80	-84.31	-191.64	-
2028	5.0	57.34	17.39	3.79	41.59	-29.35	63.74	98.00	0.84	50.14	-110.75	41.34	62.56	0.00	14.16	-89.74	-229.84	-
2028	6.0	69.18	19.29	0.00	37.55	-50.92	61.98	108.75	0.00	40.29	-130.45	40.08	69.19	0.00	13.17	-96.10	-277.46	-
2028	7.0	90.42	21.21	0.00	36.81	-74.82	64.76	120.87	0.00	39.35	-146.27	41.76	78.00	0.00	13.27	-106.49	-327.59	-
2028	8.0	86.68	19.20	0.00	39.70	-66.17	66.18	112.98	0.00	42.61	-136.55	42.55	72.70	0.00	14.05	-101.21	-303.93	-
2028	9.0	61.72	14.82	1.44	41.05	-34.06	64.63	96.82	0.44	54.19	-106.82	41.44	62.13	0.00	15.02	-88.55	-229.42	-
2028	10.0	47.90	11.06	10.45	50.14	1.63	66.74	86.89	1.95	63.45	-88.22	42.67	55.60	0.00	17.76	-80.50	-167.10	-
2028	11.0	44.44	6.80	28.37	51.42	28.55	65.12	65.51	5.61	69.54	-55.48	41.52	41.80	0.00	19.62	-63.69	-90.62	-
2028	12.0	47.44	5.21	49.76	56.64	53.76	67.75	56.44	10.85	71.44	-41.89	43.07	35.91	0.00	23.33	-55.65	-43.79	-
2029	1.0	59.04	5.19	77.43	62.90	76.10	77.65	50.37	20.68	89.14	-18.19	49.92	31.94	0.00	26.35	-55.50	2.40	0.00
2029	2.0	53.08	9.26	62.77	54.74	55.17	69.25	79.31	16.15	82.72	-49.69	44.39	50.11	0.00	23.88	-70.62	-65.14	-
2029	3.0	57.22	15.23	49.05	61.79	38.40	75.94	106.41	12.18	82.46	-87.70	48.53	67.00	0.00	24.55	-90.98	-140.29	-
2029	4.0	55.49	18.46	23.19	56.90	6.14	72.82	111.46	5.07	74.12	-105.09	46.40	69.94	0.00	21.55	-94.78	-193.73	-
2029	5.0	66.37	20.87	5.49	58.57	-23.18	75.30	118.55	1.35	72.74	-119.76	47.84	74.13	0.00	20.50	-101.47	-244.41	-
2029	6.0	80.17	23.15	0.00	52.48	-50.84	73.23	131.55	0.00	58.27	-146.51	46.38	81.97	0.00	18.97	-109.39	-306.74	-
2029	7.0	104.91	24.78	0.00	52.09	-77.60	76.50	142.16	0.00	57.18	-161.49	48.32	89.90	0.00	19.08	-119.13	-358.22	-
2029	8.0	100.69	22.43	0.00	55.70	-67.42	78.18	132.88	0.00	61.43	-149.63	49.23	83.78	0.00	20.09	-112.92	-329.97	-
2029	9.0	71.79	17.31	2.06	57.18	-29.86	76.35	113.87	0.72	77.09	-112.41	47.94	71.59	0.00	21.37	-98.15	-240.43	-

2029	10.0	55.78	12.91	15.21	70.64	17.15	78.84	102.20	3.27	90.56	-87.21	49.36	64.06	0.00	25.27	-88.14	-158.20	-
2029	11.0	51.82	7.94	41.49	71.91	53.64	76.93	77.05	9.44	98.69	-45.84	48.02	48.15	0.00	27.81	-68.36	-60.56	-
2029	12.0	55.39	6.08	73.98	79.13	91.65	80.04	66.38	18.37	101.78	-26.27	49.81	41.36	0.00	32.99	-58.19	7.20	(0.00)
2030	1.0	67.05	6.06	114.81	87.19	128.89	89.87	59.32	33.53	125.37	9.71	56.60	36.83	0.00	37.02	-56.41	82.18	-
2030	2.0	60.34	10.83	92.80	75.58	97.22	80.16	93.51	26.39	115.63	-31.65	50.33	57.84	0.00	33.38	-74.79	-9.22	-
2030	3.0	65.09	17.83	71.85	84.38	73.31	87.90	125.61	20.05	114.69	-78.77	55.02	77.42	0.00	34.11	-98.33	-103.79	-
2030	4.0	63.18	21.64	33.49	78.66	27.33	84.29	131.74	8.41	103.21	-104.41	52.60	80.90	0.00	29.88	-103.62	-180.70	-
2030	5.0	75.63	24.49	7.94	80.02	-12.16	87.16	140.29	2.25	100.41	-124.79	54.23	85.83	0.00	28.25	-111.81	-248.76	-
2030	6.0	91.44	27.20	0.00	71.03	-47.61	84.76	155.88	0.00	80.69	-159.94	52.57	95.02	0.00	26.02	-121.57	-329.12	-
2030	7.0	119.78	28.56	0.00	71.25	-77.09	88.55	165.06	0.00	79.45	-174.15	54.76	102.13	0.00	26.14	-130.75	-381.99	-
2030	8.0	115.06	25.87	0.00	74.91	-66.03	90.49	154.44	0.00	84.39	-160.54	55.79	95.26	0.00	27.35	-123.70	-350.27	-
2030	9.0	82.12	19.98	2.93	77.67	-21.50	88.37	132.49	1.22	105.24	-114.40	54.32	81.47	0.00	29.07	-106.71	-242.61	-
2030	10.0	63.87	14.91	22.06	95.12	38.41	91.26	119.03	5.61	122.83	-81.85	55.93	72.96	0.00	34.22	-94.67	-138.11	-
2030	11.0	59.39	9.18	60.29	95.83	87.55	89.04	89.84	16.23	132.97	-29.68	54.40	54.89	0.00	37.51	-71.79	-13.92	(0.00)
2030	12.0	63.53	7.03	108.32	106.79	144.54	92.64	77.48	31.64	138.73	0.25	56.43	47.19	0.00	44.49	-59.14	85.66	-


Average Annual Temperature (°F)
51.00
50.00
49.00
48.00
47.00
46.00
45.00
44.00
1950
1960
1970
1980
1990
2000
2010

Year	Albany	Buffalo	Massena	Rochestor	Syracuse	Boonville	Watertown	Average_Temp	Trend
1960	47.4	47.3	43	46.9	47.6	42.9	45.3	45.77	1
1961	47.6	47.3	43.5	48.1	48.3	43.1	45.9	46.26	2
1962	46.4	46.3	41.8	46.8	47.2	42.6	44.4	45.07	3
1963	46.1	46	41.9	46.4	46.4	41.9	44.4	44.73	4
1964	47.9	48.1	43.7	48.5	48.6	43.4	46.9	46.73	5
1965	46.8	47.1	42.3	47.1	46.6	41.4	45	45.19	6
1966	46.8	46.7	42.9	47.9	46.5	41.9	45.5	45.46	7
1967	46.2	47.6	41.4	47.4	46.9	41.5	45.6	45.23	8
1968	47.2	47.6	41.8	47.6	46.9	41.6	44.7	45.34	9
1969	46.6	47	42.5	47.8	47.1	42.4	45.2	45.51	10
1970	46.7	47.6	42.5	47.9	46.5	42.4	44.9	45.50	11
1971	46.2	47.9	43.2	47.6	47.6	42.4	45.4	45.76	12
1972	45.6	46.2	41.2	47.7	46.8	40.4	44.2	44.59	13
1973	49	49.3	45.6	50.5	49.6	44.4	47.9	48.04	14
1974	46	47.3	42.2	47.6	46.9	42.2	44.9	45.30	15
1975	48	49	43.9	49	48.6	43.8	46.8	47.01	16
1976	46.3	46.2	41.6	47.4	46.3	40	43.8	44.51	17
1977	47.6	47.8	44.4	48.3	47.9	41.6	45.6	46.17	18
1978	45.6	45.9	42	47.4	46.4	40.1	43.6	44.43	19
1979	47.9	47.4	44.3	47.2	47.8	42.3	45.5	46.06	20
1980	46.3	47.1	42.3	47.5	47.2	43.4	43.9	45.39	21
1981	46.7	48	44.5	47.6	48.6	42.7	45.6	46.24	22
1982	46.7	47.4	43	47.9	47	41.3	45.3	45.51	23
1983	47.9	48.5	44.6	48.8	47.1	42.7	46.4	46.57	24
1984	47.9	48	43.9	48.3	46.4	42.9	45.8	46.17	25
1985	47.8	48	42.6	47.7	48	42.2	43.2	45.64	26
1986	47.8	48.3	43.1	47.6	47.9	42.3	45.7	46.10	27
1987	48.2	49.9	43.7	48.8	49	43.5	46.9	47.14	28
1988	47.6	48.7	44.3	47.8	48	42.2	44.9	46.21	29
1989	47.2	46.4	42	46.8	46.6	40.6	46.7	45.19	30
1990	50.3	50.3	45.5	50	50.2	44.1	48.3	48.39	31
1991	49.9	50.5	45.6	49.9	50.2	43.7	47.6	48.20	32
1992	46.9	47.1	42.3	46.4	46.6	40.3	44.2	44.83	33
1993	47.5	47.8	43.2	46.9	46.8	41.1	44.6	45.41	34
1994	47.1	48.3	44	48	46.7	41.2	44.5	45.69	35
1995	48.2	48.3	44.8	48.7	48	42.1	45.9	46.57	36
1996	47.2	46.9	44.7	46.9	47.2	41.6	45.6	45.73	37
1997	47.1	46.9	44	46.6	47.2	41	45.2	45.43	38
1998	50.5	50.9	47.9	50.7	50.8	45.7	49.4	49.41	39
1999	49.3	49.3	46.7	49.2	49.5	44.2	47.8	48.00	40
2000	47	47.5	41.9	47.8	47.2	42.3	45.3	45.57	41
2001	49.4	50.1	44.4	49.7	50	44.3	48.3	48.03	42
2002	49.6	49.2	44.5	50.1	50.4	43.4	47.2	47.77	43
2003	47.2	46.9	41.8	46.9	47.1	42.2	45	45.30	44
2004	47.9	47.7	42.2	47.3	47.5	39.4	45.7	45.39	45
2005	49.2	48.9	44.1	48.5	49.1	44.2	49.8	47.69	46
2006	50.5	50.7	46	51.5	50.3	44.4	46.6	48.57	47
2007	48.3	49.1	43.4	49.3	48.1	41.8	40.6	45.80	48
2008	49	48.4	41.5	48.9	48.2	42.1	46.5	46.37	49
2009	47.8	47.5	43.8	47.1	47.6	41.2	45.3	45.76	50
2010	50.2	49.2	46.8	49.4	49.7	43.8	47.6	48.10	51
2011	50	49.6	46.4	49.5	50.7	43.3	47.3	48.11	52
2012	51.6	52.1	49.5	51.8	52.5	44.9	49.9	50.33	53
2013	48.6	48.8	43.8	48.9	48.8	41.4	46.4	46.67	54
2014	48	47	43.1	47.7	47.7	40.6	45.1	45.60	55
2015	49.5	48.5	43.9	48.9	48	41.9	46.1	46.69	56
2016	51.1	51.1	45.7	51.1	49.6	43.7	48.1	48.63	57
2017	50.2	50	48.1	50.5	48.9	42.7	47.3	48.24	58
2018	50.2	49.4	45	50.1	48.3	42	46.6	47.37	59
2019	49.5	48.2	43.1	48.7	48.3	41.1	45	46.27	60
2020	50.6	51.5	45.6	50.2	51.3	43.7	48.1	48.71	61
2021	48.9	52	45.9	50.7	52	43.6	47.6	48.67	62
2022	50.6	49.9	44.1	49.2	50	42.4	46.3	47.50	63
2023	52.2	51.2	46.3	51	51.8	44.4	47.6	49.21	64



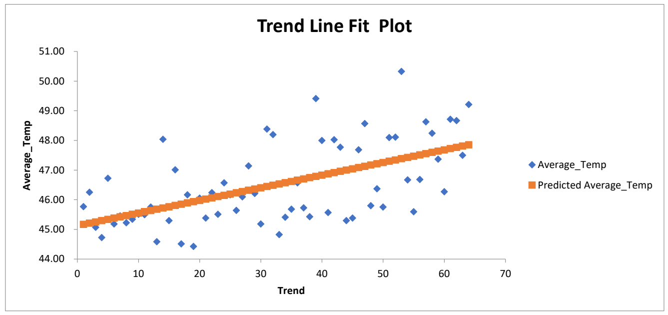
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.573061
R Square	0.328399
Adjusted R	0.317567
Standard E	1.143858
Observatio	64

ANOVA

	df	*SS*	*MS*	*F*	*ignificance F*
Regression	1	39.66677	39.66677	30.31673	7.47E-07
Residual	62	81.12152	1.308412		
Total	63	120.7883			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*Jpper 95.0%*
Intercept	45.1281	0.289349	155.9643	3.69E-82	44.5497	45.7065	44.5497	45.7065
Trend	0.042617	0.00774	5.506063	7.47E-07	0.027145	0.05809	0.027145	0.05809



RESIDUAL OUTPUT

Observatior	*ed Average*	*Residuals*
1	45.17072	0.600707
2	45.21334	1.043804
3	45.25596	-0.184527
4	45.29857	-0.570002
5	45.34119	1.387381
6	45.38381	-0.198094
7	45.42643	0.030717
8	45.46904	-0.240472
9	45.51166	-0.168803
10	45.55428	-0.039992
11	45.5969	-0.096895
12	45.63951	0.11763
13	45.68213	-1.096416
14	45.72475	2.31811
15	45.76736	-0.467365
16	45.80998	1.204303
17	45.8526	-1.338314
18	45.89522	0.276211
19	45.93783	-1.509263
20	45.98045	0.076691
21	46.02307	-0.637355
22	46.06569	0.17717
23	46.1083	-0.594019
24	46.15092	0.420507
25	46.19354	-0.02211
26	46.23616	-0.593299
27	46.27877	-0.178774
28	46.32139	0.821466
29	46.36401	-0.149723
30	46.40663	-1.220912
31	46.44924	1.936471
32	46.49186	1.708139
33	46.53448	-1.705907
34	46.5771	-1.16281
35	46.61971	-0.933999
36	46.66233	-0.090902
37	46.70495	-0.976377
38	46.74757	-1.318994
39	46.79018	2.624103
40	46.8328	1.1672
41	46.87542	-1.303989
42	46.91804	1.110536
43	46.96065	0.810776
44	47.00327	-1.70327
45	47.04589	-1.660173
46	47.0885	0.59721
47	47.13112	1.440306
48	47.17374	-1.37374
49	47.21636	-0.844928
50	47.25897	-1.501832
51	47.30159	0.798408
52	47.34421	0.770077
53	47.38683	2.941745
54	47.42944	-0.758015
55	47.47206	-1.872061
56	47.51468	-0.828965
57	47.5573	1.071275
58	47.59991	0.642943
59	47.64253	-0.271102
60	47.68515	-1.41372
61	47.72777	0.98652
62	47.77038	0.901045
63	47.813	-0.313001
64	47.85562	1.358668

Dependent Variable: Average_Annual_Temperature
Least Squares

Sample: 1960 2023
Included observations: 64

Variable	Coefficient	Std. Error	t-Statistic
Intercept	45.1281	0.289349	155.96433
Trend	0.042617	0.00774	5.50606

R-squared	0.328399
Adjusted R	0.317567
S.E. of regı	1.143858

βeta = b / (	0.037258		
N	**10.97**		
τ	**1.00**		
η_a		0.091151	
η_b	5.985414	0.04973	
Sum		0.140881	minimized @ optimal N

βeta = b / (	0.037258		
N	**10.38**		
τ	**2.00**		
η_a		0.096359	
η_b	6.688923	0.062107	
Sum		0.158466	minimized @ optimal N

Year	Jan	Feb	ar	Apr	ay	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1960	22.6	28	26.5	49.6	60.3	67.1	69.5	69.8	62.8	49.3	41.5	21.6	47.4
1961	15.3	25.5	33	43.9	55.4	67	71.5	69.7	68.8	53.9	39.3	27.6	47.6
1962	21.9	20.5	34.7	47	59.8	68.1	69	69	58.7	50.1	35	23	46.4
1963	20.2	17.2	33.5	45.7	56.6	67.3	72	66.4	56.8	55.5	44.3	18.1	46.1
1964	23.8	22.3	34.8	45.7	61.6	66.5	74.4	66.2	61	49.2	41.3	27.9	47.9
1965	18	22.3	31.1	42.2	59.5	66.9	68.9	69.4	63.5	51.2	37.6	30.8	46.8
1966	21.5	23.3	34.3	44	53.9	67.4	72.2	69.1	58	48.5	42.3	27.2	46.8
1967	27	18	28.9	43.5	50.4	69.8	71.6	69.2	61.3	51	34.8	28.9	46.2
1968	14.6	21.1	37.1	51.1	54.9	66.7	72.7	68.6	63.7	53.3	38.5	23.5	47.2
1969	20.9	24.6	31.1	47.6	56.3	66	69.6	70.6	62.4	48.9	39.7	21.6	46.6
1970	9.7	23	32	48.7	60.5	65.9	71.9	69.6	63.3	52.8	41.9	21.6	46.7
1971	13.9	25.3	30.6	42.3	54.9	66.3	68.4	66.8	64.7	54.7	36.8	30	46.2
1972	22.9	21	30.5	41.2	59.5	63.5	70.9	67.1	60.7	45.7	35.1	28.8	45.6
1973	27	22	41.9	48.8	55.3	68.7	72.7	72.9	60.4	50.9	39.8	28.2	49
1974	23.3	21.3	32.4	48.1	54	65	69.3	67.9	58.3	44.4	38.6	28.9	46
1975	25.7	24.8	30.8	40.7	61.8	65.1	72.7	70	59.4	53.2	45.5	26.1	48
1976	16	31.5	36.7	49.6	54.9	69.4	68.5	67.4	59	46.5	34.9	21.4	46.3
1977	15.5	24.5	40	46.8	60.2	64.6	71.7	67.8	61.3	49.7	42.5	26.7	47.6
1978	21.5	18.2	30.7	43.3	58.3	64.3	68.8	69.1	56.8	48.5	38.6	28.7	45.6
1979	22.1	14.4	38.9	45.4	60	65.9	72.5	69	61.2	50.2	44	31.4	47.9
1980	24.1	19.8	33.3	48	59.5	63.3	72.2	70.7	62.5	47.4	34.8	19.9	46.3
1981	14	33.1	34.7	48.1	58.9	66.7	69.3	68.5	58.8	44.7	37.7	25.7	46.7
1982	14.3	23.3	32.7	44.2	59.5	62.9	70	65.5	60.5	50.6	43	33.6	46.7
1983	24.3	26.8	37.6	46.7	54.9	67.2	72.2	69.8	62.6	49.5	39.2	24	47.9
1984	18.1	32.4	28.9	47.5	53.2	66.4	68.9	71.8	60.2	53.8	40.2	33.8	47.9
1985	19.9	26.8	37.3	49.6	60	62.2	70.7	68.7	63.3	50.2	40.1	24.5	47.8
1986	23	22.7	37.2	50.5	61.3	64.6	71.3	67.8	60.1	48.9	35.7	30.8	47.8
1987	21.7	21.7	37.6	50.4	60	68.3	73.5	67.2	60.6	46.5	40.1	30.7	48.2
1988	20.6	24.1	34.2	46.6	59.5	65.1	75	72.3	60	46	41	26.6	47.6
1989	27.8	24.2	33.5	44.6	59.5	68	71.6	69.7	62.5	51.5	39.3	13.6	47.2
1990	32.8	28.1	37.8	48.9	55.2	67.3	73	70.9	61.7	53.1	41.8	33.6	50.3
1991	23.1	30	37.4	51.1	63.2	69	71.6	71.2	59.9	53.2	40.1	28.9	49.9
1992	24.5	26.9	31.5	44.7	58.5	65.2	67.6	67.4	61.4	46.4	38.9	29.8	46.9
1993	26.6	18.3	31.4	48.4	59.4	66.3	73.1	71.6	60.5	48.6	38.4	27.3	47.5
1994	12.7	19.2	33.1	48.1	56.4	68.9	74	67	60.8	50	43.3	31.6	47.1
1995	31.3	22.8	40	43.9	56.9	66.9	74	70.8	59.1	53.3	35.7	23.9	48.2
1996	20.6	25.2	31	46.2	55.2	68.5	69.7	70.1	62.3	49.1	34.6	33.8	47.2
1997	22.6	30.4	33.2	44.2	53.5	67.9	70.6	68.5	60.7	48	35.7	29.8	47.1
1998	28.9	31.8	38.4	48.8	62.8	66.2	70.9	71.1	63.2	50.7	39.9	33.7	50.5
1999	21.7	28.2	34.4	46.6	59.4	69.7	74.1	69.2	64.8	48.8	44	31	49.3
2000	20.7	27.6	40.1	45.3	59.3	65.9	67.6	68.5	59.4	50	38	22.1	47
2001	24.5	26.9	30.9	47.4	58.8	68.3	68.9	73.7	62.4	51.9	44.7	34.1	49.4
2002	31.3	31.6	36.3	48.9	55	66.8	73.4	72.9	65	47.9	38.6	27	49.6
2003	15.5	21.1	34.4	44.5	56.8	66.3	72.2	72.7	63	48.2	42.3	29.2	47.2
2004	14.6	24.8	37.9	49.1	61.5	66	70.9	69.3	63.2	49.9	39.5	27.8	47.9
2005	19.5	26.9	31.1	50.2	54.5	72.8	73.8	73.8	66.2	52	42.4	26.7	49.2
2006	31.5	27.9	36	49.5	58.6	67.6	74.9	69.8	61.1	48.8	44.6	35.2	50.5
2007	27.4	19.4	31.8	44.3	60.3	68.8	70.5	70.7	64.3	56.8	37.6	27.8	48.3
2008	27.6	26.2	33.8	51.9	55.5	70.4	73.5	68.5	64.3	48.1	39.5	28.4	49
2009	18.3	27.4	36.3	49.6	58	66	68.3	71	60.4	48	43.4	27.4	47.8
2010	24.4	28	41.7	51.9	61.2	67.6	74.9	72	64.6	50.3	39.6	25.9	50.2
2011	20.5	23.9	34.4	48.7	62	67.9	74.9	70.8	65.2	52.9	44.4	34	50
2012	28.6	32.1	45.9	48.1	63.1	67.5	74.8	72.2	62.6	53.3	38.1	33.3	51.6
2013	25.5	26.8	33.8	45.9	59.9	67.6	75.9	69.6	61.3	52.6	37.2	27.6	48.6
2014	19.7	21.9	27.7	47.4	60	69.3	72.4	69.3	63.2	54	38.3	32.5	48
2015	19.7	12.7	29.8	47.8	65.6	66.8	73	73.1	68.6	49.8	45.5	41.8	49.5
2016	27.7	30.6	42.7	46	59.5	68.2	74	73.9	66.1	52.4	41.4	30.3	51.1
2017	30.6	33.3	31.7	53	57.4	68	71.7	69.2	65.6	57.8	39.2	24.8	50.2
2018	23.3	32.4	34.1	41.1	64.3	67.9	76.5	75.1	67.2	50.7	37	32.4	50.2
2019	23.3	27.6	35.1	49.8	58.5	68	76.2	71.7	63.8	53.6	36.7	29.8	49.5
2020	31.8	31.5	42.3	46.6	59.8	70.8	75.9	68.8	59.7	48.9	41	29.9	50.6
2021	23.3	23.7	36.4	46.7	55.6	68.2	67.8	70.9	62.2	56.8	38.8	36.1	48.9

2022	19.7	27.5	37.3	47.8	63.3	67.8	75.6	75.6	63.9	52.3	44.3	31.9	50.6
2023	32.9	31.5	36.8	52.6	58.8	67.5	75.8	70.3	66.3	57.2	39.5	37.6	52.2
2024	30.1	33.8	40.9	49.5	64.8								43.8

Year	Jan	Feb	ar	Apr	ay	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1960	26.4	27.2	24.1	48.4	58.1	65.8	69.1	69	64.3	50.6	42.8	21.5	47.3
1961	18.5	26.5	34.2	39.8	53.1	63.4	69.7	69.5	68.6	54.4	40.8	29.7	47.3
1962	22.5	21.3	32.4	44.9	60.9	64.9	68.2	68.1	58.5	51.5	37.1	25	46.3
1963	18.9	18.8	35.4	44.2	52.8	66.7	70.2	64.3	57.1	57.1	43.6	23.4	46
1964	29.3	23.4	34	46.9	59.2	65.7	73.1	64.9	60.8	48	42.1	29.5	48.1
1965	23.6	25.8	29.9	41.2	59.6	64.2	67.5	67.8	63.5	47.8	40	34.3	47.1
1966	20.4	24.9	34.7	43.3	52.2	67.3	71.4	68.5	58.7	48.8	41.5	28.5	46.7
1967	29.8	20.5	30.9	46.1	50	72.5	71.2	68.1	60.7	51.9	36.3	33	47.6
1968	19.8	20.6	35.6	49.2	53.4	64.8	71.2	69.4	66.1	53.4	40.6	26.7	47.6
1969	25	24.6	30.9	46.7	54.3	64.3	70.5	71.1	62.2	51	39.1	24.7	47
1970	17.6	24.7	30	46.9	57.3	66	70.9	70.1	64	54.5	41.6	27.3	47.6
1971	20.8	26.9	29.8	41.7	54.5	67.6	68.7	67.8	65.4	58.7	39.1	33.5	47.9
1972	25.5	22	30.1	41.1	59.1	62.6	71	67.7	62.8	46.2	36	30.8	46.2
1973	27.5	22.9	42.3	46.9	54.5	68.1	72.2	71.7	61.7	54.3	40.8	29	49.3
1974	27.1	22.3	32.9	46.2	53.1	65.5	69.9	69.9	59.5	49.1	40.2	31.7	47.3
1975	30	29.1	30.8	39.3	62	67.9	72.3	69.7	58.3	53	46.9	28.2	49
1976	19.7	31.8	37.2	46.5	53.4	68.4	67.8	67.5	60.1	46.3	34.1	21.9	46.2
1977	13.8	24.6	39.8	47	60.3	64.4	72	68	62.6	49.5	43.3	27.8	47.8
1978	20.4	15.5	28.2	42.5	57.4	65.1	70.4	70.3	60.8	49.5	40.3	30.4	45.9
1979	20.5	14.8	38.2	44.3	56.9	66.5	71.3	67.5	61.9	50.7	43.5	33.3	47.4
1980	25.8	21.1	31.8	46.1	58	61.8	71.6	72.6	62.4	48.7	39.4	25.3	47.1
1981	19.2	32.9	33.9	47.2	56.4	66.2	71.8	69.9	60.9	48.2	40.4	29	48
1982	17.1	23.2	32.4	41.6	61	62.2	71.8	65	61.6	52.6	42.9	37.5	47.4
1983	26.9	29.5	36.7	43.6	53.9	67.6	74.2	71.2	63.7	51.7	40.8	22.6	48.5
1984	20.3	33.8	27.1	47.6	52.9	67.7	70.3	70.3	58.5	53.2	39	35.6	48
1985	21.1	24.8	35.6	49.5	59.5	62.7	69.7	69.2	64.1	52.5	41.9	25.5	48
1986	25.5	24.4	36.1	47.8	59.6	64.1	71.1	67.8	61.8	50.9	37.7	32.4	48.3
1987	26	25	37.7	50	60.5	68.9	74.2	68.9	63.4	47.8	42.5	34.3	49.9
1988	26.5	24.3	35.2	46.1	59.6	64	74.8	72.4	62.1	46.9	43	30	48.7
1989	31.3	22.6	33	41.9	55.1	65.9	71.5	68.4	60.8	51.5	37.9	17.4	46.4
1990	33.4	29.3	36.9	48.4	54.8	66.7	71.3	70.4	61.6	52.5	43.4	34.4	50.3
1991	26	30.6	37.8	50.4	64.2	69.1	71.9	71	62	53	39.3	31.3	50.5
1992	27	27.7	31.5	43.8	57.3	63.4	66.8	66.3	61.6	47.9	40.2	31.8	47.1
1993	29.5	20.7	30.7	47.3	57	66	73.4	71.9	59.4	49.2	39.6	29.5	47.8
1994	17.2	22.8	33.4	48.2	54.6	69	73.3	68	61.9	52.2	45.1	34	48.3
1995	29.7	21.9	37.8	42.3	56.8	69.8	72.7	73	60	54.2	36.4	24.5	48.3
1996	22.5	24.2	29	42.2	54.5	67.7	68.5	70.5	62.6	51.7	35.4	33.4	46.9
1997	24.7	30.1	33	42.3	50.6	66.7	68.6	66.7	60.5	50.4	37.6	31.7	46.9
1998	31.1	34.1	36.5	46.8	62.8	65.2	69.5	71.1	63.7	52.5	42	35.2	50.9
1999	23.5	30.9	31	45.9	59.6	68.4	74.3	67.9	64.3	50.1	43.9	32	49.3
2000	23.6	29.8	40	44.2	57.5	64.9	67.6	67.9	61.2	52.3	38.8	22.1	47.5
2001	27	28.2	31.1	47.3	58.8	67	69.8	73	62.7	53	46.9	35.9	50.1
2002	31.5	31.2	34.2	46.2	51.8	67	73.3	71.5	66.9	49.2	39.4	28.4	49.2
2003	19	20.8	33.5	43	55.4	63.5	69.6	70.8	62.8	48.8	43.1	33.1	46.9
2004	17.4	25.5	37	46	58.2	63.6	69	67.2	65.2	51.6	42.3	29.7	47.7
2005	23.8	25.3	29.4	46.8	53.5	71.8	74.9	72.7	66	52.6	43.3	27.1	48.9
2006	34.8	27.8	35.2	48	59.9	68.3	73.7	69.7	60.5	49	44.6	37.2	50.7
2007	28.9	18.6	35	42.5	59.2	69.4	69.7	72.3	66.1	58.8	39	29.3	49.1
2008	29.7	25.1	31.5	50.9	53.3	67.9	71.4	68.5	64.2	49.6	39.8	29.4	48.4
2009	18.5	27.2	35.4	46.7	57.2	64.5	66.9	70.1	62.3	48.6	44	28.6	47.5
2010	23.2	24.6	38.1	51.1	60.2	67	73.5	71.7	62.6	50.9	41.5	26.2	49.2
2011	21.3	24.6	31.9	45.7	58.7	66.8	75.2	71.3	65.5	52.2	46.5	35.5	49.6
2012	30.3	31.7	47.4	45.2	63.8	68.2	75.5	71.7	63.3	52.2	39.3	36.3	52.1
2013	30	26	32.9	46.4	61.4	65.7	72.5	69	61.4	54.2	37.6	28	48.8
2014	20	19.8	26.7	45.8	57.7	68.8	68.6	69	63.2	53.4	37.8	33.5	47
2015	20.4	10.9	29.2	45.8	62.6	65.6	71	69.7	67.3	51.4	46.2	42.1	48.5
2016	26.9	29.7	39.9	43.1	58.9	67.6	74.1	75.6	67	54.4	45.1	31.2	51.1
2017	31	34.8	33	50.5	56.1	67.3	70.6	68.7	65.4	57	39.8	25.4	50
2018	24.2	31.9	31.4	39.2	65	67.2	74.4	72.8	67.2	50.5	35.5	33.2	49.4
2019	22.9	27.6	31.5	44.8	55.4	65.2	74	70.3	65.2	52.3	35.8	33.3	48.2
2020	33	29.4	41.3	43.4	56	67.1	77.6	73.5	64.4	51.8	46.5	33.5	51.5
2021	29.4	24.7	40.3	48.3	57.2	71.3	71.1	75.7	66.5	59.4	42.2	38.2	52

2022	21.9	28.5	38.3	45.5	61.3	66.7	72.4	72.7	63.3	52.4	43.3	32	49.9
2023	32.8	32.1	35.2	49.5	56.6	66.9	72.8	68.9	65.4	54.9	40.3	39.4	51.2
2024	29.4	34.8	40.8	50	63.7								43.7

Year	Jan	Feb	ar	Apr	ay	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1960	13.7	19.9	20.5	43.1	59.9	64.2	66.3	66	58.4	45.4	39.9	19	43
1961	8.7	20	27.3	40.4	52.1	61.7	68.8	66.5	65	50.3	36.5	24.2	43.5
1962	14.5	12.7	29.5	41.1	57.8	64.2	64.3	65.8	55.3	46.1	31.8	18.6	41.8
1963	14.9	11.2	26.2	41.9	53.1	65.4	69.8	63	53	53.7	40.2	10.9	41.9
1964	21.5	17.4	30.4	42.7	57.7	63.4	70.4	62.2	56.2	45.3	34.6	22.7	43.7
1965	12.5	16.9	26.1	39.2	56	62.3	64.8	65.1	58.6	45.5	33.1	27.1	42.3
1966	14	16.3	30.2	41.5	50.9	64.7	68.8	65.8	55.5	47	38.9	21.2	42.9
1967	22.2	8.4	24.6	40.9	46.5	65.2	67.8	65	56.7	46.5	30.8	22.1	41.4
1968	6.6	10.4	28.9	47.6	52.1	61.9	69.4	64.3	61.1	49.9	32.7	16.7	41.8
1969	15.2	19.9	25.6	42	51.1	63.2	67.2	68.7	57.7	46.5	36.2	16.4	42.5
1970	5	16.6	26.6	42.8	54.9	63.2	69.2	67.9	59.5	50.9	39.6	14.2	42.5
1971	8.6	19	25.3	41.3	59.8	64.5	66.7	65.9	62.9	52.9	32.4	19.4	43.2
1972	17.7	11.7	22.5	36.1	55.4	62.8	69.5	65.9	58.7	42.6	33	19	41.2
1973	20.2	14.3	38.1	45.1	55	67.5	71.1	72	58.7	49.1	34.4	21.8	45.6
1974	13.8	12.3	25	41.2	51.6	65.1	69.5	67.7	56.6	42.8	33.7	26.9	42.2
1975	19.7	16.9	25.4	37	61.3	65.4	72.3	69.4	57.1	48.1	38.6	15.9	43.9
1976	6	22.8	26.1	43.2	53.3	66.8	66.8	65.5	57.8	44.5	32.6	13.5	41.6
1977	9.8	21.3	37.8	45.6	58	62.5	69.5	66.8	59	46.1	36.9	19.9	44.4
1978	13	10.7	24	37.8	59.5	64.6	70	67.7	54.4	46.1	33.8	22	42
1979	16.7	7.1	34.1	44.3	57	64.3	71.2	65.4	58	46.9	40	27.1	44.3
1980	18	14.7	28.7	45.3	56.3	61.6	69.6	69.2	56.8	43	32.1	11.8	42.3
1981	6.7	31.2	32.2	45.5	56.4	64.9	69.8	65.9	57.1	42.7	35.2	26.2	44.5
1982	4.9	15.8	27.4	40.4	58.7	61.7	69.2	63.3	58.8	48.4	39.2	28.4	43
1983	18.2	21.3	32	41.7	52.6	65.9	71	68.5	61.9	47.5	35.1	18.9	44.6
1984	11.2	26.3	20.6	45.3	52.9	65.6	70.6	70.2	55.4	48.3	35.1	25.9	43.9
1985	7.9	18.3	29.8	44.4	56.5	60.8	68.1	65.5	60	47.5	34.2	17.8	42.6
1986	16.7	13.4	30.6	47.2	56.6	60.7	66.5	64.5	56.4	46	33.4	25.1	43.1
1987	14.7	12	31.3	48.4	54.5	65.2	70.7	64.3	58.6	44.2	34.2	26.2	43.7
1988	19.9	17.8	28.9	44.1	58.7	62.4	72.2	69.2	57.5	42.8	38.3	19.8	44.3
1989	21.5	16.6	24	40.5	56.8	65.1	70.3	65.9	58.7	48.8	33.2	3	42
1990	27.4	21.7	30.2	44.9	51.7	64.5	69.2	68.2	56.4	47.9	38.3	26	45.5
1991	14.8	23.3	31.3	47.7	58.8	66.4	70.7	69.7	56.4	50.5	36.2	21.5	45.6
1992	14	16.1	22.9	42.1	56.4	62.9	65.2	66	58.1	43.5	35.7	25.1	42.3
1993	16.9	5.4	24.8	43.2	57.6	64.9	72.9	70.3	58.2	46.1	35.4	22.6	43.2
1994	2.4	12	28.1	44.6	55	68.5	72.7	66.5	60.6	49.5	40.9	27	44
1995	22.4	15.6	33.7	40.5	57.3	69.2	72.7	69.6	56.2	53	30.8	16.6	44.8
1996	13.7	18.8	27.5	41.7	55.7	67.3	69.4	69.1	62	47.5	31.7	31.7	44.7
1997	15.8	20.9	26.8	43.9	52.8	69.1	69.9	66.8	58.9	46.6	33.3	22.7	44
1998	19.3	24.8	33.3	48.5	63.5	67.2	69.7	69.3	60.7	49.6	39.2	29.5	47.9
1999	11.5	21.9	27	43.4	59.3	66.6	71	64.8	61.6	44.9	41.4		46.7
2000	13.7	18	35.1	40	54.9	61	65.3	64.8	56	47	33.7	13.6	41.9
2001	14.2	15.9	24.5	42.6	57	65.3	66.1	69.5	58.7	48.7	40.5	29.2	44.4
2002	25.1	23.1	28.7	44.3	50.8	62.2	69.2	68.1	62.3	43.5	33.2	23	44.5
2003	8.4	9.7	25.2	39.4	54	63.4	68.5	68.4	60.5	44.8	37.1	22	41.8
2004	5.4	15.4	30.9	42	55.7	61.8	68.5	65	60.2	46.4	36.2	19.2	42.2
2005	12.3	18.2	24	44	51.2	69.5	70.5	69	62.3	49.2	38.1	20.9	44.1
2006	23.8	20.3	30.7	44.7	57.1	64.3	71.2	66.3	57.5	45.6	39.8	30.5	46
2007	19.1	10.9	26.9	42.1	55.2	65.5	67.3	66.8	60.9	52.1	33.9	20.3	43.4
2008	21.3	18	24.3	46.7	52.5	66.2		65.3	60	45.7	35.6	21.1	41.5
2009	11.1	20.5	31.2	45.3	54.5	62.7	66.9	67.9	57.9	44.8	39.8	22.9	43.8
2010	19.9	23.5	37.5	49	59	64.1	72.3	68.6	60.8	47.2	36.5	22.6	46.8
2011	14.2	19.6	29.3	45.1	57.9	66.9	72.5	68.5	62.9	49.2	41.9	28.2	46.4
2012		25.6	39.9	43.4	59.8	66	70.6	69.6	59.4	50.8	32.7	26.7	49.5
2013	18.9	19	29.9	42.8	57.7	63.4	70.4	66.6	57.6	49.3	32.4	17.7	43.8
2014	12.2	15.3	18.6	41.5	56.6	66.3	67.5	66.2	59.1	51.3	35.7	26.7	43.1
2015	10.5	2.4	22.9	43.5	60.5	62.9	69.1	68.4	64	45.1	40.6	36.7	43.9
2016	19.1	20.3	32.2	39.3	57	64.8	69.7	71.3	61.7	49.2	39	25.3	45.7
2017	25.3	26.2	24.3	46.8	54.9	64.2	68.5	66.9	62.8	54.7	34.6		48.1
2018	15.8	25.1	29.4	38.3	59.1	64.3	72.8	71.9	63.3	45.3	31.4	23.6	45
2019	13.2	17.2	26.5	42.6	53	63.5	72.3	66.8	59	48.9	29.8	24.6	43.1
2020	21.7	19.5	34.5	40	53.4	65.4	74.4	67.3	57	46.5	39.9	27.4	45.6
2021	18.7	16	32	46.6	55.2	67.9	66.6	71.4	60.7	53	35.1	27.5	45.9

2022	6	16.5	30	43.6	58.2	64	69.3	68.8	58.9	47.9	39.1	27.3	44.1
2023	23.6	20.7	29.7	46.3	54.5	64.1	70.7	65.8	61.9	52.5	34.7	30.9	46.3
2024	23.2	26.3	35.3	45	59.6								37.9

Year	Jan	Feb	ar	Apr	ay	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1960	24.6	26.1	22.4	48.6	58.6	65.6	68.5	67.7	64.5	50.2	43.2	23.4	46.9
1961	19.4	27.4	34.3	41.7	53.8	65.3	70.8	69.9	68.5	55.4	40.6	29.5	48.1
1962	22.9	21.4	33.5	45.6	62.4	66	67.5	68.9	58.9	51.7	36.9	26	46.8
1963	19.3	17.9	35.6	46.2	54.3	67.1	70.8	65.5	56.7	57.3	44.2	21.7	46.4
1964	28.3	24	34.4	47.2	60.3	65.8	73.8	66.2	61.2	48.6	42.3	29.6	48.5
1965	21.6	25.7	29.5	41.3	60.1	64.4	67.5	68.4	63.8	48.8	39.8	34.6	47.1
1966	22.5	25.5	36.6	44.4	52.9	67.8	73	68.8	59.2	50	43.5	30.7	47.9
1967	31	21.3	32.5	46.4	49.1	70.3	69.4	67.5	60.3	52.1	36.3	32.3	47.4
1968	19.7	20.8	36	49.4	53.2	64.7	70.6	69.4	64.8	53.8	41.2	27.7	47.6
1969	25.1	25.9	32	47.6	55.6	65	70.7	72	63.6	50.9	40.1	25.1	47.8
1970	18	23.7	30.8	48.4	59.5	68.1	72.2	70	62.9	53.9	41.4	25.5	47.9
1971	19.5	26.9	28.5	41.1	54	67.5	68.8	68.8	67.4	59	38.4	30.9	47.6
1972	26	23.4	30.3	42.2	60.4	65.2	73	69.8	64.3	47.6	37	33	47.7
1973	28.7	22.2	42.5	48	56	70.7	73.4	73	62.5	55	43	31.2	50.5
1974	27.1	22.4	33	49.4	53.9	65.7	71.3	70.6	59.1	47.6	39.5	31.4	47.6
1975	29.4	28.4	31.5	39.3	63.1	67	72.9	70	58.4	53.1	47.2	27.8	49
1976	19.8	33.3	37.1	48.6	55.3	69.8	69.2	68.4	60.8	47.4	35.4	23.5	47.4
1977	15.5	25.4	39.8	47.9	60.7	64.7	72.9	68.6	62.6	49.4	43.6	28.4	48.3
1978	22.9	16.2	29.6	43.6	60.2	67.3	72.5	71.6	62.4	51	41	30	47.4
1979	21.5	13.7	38.5	44	56.4	66.2	72.2	67.1	61.3	50.2	43	32.3	47.2
1980	24	19.7	32.4	47.8	60	63.1	72.9	74.2	63.7	48.7	38.7	24.6	47.5
1981	15.7	32.3	34.5	48	57.1	67.3	71.9	69.4	59.7	47.2	39.8	28.6	47.6
1982	16.1	22.9	33.5	43.2	60.9	63.6	72	66.1	62.8	52.7	43.4	37.4	47.9
1983	27.4	29.1	37.2	43.9	53.8	66.7	73.8	70.7	63.9	52.9	40.7	25	48.8
1984	20.4	33.2	26.5	47.5	52.5	66.8	69.2	71.9	60.5	54.8	40.7	35.8	48.3
1985	21.9	25.6	36.6	49.6	58.6	61.7	68.7	68.7	63.7	50.9	41.4	25	47.7
1986	24.9	24.4	37	47.9	59.8	63.3	69.7	65.7	59.8	49.9	36.8	31.7	47.6
1987	25.3	23.6	37.1	49.7	59.9	67.8	72.7	67.3	61.5	47.1	40.6	32.6	48.8
1988	25	23.6	34.6	44.9	58.7	64.1	73.7	71	60.1	45.8	42.6	29.4	47.8
1989	30.3	22.4	32.3	42	56.3	67.4	72.8	68.5	61.7	52.5	38.1	17.1	46.8
1990	33.5	29.3	37.3	48.8	54.4	67.2	70.7	69.9	60.6	52.1	42.4	33.8	50
1991	25.1	30.5	37	50	62.8	68.3	72.3	70.3	60.5	52	39	30.6	49.9
1992	26.2	27.2	30.2	44	57	63.5	66.6	66.3	60.9	46.3	38.9	30.1	46.4
1993	27.4	18.7	30	46.9	56.5	65.5	72.4	71.3	59	48	38.9	28.3	46.9
1994	14.9	21.1	32	47.9	54.1	67.8	73.5	69.1	62.4	52.4	45.8	34.8	48
1995	32	23.8	38.5	41.5	57.2	69.5	72.9	73.2	60.4	55.2	35.2	25.2	48.7
1996	23.7	24.6	29.6	43.2	54.6	68	68.1	69.3	62	51.2	34.3	33.6	46.9
1997	24.3	30.5	32.8	43.8	50.3	67	67.8	66.2	59.3	49.1	37.4	31.2	46.6
1998	31.6	32.6	38.1	47.7	62.9	65.7	69.6	69.7	62.6	51.2	41.8	34.6	50.7
1999	22.9	30.5	30.8	45.3	59.5	68.3	74.2	67	64	50.9	44.9	32.1	49.2
2000	23.2	30.1	41.2	45.1	59.5	65.8	67.1	67.5	60.9	51.7	38.4	22.6	47.8
2001	26.6	28.5	30.3	47.7	59.5	66.7	69	72.2	61.2	52.3	47.1	35.8	49.7
2002	32.6	31.9	35.1	48.2	53.4	67.6	73.9	72.4	67.7	49.9	40.5	28.4	50.1
2003	18.1	20.9	34.1	43.3	55.1	64.7	70.5	70.7	62.5	48.2	42.2	32.3	46.9
2004	17.2	25	38.6	45.7	58.7	62.6	68.3	66.9	64.2	50.2	41.1	29.3	47.3
2005	21.6	25.8	29.7	46	52.2	70.5	73	72.8	65.5	53.4	43.7	28	48.5
2006	35.4	28.4	36	48	58.9	67.8	75	70.3	62.1	50.6	45.9	39	51.5
2007	30	20.3	35.3	44.6	59.5	69.5	69.7	71.7	64.7	58	38.5	29.3	49.3
2008	30.4	26.4	31.5	52.3	54.8	69.8	72	67.6	63.1	49.6	39.3	30.6	48.9
2009	19.1	29	35.8	46.6	56.8	63.5	66.2	69.3	60.7	48.2	41.9	27.9	47.1
2010	24.2	25.5	39.9	52.4	60.5	66.8	73.6	71	61.9	50.7	39.9	26.2	49.4
2011	21.9	24.5	33.8	46.4	58.8	67.2	74.6	69.6	64.3	51.5	45.9	35.2	49.5
2012	30.2	31.8	47.3	45.9	63	68.4	74.5	70.6	62	52.8	39.3	36.2	51.8
2013	30.1	26.8	33.5	46.6	61.4	66.4	73	69.3	61	53.3	37.5	28.5	48.9
2014	20.6	21.3	27.7	46.1	59.8	68.9	69.3	68.2	62.9	53.9	38.7	34.4	47.7
2015	19.5	12.2	30	47.6	64	65.9	70.9	69.5	67.9	51	46.6	42.2	48.9
2016	27.4	29.5	40.1	42.3	58.5	67.5	74.8	75.9	66.8	54.2	45.2	31.3	51.1
2017	31.4	35.5	32.9	51.5	57	67.7	71.1	68.6	65.6	57.7	40.5	26	50.5
2018	25	33.6	32.2	40.9	64.6	67.6	75.2	73.6	67.7	50.9	36.4	33.8	50.1
2019	23.9	28.7	33.5	46.9	56.5	66	74.1	70.1	64.6	53.6	35	31.5	48.7
2020	31.1	28.6	40.1	42.4	55	67.9	75.6	70.7	62.2	50.9	45.5	32.9	50.2
2021	27.9	23.9	39.3	47.2	56.9	70.8	69.6	73.8	64	57.6	40.6	36.7	50.7

2022	19.5	26.1	37.4	46.4	60.6	67.4	72.1	72.5	62.5	50.6	43.4	32	49.2
2023	32.8	31.8	35	50.2	55.6	65.8	71.9	68.6	64.6	55.5	40.2	39.9	51
2024	30.1	34.7	41.5	49.1	63.3								43.7

Year	Jan	Feb	ar	Apr	ay	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1960	24.7	26.9	24.3	49.5	59.8	66.6	69.4	68.7	63.7	50	43.8	23.7	47.6
1961	18.7	25.9	33.2	42.9	55.5	66.6	71.7	70.4	69.5	55.8	40.6	29.1	48.3
1962	24	21.5	34.6	47.3	62.3	68.3	69.2	69.1	59.6	51.1	35.5	24.4	47.2
1963	20.8	18.4	34.2	45.6	54.7	66.6	71.7	66.1	57.2	56.2	44.9	20.8	46.4
1964	25.9	23.7	35	46.5	61.6	65.9	73.2	67.5	61.6	49.5	43.6	29.6	48.6
1965	20.5	24.6	30.3	42.2	59.3	63.7	67.5	69	62.8	47.9	38.7	32.1	46.6
1966	18.9	23.1	34.3	42.6	51.2	65.7	71.1	70.4	59.5	49.5	42.9	29.2	46.5
1967	30.6	19.2	31.6	44.9	50.2	69.5	67.6	66.6	60.7	51.8	37.6	32.6	46.9
1968	18.5	21.1	33.2	48.1	53.6	64.8	69.9	68.8	64.8	52.5	40	27.2	46.9
1969	24.3	23.6	30.4	46.9	55.6	64.5	69.9	71.3	63.7	51.1	40.4	23.7	47.1
1970	16	24	31.6	47.2	57.5	63.4	69.7	68	61.4	52.3	41.7	25.4	46.5
1971	18.5	26.5	31.2	42.8	55.8	67.9	69	67	65.5	56.6	36.8	33.1	47.6
1972	26.4	22.9	29.3	40.4	58.5	64.5	72.9	69.2	63.5	46.5	37	30.8	46.8
1973	28.4	21.4	42.6	46.8	54.3	69.6	72.7	73.5	62	53.7	40.7	29.5	49.6
1974	26	21.6	32.3	48.8	54.1	65.6	69	68.8	59	46.5	40.6	30.4	46.9
1975	29.3	28	31.7	39.8	62.9	67.1	71.7	68.2	57.1	53.2	46.6	27.6	48.6
1976	18.1	32.4	36.6	48.3	54.2	67.9	66.7	66	59.8	46.8	35.8	22.6	46.3
1977	15.7	26	40	48.1	60.3	62.7	70.8	67.3	62.5	50.5	43.9	27.3	47.9
1978	21.2	17.5	29.4	42.2	58.2	64.8	71.9	71.6	59.9	49.5	40.2	30.5	46.4
1979	22.4	12.9	39	45.1	58.6	65.9	71.7	67.8	61.4	50.9	44.5	33.4	47.8
1980	25.5	19.8	32.3	47.8	59.8	63	72.5	73.8	63.4	48.7	37.6	22.6	47.2
1981	15	33.7	36.4	50	59.1	68	73.3	70.4	61.6	47.9	39	28.9	48.6
1982	14.8	25.1	33.2	43.8	59.4	63	70.4	65.3	60.6	50.4	43.9	34.1	47
1983	23.4	26.4	35.7	44.2	53.6	66.7	72	69	62.5	50.3	39	22.5	47.1
1984	18.6	32	24.5	45.9	52.4	65.4	68	68.7	57.6	52.2	38.2	33.4	46.4
1985	21.9	27.3	36.3	47.8	59.5	62	69.8	68.9	63.5	51.4	41.2	26	48
1986	23.9	23.4	37.3	49.2	60.9	64.3	71	66.7	60.4	49.7	36.8	31.6	47.9
1987	23.8	21.6	37.9	51.8	60.3	68.3	73.6	68.5	61.1	47.7	40.9	32.3	49
1988	23.1	24.6	34.4	45.7	59.7	64.1	74	71.7	60.8	46.6	43	27.7	48
1989	28.5	22.7	32.8	43.4	58.2	67.3	71.1	68.2	61.8	51.7	38.8	14.7	46.6
1990	33.2	29	37.5	49.3	54.5	67.3	71.8	70.3	61.2	52.8	42.2	33.5	50.2
1991	24.3	29.8	37.7	51	62.7	68.4	72.3	71.8	60.5	53.1	40	30.7	50.2
1992	24.7	26.4	29.3	44.4	57.5	64	67.3	67.5	61.3	46.6	39.7	31	46.6
1993	27.5	17	30	46.9	58	65.1	72.4	70.6	60	48.2	38.6	26.9	46.8
1994	12.6	19.2	30.8	47.9	54.1	68	72.9	67.5	60.9	50.6	44	31.9	46.7
1995	30.5	20.7	37.4	42.4	56.9	69.5	73.5	71.9	59.1	54.7	35.3	24.2	48
1996	22.5	24.7	29.8	43.2	54.9	68.2	69.4	70.3	63.1	50.6	34.7	34.8	47.2
1997	23.8	30.3	33.5	44.2	52.2	67.9	69.8	68.4	60.1	49	37.2	30.4	47.2
1998	29.6	31.2	37.8	48.1	62.9	66.3	70.1	71.1	64	51.8	41.7	35.4	50.8
1999	22.5	29.6	31.5	46.5	60.7	69.8	75	68.9	64.8	49.5	44.3	30.9	49.5
2000	21.3	28.8	40	44.3	59.1	65.6	67	68.1	60.7	50.9	38.4	21.6	47.2
2001	25.6	27.6	29.9	47.8	59.3	67.2	69.4	73.6	62.3	53.3	47.3	36.8	50
2002	32.9	32.3	36.3	48.5	54	68	73.7	73	66.9	50.4	40.6	28.7	50.4
2003	18.8	21.6	34.2	43.8	56	64.6	71.2	71.5	63.2	48.6	42.2	30	47.1
2004	14.7	23.5	37.5	46.1	60.3	63.7	69.5	68.6	65	51.4	41	29.1	47.5
2005	21	25.7	30.7	48.3	54.2	72.7	74.7	73.7	65.4	52.1	44	26.2	49.1
2006	33.4	27.2	34	47.8	58.2	67.2	74.1	69.2	60.7	49.2	44.7	37.4	50.3
2007	27.2	18.5	31.5	43.7	58.5	68.3	69.8	70.8	65.3	58	37.9	27.9	48.1
2008	29.5	25.7	31.6	51.6	53.7	69.7	71.3	66.9	62.7	48.3	38.2	28.9	48.2
2009	18.2	26.3	35.3	48.2	57.5	64.7	68	70.9	61.3	49	43.5	28.1	47.6
2010	23.2	25.9	40.5	51.8	61.1	67.5	74.5	71.4	63.1	51.3	40.8	25.5	49.7
2011	21	23.8	33.3	49.2	62.8	68.9	75.8	71.9	66	52.6	46.8	35.9	50.7
2012	31.1	32.3	46.5	45.9	64.3	68.8	76.2	73	63.6	54.2	39.3	35.3	52.5
2013	27.7	25.3	33.6	46.1	60.4	66.8	74.5	70	61.3	53.8	37.7	27.9	48.8
2014	19.9	20.9	25.7	46	60.4	68.8	71.4	69.2	63.8	54.9	39.7	32.1	47.7
2015	17.3	9	27	46.4	64.1	66	71	70.5	67.9	49.9	46	41.1	48
2016	25.9	27.6	39.7	42.6	58.2	66.3	73.3	74.1	64.8	51.6	41.8	29.6	49.6
2017	29.1	33.3	30.1	50.9	55.7	65.9	70.3	68.2	64.5	57	38	24.1	48.9
2018	21.5	32.2	30.8	39.5	62.8	65.6	73.7	72.5	65.6	49.9	34.5	30.7	48.3
2019	21.4	26.6	32.4	48.2	57	66	74.8	69.7	63.9	53.5	36	30.5	48.3
2020	31	28.5	40.3	44.4	56.8	69.3	77.1	73	63.8	51.9	45.6	33.8	51.3
2021	27.2	25.1	38.6	49.2	59	72.6	72.4	75.5	66	59	41.1	38	52

2022	19.5	27.8	37	45.8	61.5	66	74.1	74.3	64	52.5	45.2	32.1	50
2023	32.3	31.6	35	52.1	57.8	67.4	74.5	69.8	65.5	56.7	40.3	38.6	51.8
2024	29.6	34.5	41	49.7	64.6								43.9

Note: NOAA NOWDATA does not have UTICA. The closest weather station i.e. Boonville had the historical data fro 1960 was used

Year	Jan	Feb	ar	Apr	ay	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1960	19.3	21.9	19.8	43.7	56.5	61.6	65.1	64.9	59.4	46.4	38.5	18.1	42.9
1961	12	21.5	27.8	37.8	51.1	61.7	66.3	64.9	65.5	50.5	34.7	23	43.1
1962	17.1	18.2	29.5	42.6	57.8	63.3	64.5	64.6	55	46.2	31.8	21	42.6
1963	15.5	13	29.4	42	52.5	62.8	64.7	61.6	53.4	54.4	40	13.5	41.9
1964	21.4	18.1	28.7	41.6	56.5	61.3	68.9	60.9	56.3	45.2	38.1	23.7	43.4
1965	13.9	18.4	25.3	36.4	55.9	59.6	63.1	63.3	58.6	44.2	32	25.8	41.4
1966	14.6	19.8	28.9	38.3	47.6	62.3	67.2	64.7	53.6	44.4	38.8	23.2	41.9
1967	23.7	12.8	25.4	40.3	44.8	66.1	65.6	63.2	56.9	46.5	29.3	23.9	41.5
1968	12.2	12.4	31.4	47.3	50.1	59.9	65.6	62.9	59.4	48.5	32.5	17.4	41.6
1969	17.8	19.6	25.5	43.3	52.1	61.4	65.5	66.8	58.6	46	34.1	17.6	42.4
1970	9.7	18.1	25.6	42.9	54.9	61.8	66.8	65.7	58.5	49.9	37.4	17.8	42.4
1971	12.4	20.7	24.3	35.7	53	63.7	65.1	63.8	61.1	53.2	31.6	24.7	42.4
1972	17.9	15.2	23.4	33.7	56.1	59	65.9	62.5	57.2	40.3	29.8	23.3	40.4
1973	20.9	16.6	37.7	42.9	50.2	64.4	67.5	67.9	57	50	34.6	23.5	44.4
1974	20.4	16.2	26.2	44	48.8	61.5	65.6	65.8	55.1	41.8	35	25.4	42.2
1975	21.9	21.6	24.2	34.9	59.4	62.8	69.1	66.5	54	49	41	20.7	43.8
1976	9.5	22.4	29	42.9	49.5	65	63.5	63	54.3	40.4	27.5	13.5	40
1977	7.3	17.8	33	41.6	55.6	59.2	65.2	62.5	55.9	43.4	37.1	20.1	41.6
1978	14.3	11.1	22.7	36.7	54.5	59.5	65.3	64.6	54.2	42.6	34.2	21.6	40.1
1979	15.8	7.1	31.3	40.3	54	61.1	68.9	64.5	56.6	45	38.7	24.2	42.3
1980	18	13.2	24.8	42.1	53.9	58.6	66.9	68.8	58.3	43.2	30.1		43.4
1981	8.8	26.5	31.4	44.1	55.5	62.7	67.3	64	53.9	41.3	33.7	22.9	42.7
1982	7	17.8	25.5	36.1	55.4	57.8	65.6	60.3	57.2	47.1	36.8	28.5	41.3
1983	18.4	22.5	30.9	37.9	49.3	62.3	67.6	65	59.5	45.9	35.7	17.7	42.7
1984	14	27.5	20.7	43.2	49.1	61.9	65.4	66.5	54.1	50.1	33.8	28.8	42.9
1985	12.7	20.3	29.1	42.6	54.3	57	65	63.7	59.2	47.4	36.7	18.9	42.2
1986	16.4	17	29.9	46.1	56.7	58.8	65.3	62.2	55	44.5	30.7	24.5	42.3
1987	17.6	15.7	33.5	46.6	54.3	63.3	68.2	63.5	56.4	43.7	34.2	25.3	43.5
1988	15.1	18.2	26.8	40.8	56.2	60.3	69.9	66.5	55.7	41.6	35.9	19.9	42.2
1989	20.1	16.4	26.6	37.5	54.4	61.9	66.2	63	56.2	46.5	31.5	7.2	40.6
1990	26.2	21.9	31.6	42.7	49.7	61.5	66	64.4	55.5	47.6	35.9	26.3	44.1
1991	16.1	22.9	30.6	44.8	57.6	63.9	65.8	66.1	54.1	47.6	33.4	21.5	43.7
1992	16.6	19.4	22.1	39	53.2	58.6	61.4	61.4	55.9	40.3	32.6	23.6	40.3
1993	20.5	10.7	25.1	41.4	52.9	59	66.6	65.3	54.5	42.4	33.5	21	41.1
1994	5.9	13.2	25.2	40.3	50.4	63.5	67.4	62.2	55.2	46	38.3	26.3	41.2
1995	24.7	13.4	32.3	35.7	51.4	64.2	67.3	66.6	54.1	49.7	29	16.2	42.1
1996	15	17.4	24.1	37.4	50	63.2	64.2	65.5	58.5	45.9	29.4	28.4	41.6
1997	15.3	22.6	25.6	38.7	47	62.8	63.2	63.1	55.2	44.2	30.9	23.9	41
1998	23.8	27.8	31.1	45.3	59.3	61.2	64.5	65.5	58.5	47	34.4	29.9	45.7
1999	16.6	23.5	26	41.9	56.4	64.9	68.2	63.8	60.6	43.2	39.7	25.5	44.2
2000	14.1	22.2	34.9	39.4	55.5	61.7	62.4	63.7	55.5	47.2	33.6	17	42.3
2001	19.4	20.6	24.7	40.9	55.7	61.8	63.6	68	58	48.1	39.6	30.9	44.3
2002	24.6	23.4	27.8	42.5	48.1	61.6	67	67.1	61.4	43.1	32.5	21.1	43.4
2003	10.4	14.9	26.6	37.4	52	60.1	65.9	67	59.2	43.9		27	42.2
2004	7.2	16.2	30.7	40.5	56.1	59		63.2	59.6	45.1	34.9	20.8	39.4
2005	13.7	20.4	23.8	43.4	49	67.5	68.6	67					44.2
2006	26.7	20.9	26.8	42.8	54.2	61.8	67.8	64.3	55.4	43.2	39.4	29.7	44.4
2007	19.2	10.7	24.5	37.6	53.6	63.6	63.7	65	59.3	51.8	31.9	21	41.8
2008	21.7	18.4	23.6	46.1	48.9	64	65.7	62.2	57.7	43.5	31.8	21	42.1
2009	10.5	19.4	27.9	42.2	51.7	59.2	62	65	55.7	42.8	38.8	19.5	41.2
2010	17	19.3	35.3	46.3	56.4	61.5	68.4	64.9	57.7	45.6	33.8	19.1	43.8
2011	14.5	16.9	25.3	41.2	55.5	61.9	67.9	64.4	59.2	46.4	39.5	26.5	43.3
2012	21.1	23.6	38.1	39.7	57.4	60.9	68.2	66	56.8	47.5	32.5	26.5	44.9
2013	18.7	17.3	26.2	37.8	54.2	60.4	67.6	62.6	54.8	47.3	29.9	20.4	41.4
2014	11.5	14.5	17.3	39	54.2	61.8	64.5	62.5	56.9	48.5	31	25.7	40.6
2015	11.1	4.2	20.5	38.3	58.8	59.4	64.5	65	62.8	43.8	39.7	34.8	41.9
2016	18	21.4	32.6	37.3	53.3	61.1	67.3	67.7	60.1	46.6	36.5	22.4	43.7
2017	22.8	24.2	21.9	44.5	49.9	60.5	64.9	63.1	60	52	31.3	17.8	42.7
2018	13.3	23.5	25.5	32.9	56.5	60	68.9	67.6	60.2	43.5	28.8	22.8	42
2019	13.4	18.4	23.8	40	50.1	60.1	68	63.9	57.5	46.6	28.3	22.9	41.1
2020	22.7	20.8	31	36.7	50.6	62.3	69.9	65.9	57.1	44.8	37.4	25.4	43.7
2021	18.1	16.6	29.5	42.4	52	64.3	63.3	66.7	58.3	51.9	33	27.4	43.6
2022	9.5	17.9	28.2	39.8	55.9	60.3	65.8	65.8	56.9	46.5	36.8	24.8	42.4
2023	24.9	21.7	27.6	44.3	51.8	60.8	67.5	62.3	59.2	50.4	31.2	30.8	44.4
2024	21.5	25.2	32.5	41.8	57.3								35.7

Year	Jan	Feb	ar	Apr	ay	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1960	18.9	22.9	21.3	46.3	59.8	64.4	67.4	68.2	62.8	48.4	42.2	20.9	45.3
1961	12.2	22.1	31.4	41.7	53.1	63.2	70.3	68.7	68.8	53.3	39.3	26.1	45.9
1962	18.4	15.2	32.1	44	59.6	65.5	67.2	67.6	58.5	49.5	33.9	21.8	44.4
1963	17.3	14.4	30.7	43.1	53	65.8	71.5	65.2	56.3	56.1	44.3	14.5	44.4
1964	25.3	21.2	33.5	45.6	59.2	64.1	73.1	64.9	60.5	47.6	41.4	26.8	46.9
1965	16.9	22	28.9	39.7	57.8	63.2	66.4	68.4	62.3	47.3	36.3	30.5	45
1966	16	20.3	33.5	42.6	51.6	65.5	71.5	69.2	58.3	48.9	42.6	26.1	45.5
1967	28.4	16.8	27.9	44	48.9	69.4	70.3	68.2	59.9	50.2	35.2	28.5	45.6
1968	12.7	15.3	33.4	48.9	52.9	63.4	70.3	66.5	64.6	52.9	36.1	19.8	44.7
1969	19.1	22.5	28.9	44.7	53	64.7	69.7	70.4	62	48.5	38.5	19.9	45.2
1970	7.4	20.9	28.4	45.4	57.4	64.9	70.6	69.6	62	52.6	40.9	18.8	44.9
1971	15	22.6	26.8	39.9	54.8	65.2	68.5	67.3	64.9	56	36.5	27.1	45.4
1972	23.1	17.2	26.6	37.9	58.4	63.4	69.8	66.9	61.8	44.5	35.5	25.7	44.2
1973	24.8	17.7	40.2	46.1	54.1	68.1	72.4	73.4	61	52.3	39	26	47.9
1974	21.2	16.8	29.7	45.6	51.9	65.4	69.1	69.6	58.8	43.8	38	29	44.9
1975	25.2	24	27.8	37	62	66.5	72.7	69.2	57.8	51.6	44.3	23.1	46.8
1976	11.7	26.8	33.2	46	52.8	68	67.4	66.6	58.1	44.2	33.4	17.8	43.8
1977	10.3	21.9	36.9	45.2	58.3	63.2	71	67.6	60.3	46.9	41.1	24.5	45.6
1978	15.6	11.8	25.3	40.4	57.5	64.5	71.1	69.7	57.3	46.5	37.5	25.7	43.6
1979	18.9	7.3	36.1	43.5	57.1	65	71.2	66.8	60.2	48.4	43	29	45.5
1980	20.9	15.1	28.7	45.2	57	61.4	70.1	71.3	60.2	45.9	34.3	17.1	43.9
1981	8.3	31	33	47.1	56.3	65.3	70.4	68	59	44.4	37.3	26.9	45.6
1982	11.1	20.2	30	41.4	58.8	62.5	69.8	64.7	61	49.6	41.2	33.4	45.3
1983	21.9	24.4	35	42.5	53.5	65.7	72.2	69.1	63.4	49	37.8	21.9	46.4
1984	15.6	28.6	22.5	46	53.2	66.1	69.7	70.6	57.5	51.3	36.9	31.9	45.8
1985	13.3	20.5	32.3	45.2	57		68.7	67.4	61.3	49.5	38.2	21.8	43.2
1986	18.9	17.4	32.5	48.7	58.5	63	69.8	67.1	58.8	48.5	35.8	29.1	45.7
1987	21.1	15.9	35.4	48.9	57.9	66.8	72.5	67.9	61	47.2	37.3	30.8	46.9
1988	20.7	20.5	30.4	44.6		63.4	73	71.5	58.7	45.8	41.1	24.5	44.9
1989	25.1		27.4	39.9	56.6	67	71	68.6	61.7	51.5	37.8	7.6	46.7
1990	30.8	24.8	34.9	47.4	53.9	65.3	70.3	69.9	60.1	50.6	40.6	31.5	48.3
1991	19.6	26.7	34.6	48.1	61.2	66.4	71	69.3	58.8	51.7	37	26.4	47.6
1992	20.2	21.9	24.9	42.9	56.3	62.9	65.4	66.5	60.1	44	37.2	27.5	44.2
1993	23.3	11.7	26.6	44.3	56	63.6	71.3	70.5	59.9	47	36.8	24.1	44.6
1994	5.4	14.8	27.8	44.4	53.4	67.5	73	67.1	60.2	49.7	42.2	29.1	44.5
1995	26.3	17	34.3	39.9	55.5	69.4	71.9	70.8	58.8	53.5	33.5	20	45.9
1996	17.4	20.2	27.1	41.4	54	67.2	69.1	71	63.7	49.2	33.3	33.2	45.6
1997	18.6	25.8	29.1	41.8	51	67.9	69.2	67	59.5	48.3	36	27.7	45.2
1998	25.1	29.3	34.1	47.7	63	66.4	70.1	70.4	62.1	50.5	38.4	35.1	49.4
1999	17.8	26.9	28.5	45	59.9	69.8	72.6	67.8	65.2	47.7	44.1	27.8	47.8
2000	18.3	23.9	37.8	42.6	58.3	63.8	67.3	68.2	59.9	49.8	36.5	17.8	45.3
2001	21.1	23.9	28.5	45.4	60	66.4	68.6	73.6	62	51.2	44.3	34.2	48.3
2002	28.4	27	32.1	45.5	51.8	65.4	71.7	71.7	66.3	47.4	35.6	24	47.2
2003	11.8	15.5	30	40.2	56.4	64.4	70.5	71	63.8	48.1	40.3	28.2	45
2004	10.5	19.9	35	44.2	59.3	63.3	69.7	67.4	63.9	50.2	39.6	25.3	45.7
2005		21.8	28.6	46.3	53	71.4	73.4	72.2	64.6	51.7	41	23.5	49.8
2006	29.5	21.2	30.9	46.9	58.7	65.9	72.8		60	47.9	43.5	35.1	46.6
2007	22.9	13.7	30	43.2	55.9	68.1	69.2				36.7	25.6	40.6
2008	27	22	26.9	50.3	53.3	68.3	70.5	67.2	61.8	47.9	36.1	26.2	46.5
2009	12.6	21.9	32.4	45.2	56.4	63.5	67.2	69.9	60.9	46.5	42.3	25	45.3
2010	20.5	21.2	38	50	60.5	65.9	72.9	70.3	62.3	49.5	38.3	22	47.6
2011	15.6	16.5	29.8	44.9	58.9	67.7	73.1	70.3	64.8	51.1	44.4	30.2	47.3
2012	25.5	28.6	43.5	42.8	62	67.8	74.3	71.9	62.5	52.7	37	30.7	49.9
2013	23.4	21.4	31.3	43.5	60	65	73.2	68.5	60	51.9	34.8	23.3	46.4
2014	15.4	17.4	21.8	43.6	57.5	67.9	69.3	68.1	61.6	53.3	35.5	30.1	45.1
2015	13.8	5.3	24	43.4	63	64.3	69.9	70	67.2	47.4	44.4	40	46.1
2016	23.1	23.4	35.9	41	57	65.6	72.7	74	64.5	51.4	40.6	28.5	48.1
2017	27.7	30	26.6	48.3	55	65.5	69.6	68.1	63.1	55.8	37.1	21.2	47.3
2018	17.8	27.4	29.6	37.8	61.3	65	74.6	72.6	65.2	47.1	33.2	27.3	46.6
2019	17.2	22.5	27.8	43.8	53.5	63.8	72.6	68.5	61.1	51	31.8	26.2	45
2020	27.2	24.3	36.1	41.3	54.8	66.6	75.2	69.6	60.2	48.8	43.3	29.3	48.1
2021	21.8	18.3	34.4	46.1	55.1	69.1	67.8	72	62.1	55	37.7	31.7	47.6

2022	10.6	21	32	44.4	59.7	65.2	70.6	71.5	61.2	50.2	40.4	29.2	46.3
2023	27.4	24.3	31	47.3	53.9	64.2	70.4	66	62.1	53.2	36.6	34.5	47.6
2024	24.3	29.3	36.1	45.4	60.5								39.1
ean	19.3	20.8	31	44.2	56.6	65.6	70.6	69.1	61.4	49.6	38.5	26.2	45.9

Estimation and Extrapolation of Climate Normals and Climatic Trends

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ABSTRACT

WMO-recommended 30-yr normals are no longer generally useful for the design, planning, and decision-making purposes for which they were intended. They not only have little relevance to the future climate, but are often unrepresentative of the current climate. The reason for this is rapid global climate change over the last 30 yr that is likely to continue into the future. It is demonstrated that simple empirical alternatives already are available that not only produce reasonably accurate normals for the current climate but also often justify their extrapolation to several years into the future. This result is tied to the condition that recent trends in the climate are approximately linear or have a substantial linear component. This condition is generally satisfied for the U.S. climate-division data. One alternative [the optimal climate normal (OCN)] is multiyear averages that are not fixed at 30 yr like WMO normals are but rather are adapted climate record by climate record based on easily estimated characteristics of the records. The OCN works well except with very strong trends or longer extrapolations with more moderate trends. In these cases least squares linear trend fits to the period since the mid-1970s are viable alternatives. An even better alternative is the use of "hinge fit" normals, based on modeling the time dependence of large-scale climate change. Here, longer records can be exploited to stabilize estimates of modern trends. Related issues are the need to avoid arbitrary trend fitting and to account for trends in studies of ENSO impacts. Given these results, the authors recommend that (a) the WMO and national climate services address new policies for changing climate normals using the results here as a starting point and (b) NOAA initiate a program for improved estimates and forecasts of official U.S. normals, including operational implementation of a simple hybrid system that combines the advantages of both the OCN and the hinge fit.

1. Introduction

Climate services of different countries provide customers with statistical information about climatic variables (mainly at the surface) that is based on long-term observations at meteorological stations. This statistical information mainly consists of parameters of the statistical distribution of climatic variables. The most important of these parameters are climatic normals, which are considered to be official estimates of the expected values of climatic variables. The importance of normals derives from their use as a major input for an enormous number of critical societal design and planning purposes.

Because of the widespread need for representative

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normals along with other climate statistics, it is crucial that climate services deliver the best estimates possible. This is universally not the case, however; currently there are either no or suboptimal published estimates of the *current* climate, that is, the expected values of climatic variables today, at time and space scales relevant to the myriad applications for which they are needed. The reason for this is threefold:

1) The contemporary climate is changing at a pace rapid enough to already have important impacts. Climate statistics, including normals, are nonstationary. In the case of U.S. climate divisions, there are many instances in which linear trend estimates (discussed later) yield changes in seasonal temperature and precipitation normals over the last 30 yr that are between 1 and 3 standard deviations of the residual variability. Examples are presented in Fig. 1—note in particular the January–March (JFM) temperature trends in the western United States and October–December precipitation trends in the south central United States. The existence of these trends is one of two sources [the other is El Niño–Southern Oscillation (ENSO) variability] of virtually all of the skill inherent in official U.S. seasonal forecasts, because these forecasts are referenced to the official 1971–2000 U.S. normals (Livezey and Timofeyeva 2007, manuscript submitted to *Bull. Amer. Meteor. Soc.*). In fact, it is impossible to exploit optimally the ENSO signal in empirical seasonal prediction without properly accounting for the time dependence of normals (Higgins et al. 2004).
2) Current physical climate models cannot credibly replicate the statistics of today's climate at scales needed for practical applications, because they cannot credibly replicate recent past climates at these resolutions. These models seem to reproduce the time evolution of the global mean annual temperature well but often fall far short for seasonal mean temperatures at subcontinental and smaller spatial scales at which the information can be practically applied (Knutson et al. 2006). The situation is worse for replication of the evolving statistics of the precipitation climate. We consequently are not in a position to develop accurate estimates of current normals and other statistics through generation of multiple modeled realizations of the climate. However, dynamical climate models may facilitate the development and testing of competing empirical approaches (see section 4).
3) Since the early 1990s, little research and development attention has been devoted to finding improved alternatives to existing (and often misapplied) empirical approaches for estimation and extrapolation of normals, which include linear trend fitting and the so-called optimal climate normal (OCN; Huang et al. 1996; Van den Dool 2006) used in seasonal prediction by the U.S. National Weather Service (NWS) of the National Oceanic and Atmospheric Administration (NOAA).

The consensus expectation of the climate community is that the global climate will continue to change, and therefore the fundamental problem emphasized here will not disappear. In the meantime a great deal of research attention and resources are being devoted worldwide to improvement of global climate models, but it will take many years before these models can be leveraged directly for monitoring current climate at time and space scales practical for applications. In contrast, viable alternatives to current empirical techniques do exist for estimation and extrapolation of time-dependent normals and other climate statistics. Therefore, they should be explored and adopted, including for official use to supplant current practices.

The intent of this paper is to highlight the problem of empirical estimation and extrapolation of time-dependent climate statistics, with a particular emphasis on normals, to raise the problem's profile and encourage increased attention to it in the applied climate community, and to effect changes in official practices. To meet these goals, we will analyze and compare the expected error of four current approaches (one introduced here for the first time) for estimation and extrapolation, through the use of a statistical time series model appropriate for many meteorological time series.

The three current methods are 30-yr normals that are officially recomputed every 10 yr (e.g., for 1961–90, 1971–2000) in the United States by the NOAA National Climatic Data Center (NCDC) and are traditionally available 2–3 yr later (historically in 1963, 1973, . . . , 2003), the above-mentioned OCN, and least squares linear trend fitting. The fourth approach is a modification of least squares linear fitting to model more closely the observed characteristics of the likely underlying cause of rapidly changing normals—namely, global climate change. In the first two of the four techniques, extrapolations are made by assigning the latest computed value to future normals, but in the latter two they are made by extending the linear trend into the future.

In the presence of strong, dominantly linear trends largely attributable to global climate change (like those characterizing North America in the winter and spring), it is intuitive that each successive approach of the four listed above (if appropriately applied) should outper-

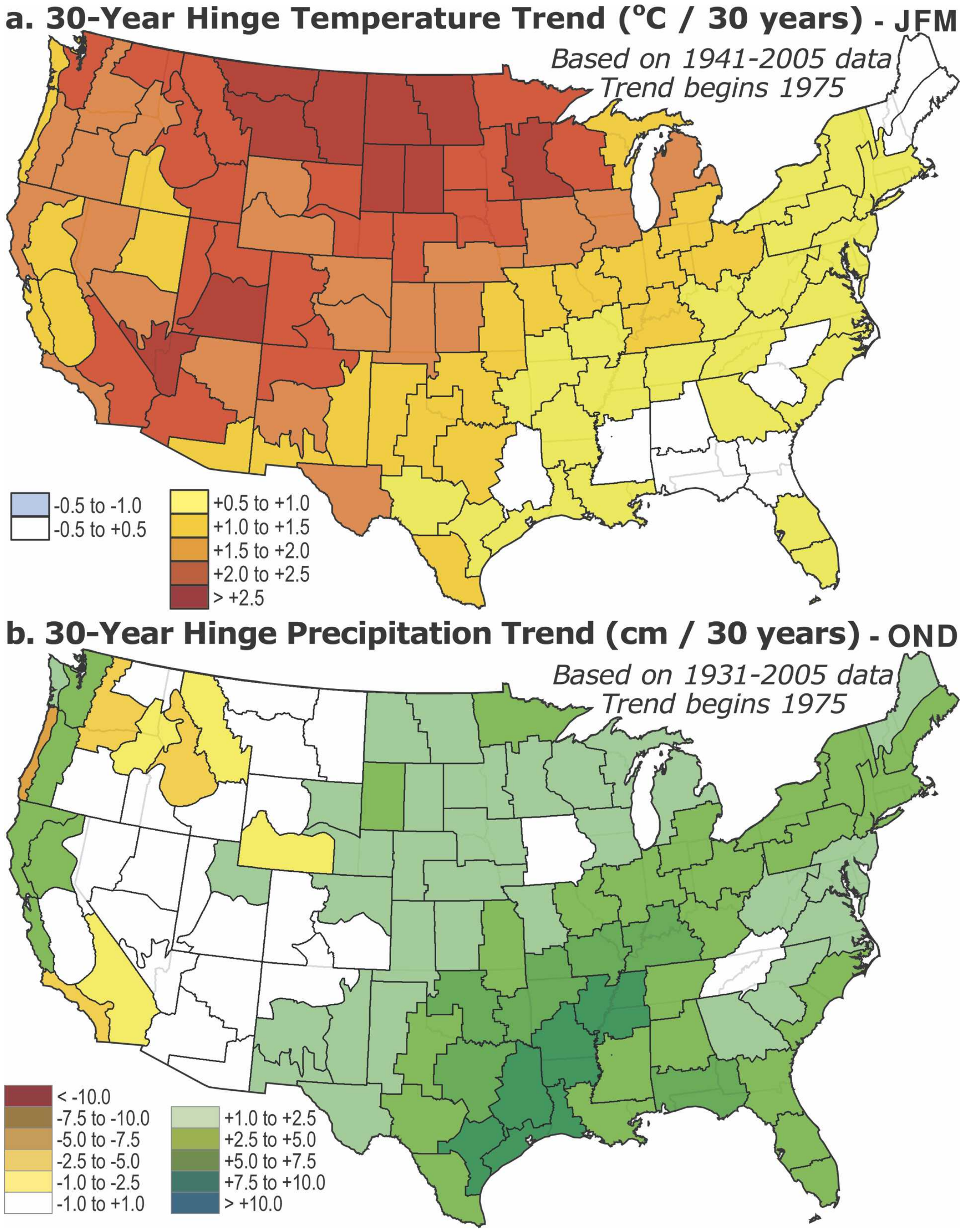

FIG. 1. Trends in (a) January–March mean surface air temperature and (b) October–December mean precipitation normals for 102 U.S. climate divisions. Trends are for the 30 yr ending in 2005 and are estimated using a technique described in section 3b.

form those preceding it. The analysis here will provide an objective, quantitative basis for this intuition. Problems associated with least squares linear trend fitting and its misapplication will also be discussed. The results here and a few other basic precepts can constitute a starting point for best practices for normals and trends for working climatologists.

Following the comparative analysis, the paper contains a brief discussion of nonlinear and adaptive trend estimation methods. An overview of recent advances in the treatment of two other important nonstationary components in climate statistics, the diurnal and annual cycles, is included in an appendix. The paper concludes with summary remarks and recommendations.

2. Trend-related errors in estimates of climatic normals

Let us consider a time series of annual (or monthly for specific month, etc.) values of a meteorological variable $y(t)$ that consists of two independent components:

$$y(t) = Y(t) + y'(t). \tag{1}$$

Time t in this case is in years, $Y(t)$ is the time-dependent expected value of $y(t)$ (e.g., climatic trend), and $y'(t)$ is climatic noise described by a zero-mean stationary red-noise random process with variance σ^2 and 1-yr autocorrelation g. Let us assume that the actual trend in expected value $Y(t)$ is linear with known constant a and b in the expression

$$Y(t) = a + bt. \tag{2}$$

The trend parameter b can be expressed in relative units of sigma per year as $\beta = b/\sigma$. Instead of the actual $Y(t)$ we always use its estimate $\tilde{Y}(t)$ derived from observed data. The accuracy of $\tilde{Y}(t)$ depends on the method by which it is estimated. Let $\delta^2(t)$ be the mean-square error of estimated expected value $\tilde{Y}(t)$ and $\eta(t)$ be the mean (expected) square relative (to the climatic noise; i.e., scaled by σ) error:

$$\delta^2(t) = \overline{[Y(t) - \tilde{Y}(t)]^2} \quad \text{and} \quad \eta(t) = \delta^2(t)/\sigma^2. \tag{3}$$

In the remainder of the article, $\eta(t)$ will be referred to as the "error" for simplicity.

a. Thirty-year normals

The traditional approach to climate normals will be evaluated first. A comprehensive historical analysis of the evolution of the definition of climatic normals can be found in Guttman (1989). The normals, recommended by the World Meteorological Organization (WMO), are 3-decade averages recomputed each 30 yr (for surface variables only). However, NCDC and many other climatic centers voluntarily recompute them each decade. If this practice survives during the next few years, the current 1971–2000 normals will be replaced by 1981–2010 normals as soon as they are computed and released, likely by 2013.

A 30-yr average was long considered an acceptable trade-off between excessive sampling errors from climatic noise for shorter averages and unacceptably large changes in the climatic normal $Y(t)$ over the averaging period for longer averages. A time average will generally approximate a monotonically changing normal that is best near the midpoint of the averaging interval, with error increasing toward the beginning and end of the interval. However, if the change is slow then it will still constitute a good estimate over the entire span, in this case 30 yr. Here we will quantify the way faster-changing climatic normals compromise the acceptability of the 30-yr average trade-off. In section 2b, the same problem will be addressed for other averaging periods updated annually, that is, moving averages, and the results will be applied to assess the OCN method.

There are two major categories of users of the WMO normals. The first category of these users is forecasters, who predict (in some fashion) climate anomalies in the future for time intervals from a few weeks to 1 yr. The predicted climate anomalies must be expressed as anomalies from the official (i.e., past) normals. Because the climate is nonstationary, however, a prediction of the normal is necessary as well and becomes a key part of the forecast and a source of much of its skill (or lack thereof). The other user category needs climatic normals for more distant periods of time (on the order of 10 yr) for planning and design purposes. Consider the case in which all of these consumers use the official normals for the next decade, until new normals can be computed and released.

Here an N-yr average of the observed $y(t)$ is the estimate of its climate normal. Let $\tau = t - t_0$, where t_0 is the last year of the averaging period. Using (2) and (3), it is straightforward to obtain

$$\eta(N, g, \beta, \tau) = \eta_a(N, g) + \eta_b(N, \beta, \tau), \tag{4}$$

where $\eta_a(N, g)$, the contribution to the error η from the sampling error of averaging red-noise residuals $y'(t)$ over N yr, is

$$\eta_a(N, g) = (1 + g)/[1 + g + (N - 1)(1 - g)], \tag{5}$$

and $\eta_b(N, \beta, \tau)$, the contribution to η related to the known trend $\beta = b/\sigma$, is

$$\eta_b(N, \beta, \tau) = \{\beta[(N - 1)/2 + \tau]\}^2. \tag{6}$$

The expression for the sampling error (5) is from Polyak (1996). The expression for trend-related error (6) follows from the derivation and represents systematic, not random, error. It is equal to zero at the mid-interval time $t^* = t_0 - (N - 1)/2$ and increases in both directions from this point proportionally to the squares of trend b and time increment $t - t^*$.

The error $\eta(N, \tau)$ of WMO normals ($N = 30$ yr), computed from (4)–(6) for different β and g, is given in Table 1 for $\tau = 0$ and $\tau = 10$ yr. As noted in the introduction, the range of β in Table 1 has been observed for U.S. climate-division seasonal mean tem-

Table 1. Theoretical estimates of $\eta(N, g, \beta, \tau)$, the expected mean-square relative [i.e., $\delta^2(t)/\sigma^2$] error of WMO normals at the end of an $N = 30$ yr period of averaging ($\tau = 0$) and 10 yr later ($\tau = 10$ yr) for different linear trends $\beta = b/\sigma$ and lag-1 correlations g in climatic records. Values equal to or greater than 0.25 are shown in boldface.

	$g = 0$		$g = 0.1$		$g = 0.2$		$g = 0.3$		$g = 0.5$	
	$\tau = 0$	$\tau = 10$	$\tau = 0$	$\tau = 10$	$\tau = 0$	$\tau = 10$	$\tau = 0$	$\tau = 10$	$\tau = 0$	$\tau = 10$
$\beta = 0$	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.09	0.09
$\beta = 0.01$	0.05	0.09	0.06	0.10	0.07	0.11	0.08	0.12	0.11	0.15
$\beta = 0.02$	0.12	**0.27**	0.12	**0.28**	0.13	**0.29**	0.14	**0.30**	0.18	**0.33**
$\beta = 0.03$	0.22	**0.57**	0.23	**0.58**	0.24	**0.59**	**0.25**	**0.60**	**0.28**	**0.63**
$\beta = 0.05$	**0.56**	**1.53**	**0.57**	**1.54**	**0.57**	**1.55**	**0.59**	**1.56**	**0.62**	**1.59**
$\beta = 0.10$	**2.14**	**6.04**	**2.14**	**6.04**	**2.15**	**6.05**	**2.16**	**6.06**	**2.20**	**6.10**

perature and precipitation. Calculations of g for residuals from these estimated trends range from near 0 to greater than 0.5; therefore Table 1 spans real-world scenarios.

Different applications require different accuracy in the trend estimates. In the absence of an econometric approach in which a cost function limits our natural desire to improve the accuracy of information any further, however, we can adopt the minimal requirement that the error should not exceed a traditionally acceptable value that corresponds to standard error $\delta \leq 0.5\sigma$. This formal criterion is often used in statistical meteorology (Vinnikov 1970). It corresponds to $\eta \leq 0.25$, which will be referenced throughout subsequent discussions.

Note first in Table 1 that the errors $\eta(g, \beta, \tau)$ are not noticeably dependent on g, the measure of redness in the residual time series, but rather on trend β and on τ, where τ is the amount of time after the last year of observations used to compute normals. The error in "persisting" WMO normals exceeds the acceptable limit for $b \geq 0.3\sigma$ (10 yr)$^{-1}$ for almost all τ [and for $\tau =$ 10 yr and $b \geq 0.2\sigma$ (10 yr)$^{-1}$]. As soon as $b \geq 0.2\sigma$ (10 yr)$^{-1}$ and τ is close to 10 yr, the WMO normals should not be used for computing climatic anomalies. Except for weak underlying trends, the error is already unacceptable when the 30-yr normal is released (between $\tau = 2$ and 3 yr).

An attempt to solve this problem motivated scientists at NWS's Climate Prediction Center (CPC) to further develop and implement the OCN. OCN, introduced pragmatically and empirically, has never been explained in sufficiently simple terms but has not been used much outside of CPC. The error associated with OCN estimation and extrapolation will be evaluated next.

b. Optimal climate normals

The first empirical attempts to find the optimal length of the averaging period for hydrological and meteorological data were by Beaumont (1957) and Enger (1959). As a criterion, they used the variance of the difference between N-yr averages and values of climatic variables 1 yr ahead. Later, Lamb and Changnon (1981) estimated the "best" temperature normals for Illinois observed temperature and precipitation using as a criterion the mean absolute value of the same differences. The CPC criterion (applied to 3-month average surface temperatures and precipitation) is based on the maximum of a correlation-like measure between N-yr averages and values 1 yr ahead over the verification period (Huang et al. 1996). The CPC group showed that their criterion produced practically the same results as those used by Beaumont (1957) and Enger (1959). Simple analysis shows that all of these criteria are based on similar definitions of a measure of error in climatic normals when compared with the time-dependent expected value. In fact, the theory of OCNs can be derived from the same simple model (3)–(5) for the error in climate normals.

Expression (4) for the error in the expected value estimate obtained by averaging observed $y(t)$ for N consecutive years $\eta(N, g, \beta, \tau)$ is a sum of two components. The first one, $\eta_a(N, g)$, decreases monotonically with increase in N. This is the expected sampling error from the climatic noise—its decrease with increasing N is what is expected intuitively. The second component, $\eta_b(N, \beta, \tau)$, increases as N increases if the trend $\beta \neq 0$. It is the expected deviation of the N-yr average from the trend line at the end of the averaging interval and beyond, which must increase with N because the number of years from the midpoint of the interval increases. As a result, the error $\eta(N, \tau)$ has a minimum $\eta_{\text{optimal}}(N, g, \beta, \tau)$ at $N_{\text{optimal}}(g, \beta, \tau)$.

Our ability to correctly estimate the climatic anomaly $y'(t_0)$ at the end of the averaging period ($\tau = 0$) and to extrapolate it into the future time, $\tau > 0$, depends on the error in expected value $Y(\tau)$. Optimal climate normals can be defined as the average of the climatic variable for the time interval N_{optimal} that minimizes the

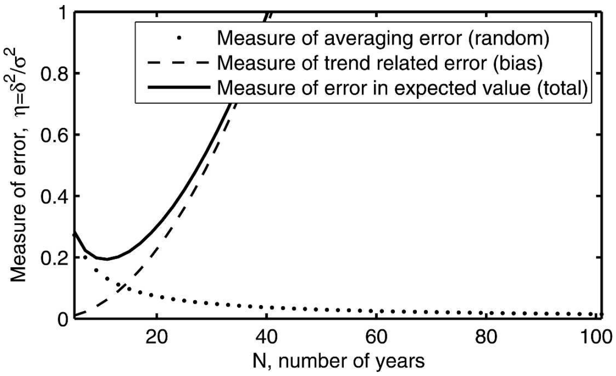

FIG. 2. Optimal climate normals: $\eta(N, g = 0.2, \beta = 0.05, \tau = 0)$—the error of expected value $Y(\tau = 0)$ at the very end of an averaging time interval of N yr for a specified linear trend $\beta = 0.05$ and lag-1 autocorrelation $g = 0.2$ (solid line). Dotted and dashed lines show separately the averaging $\eta_a(N, g = 0.2)$ and the trend-related $\eta_b(N, \beta = 0.05, \tau = 0)$ components of the error.

error $\eta(N, g, \beta, \tau)$ in estimates of expected value $Y(\tau)$. Estimates of N_{optimal} for given g, τ, $\beta \neq 0$ can be obtained from the condition

$$\eta(N, g, \beta, \tau) = \text{minimum}, \qquad (7)$$

and then substituted into (4)–(6) to compute η_{optimal}.

For illustration, consider a process with lag-1 correlation $g = 0.2$ and trend b $= 0.05\sigma$ yr^{-1}. These parameters could belong to time series of wintertime seasonal mean surface air temperatures for a number of western U.S. climate divisions. Figure 2 shows the dependence on N, the number of years of observations averaged to obtain the estimate of $Y(t_0)$, of $\eta(N, g, \beta, \tau)$ and its components $\eta_a(N, g)$ and $\eta_b(N, \beta, \tau)$ for $\tau = 0$. The two components respectively are the sampling error from the climatic noise (decreasing with N) and the error from the diverging trend (increasing with N). In this example, the function has a minimum at $N = N_{\mathrm{optimal}} \approx$ 11 yr.

Forecasts at CPC and other climate prediction centers do not, in general, exceed 1-yr lead ($0 \leq \tau \leq 1$ yr). Estimates of $N_{\mathrm{optimal}}(g, \beta, \tau)$ and $\eta_{\mathrm{optimal}}(g, \beta, \tau)$ for $\tau =$ 0 and 10 yr and for realistic ranges of g and β, $\beta \neq 0$, are given in Table 2. The estimates for $\tau = 1$, not shown here, are very close to those for $\tau = 0$. Note the following from Table 2:

1) The optimal period of averaging N_{optimal} and its associated error η_{optimal} depend more on β than on g except for large g; that is, it is dominated by trend rather than weak red noise. Thus, if the climatic trend has a seasonal cycle and geographical pattern, so will the optimal period of averaging.
2) For trends as large as $b = 0.1\sigma$ yr^{-1} the optimal period of averaging N_{optimal} is very short (from 6–7 yr for $\tau = 0$ to 3 yr for $\tau = 10$ yr) and the error η_{optimal} of OCN exceeds the acceptable limit of 0.25 for almost all τ shown. For $b = 0.05\sigma$ yr^{-1}, $\tau > 0$, and $g > 0.2$, the error also exceeds 0.25.
3) The errors related to the climatic trend in the OCN estimates of $Y(t_0)$ are systematic, not random. Such errors should be treated differently than random errors.
4) The WMO-recommended 30-yr averaging (Table 1) is close to the OCN for very weak climatic trends ($b = 0.01\sigma$ yr^{-1}), and the error is identical within the precision of both tables. Because OCN is updated annually, however, it is the preferred choice even with very weak underlying trend, but not as practiced at CPC (see the paragraph after next). As a consequence, OCN has two advantages over conventional practice: N_{optimal} adjusted to the situation and immediate updates through the last year.

Thus the WMO technique is a good treatment for very weak climatic trends, and the OCN technique is good for modest to medium trends with the lead τ relatively small, but neither has acceptable error for strong trends and longer leads.

TABLE 2. Optimal climate normals technique: analytical theoretical estimates of N_{opt} (yr) and η_{opt} (where opt denotes optimal) for $\tau = 0$ and 10 yr and different lag-1 correlation coefficients g and trends β in climatic records. Values equal to or greater than 0.25 are shown in boldface.

		$g = 0$		$g = 0.1$		$g = 0.2$		$g = 0.3$		$g = 0.5$	
$\beta = b/\sigma$	Year	N_{opt}	η_{opt}	N_{opt}	η_{opt}	N_{opt}	η_{opt}	N_{opt}	η_{opt}	N_{opt}	η_{opt}
$\beta = 0.01$	$\tau = 0$	27.5	0.05	29.2	0.06	31.1	0.07	33.1	0.08	38.2	0.11
	$\tau = 10$	22.1	0.09	23.7	0.10	25.5	0.11	27.4	0.12	32.2	0.15
$\beta = 0.02$	$\tau = 0$	17.4	0.08	18.5	0.10	19.6	0.11	20.8	0.13	23.7	0.17
	$\tau = 10$	12.6	0.18	13.5	0.19	14.5	0.21	15.5	0.23	18.1	**0.29**
$\beta = 0.03$	$\tau = 0$	13.4	0.11	14.1	0.12	15.0	0.14	15.8	0.16	17.9	0.22
	$\tau = 10$	8.9	**0.29**	9.5	**0.31**	10.2	**0.33**	10.9	**0.36**	12.5	**0.43**
$\beta = 0.05$	$\tau = 0$	9.6	0.15	10.1	0.17	10.7	0.19	11.2	0.22	12.5	**0.29**
	$\tau = 10$	5.7	**0.56**	6.0	**0.59**	6.4	**0.62**	6.7	**0.66**	7.5	**0.88**
$\beta = 0.10$	$\tau = 0$	6.2	0.23	6.5	**0.26**	6.7	**0.29**	7.0	**0.33**	7.6	**0.42**
	$\tau = 10$	3.0	**1.54**	3.1	**1.59**	3.2	**1.64**	3.2	**1.69**	3.2	**1.81**

As mentioned earlier, OCN is currently used at CPC for short-term climate prediction, $\tau \leq 1$ yr, using empirically, not theoretically, estimated optimal averaging time intervals (for $\tau = 1$ yr) fixed at 15 yr for monthly precipitation and 10 yr for monthly temperatures (Huang et al. 1996; Van den Dool 2006). From Table 2 these averaging periods correspond approximately to those for short-lead cases with $b = 0.03\sigma$ yr^{-1} and $b = 0.05\sigma$ yr^{-1}, respectively. As a consequence, the entries in Table 2 are underestimates of the errors of CPC/OCN when underlying trends in precipitation and temperature differ much from these values. More specific, for $\tau = 0$, CPC/OCN will have larger errors than those in Table 2 for all cases except $b = 0.05\sigma$ yr^{-1} and $g = 0.1$ for temperature and $b = 0.03\sigma$ yr^{-1} and $g = 0.2$ for precipitation. Fixed N is more convenient but is inadvisable unless N_{optimal} varies little across a user's applications.

The OCN technique is an attempt to account for the effects of a climatic trend without defining and estimating the trend itself. Consideration will be given next to the use of observed data to estimate climatic trends and to utilize the estimated dependence of expected value on time. Such an approach should work better than the OCN for very strong trends.

3. Time-dependent climatic normals

a. Least squares linear trend

Consider again the same (as above) climatic process $y(t)$ whose random red-noise component has standard deviation σ and lag-1 autocorrelation g. Suppose there is confidence from independent sources that this record has a linear trend in expected value $Y(t) = a + bt$. Using a least squares technique, the unknown parameters a and b and the statistics of their errors can be estimated through use of an analytical solution obtained by Polyak (1979). A summary of the same equations is reproduced in Table 2.1 of the English edition (Polyak 1996). Now the estimates of the expected normal at the end of the interval and beyond are based on the fitted trend line. We can use the same (1)–(3) and (5) equations and definitions as above, but with N now the length of the time interval used to estimate a and b in (2), and with a new expression, different from (6), for trend-related error $\eta_b(N, g, \tau)$, to write

$$\eta(N, g, \tau) = \eta_a(N, g) + \eta_b(N, g, \tau), \quad (8)$$

$$\eta_b(N, g, \tau) = [\sigma_\beta(r + \tau)]^2, \; r = (N - 1)/2, \quad \text{and} \quad (9)$$

$$\sigma_\beta^2 = (1 + g)/\langle r\{2[r + g/(1 - g)] + (1 - g)(r - 1)(2r - 1)/3\}\rangle. \quad (10)$$

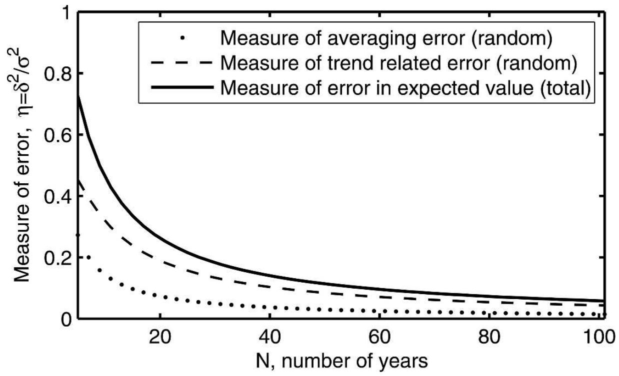

FIG. 3. Estimates of $\eta(N, g = 0.2, \tau = 0)$, the error in expected value $Y(t_0)$ at the end of time interval N yr utilized to estimate parameters of linear trend (black line). Dotted and dashed lines show separately the averaging and the trend-related components of error variance.

As before the first term represents sampling error associated with estimating the stationary part of the normal. However, now the second term represents the error at the endpoint of the estimation interval and beyond associated with the slope estimation, not the error associated with not accounting for the slope at all.

The values of $\eta(N, g = 0.2, \tau = 0)$, the error in expected value $Y(t_0)$ at the end of time interval N yr [used to estimate the trend in $Y(t)$], are displayed in Fig. 3 (the solid line). Dotted and dashed lines show separately the averaging and the trend-related components of error variance. The first of them (dotted line) is the same as in Fig. 2. It decreases with an increase of N. However, the trend-related error (dashed line) also decreases with an increase of N, because the error in estimating the slope must decrease as the length of the fitted series with the underlying trend increases. Furthermore, unlike before, the trend-related error does not depend on the trend, and as a consequence the total error η is random with no systematic component. We can conclude that the empirically estimated climatic trend $Y(t) = a + bt$ provides sufficiently accurate unbiased estimates of expected value of $Y(t_0)$ for records as short as ~30 yr in the case of $g = 0.2$.

Climatic normals, estimated from observations over a limited time interval, should be useful for predictions beyond the boundaries of this time interval. Given estimated parameters of a linear trend in expected value $Y(t) = a + bt$, we can use the same a and b to find $Y(t_0 + \tau)$, where t_0 is the end of the fitting period N and $t = t_0 + \tau$ is some time in the future. Errors in extrapolated $Y(t_0 + \tau)$ increase with increasing τ. Theoretical estimates of the error $\eta(N, \tau)$ for different N, τ, and g are shown in Fig. 4.

For all cases in Fig. 4 with $g < 0.5$, extrapolation of

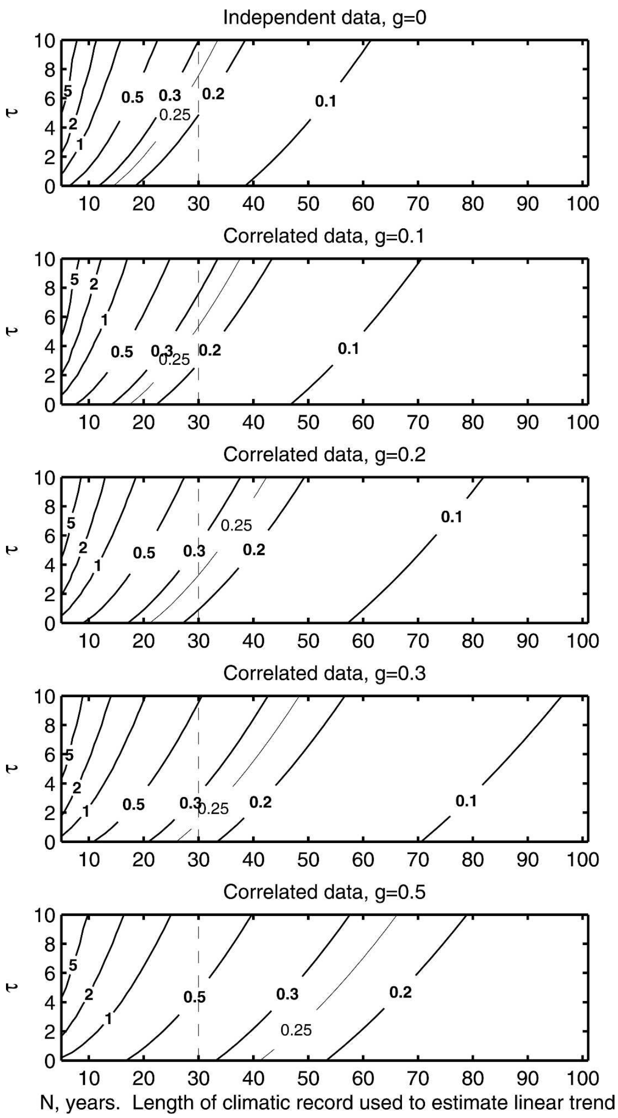

FIG. 4. Estimates of $\eta(N, g, \tau)$, the error for extrapolated expected value $Y(t_0 + \tau)$ beyond the end of time interval of N yr utilized to estimate parameters of linear trend; τ is in years.

the linear trend 1 yr into the future estimated from $N \geq 30$ has expected error less than the acceptable value of 0.25. For users of climatic information a decade in the future ($\tau \approx 10$ yr), trends must be estimated from significantly longer ($N \approx 40$–50 yr) climatic records for acceptable precision. In actuality, it is highly questionable that these longer trend fits are viable in practice because of the nature of actual trends discussed next.

As a practical matter, virtually all of the current important temperature trends over the United States (many exceed $b = 0.05\sigma$ yr^{-1}) have occurred over the last 30 yr. As a consequence, the only relevant (to current climate change) parts of Fig. 4 are those with $N \leq 30$ yr. Because of the strong dependence on the redness

TABLE 3. The maximum lead (yr) τ_{max} with acceptable error $\eta \leq 0.25$ for different 1-yr lag autocorrelation g and different projections of an underlying linear-trending normal estimated from climate time series models. Results for the hinge fit (trend period is 30 yr, the same as for the linear fit) are for generalized least squares, which yields small gains over the ordinary least squares results from the Monte Carlo experiment.

	τ_{max}			
g	Hinge fit (N = 65 yr)	Linear fit (N = 30 yr)	OCN (β = 0.03)	OCN (β = 0.05)
0.0	14	7	8	3
0.1	10	5	7	2
0.2	7	3	6	2
0.3	4	1	5	1
0.5	—	—	2	—

(g) of the residual variability, the results in Fig. 4 preclude accurate multiyear extrapolation except when the 1-yr lag correlation is zero or very small, because N should be constrained to be less than or equal to 30 yr.

It is crucial to account for these considerations in studies focused on the current climate and on modern and future climate changes. In these instances, least squares linear trend fits to the last (prior to 2006) 40–100 or more years of data will generally underestimate recent changes and can distort and misrepresent the pattern of these changes. These problems can be avoided by following some sound practices for linear trend estimation: 1) Linear trends should never be fit to a whole time series or a segment arbitrarily, 2) at a minimum, a plot of the times series should be examined to confirm that the trend is *not* obviously nonlinear, and 3) to the extent possible, the functional form of the trend should be based on additional considerations.

In this context, note that very large scale trends associated with global climate change are approximately linear over the last 30 yr or so but decidedly not over the last 40–70 or more. This fact is the basis for the modified approach to linear least squares that will be examined next. First, however, the relative performance in estimation and extrapolation of normals between the OCN and linear least squares (given an underlying linear trend) will be summarized.

Table 3 shows error thresholds (as a function of redness) expressed as the maximum lead τ (in years) with acceptable error, for 30-yr linear trend fits and the OCN with $b = 0.05\sigma$ yr^{-1} and $b = 0.03\sigma$ yr^{-1}. The table reflects a main conclusion of the last section: that the OCN has acceptable error for modest to moderate underlying linear trends at medium to short leads, respectively. However, it is also clear from Table 3 that 30-yr least squares linear fits (hinge fits are discussed in the next section) substantially outperform the OCN with

$b = 0.05\sigma$ yr^{-1} and are competitive (as long as the autocorrelation in the climate noise is very small) at $b = 0.03\sigma$ yr^{-1}. The OCN's advantage with $b = 0.03\sigma$ yr^{-1} (as reflected in Table 3) in operational CPC practice should be less for every g because of the use of fixed (and suboptimal) averaging periods. Except for very small g, this overestimation of operational OCN τ_{max} will be greater for temperature series than for precipitation because the latter's averaging period (15 yr) is generally closer to the optimal period (Table 2).

The calculations here suggest that 30-yr linear trends are at least as good for operational purposes for all but very modest trends ($b < 0.03\sigma$ yr^{-1}), at least for temperature normals (for precipitation normals, OCN's advantage is lost for only slightly stronger trends). As shown in the next section, a modification to the linear trend fits (based on global climate change considerations) that reduces the trend-related error extends the useable extrapolation range even further.

b. The least squares "hinge"

Very large scale trends (in global, hemispheric, land, ocean, etc., seasonal and mean annual temperatures) associated with global warming are approximately linear since the mid-1970s but decidedly not when viewed over longer periods. In particular, smoothed versions of these series dominantly suggest little change in their normals from around 1940 up to about the mid-1970s (e.g., Solomon et al. 2007).

With the reasonable assumption that the strong trends over North America (and probably elsewhere as well) in the last 30 yr or so are related to global warming, an appropriate trend model to fit to a particular monthly or seasonal mean time series to represent its time-dependent normal is a hingelike shape. This least squares hinge fit is a piecewise continuous function that is flat (i.e., constant) from 1940 through 1975 but slopes upward (or downward as dictated by the data) thereafter: $Y(t) = a$ for $1940 \leq t \leq 1975$ and $Y(t) = a + b(t - 1975)$ for $t \geq 1975$. The choice of 1975 as the hinge point is based on numerous empirical studies and model simulations that all suggest the latest period of modern global warming began in the mid-1970s. The slope b is insensitive to small changes in this choice.

The hinge shape is clearly the behavior of the JFM mean temperature series for the climate division representing western Colorado (Fig. 5), where the observed series and the ordinary least squares hinge fit are both shown. Western Colorado temperature was selected as an example for Fig. 5 because it has little or no ENSO signal, but to first order the hinge dominantly characterizes the behavior of U.S. climate-division monthly and seasonal mean time series with moderate to strong trends, especially for surface temperatures.

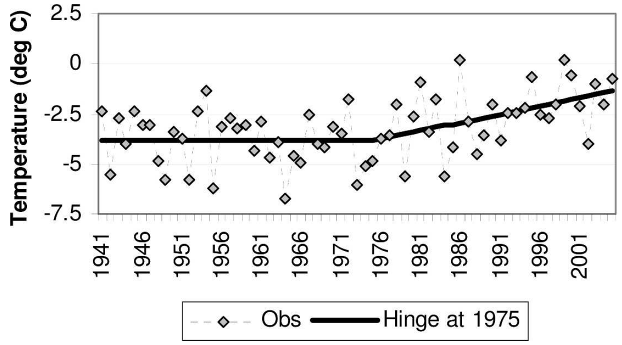

FIG. 5. January–March mean temperatures for western Colorado, and the ordinary least squares hinge fit to the data.

The hinge technique was first (and exclusively) used in 1998 and 1999 by CPC to help to estimate and extrapolate normals for the cold-season forecasts for 1998/99 and 1999/2000, respectively—both winters with a strong La Niña. After the winter of 1997/98, the great El Niño winter, it was determined at CPC that the cold bias in the winter forecast for the western United States was entirely a consequence of failing to account for a warming climate. Based on the work of Livezey and Smith (1999a,b), the warming was associated with global climate change.

The hinge fit was subsequently devised not only to estimate and extrapolate the trends, but to assess more accurately the historical impacts of moderate to strong ENSO events on the United States. This signal separation required the reasonable assumption that ENSO and global change were independent to first order. With this assumption, conventional approaches for estimating event frequencies conditioned on the occurrence of El Niño or La Niña (e.g., Montroy et al. 1998; Barnston et al. 1999) were modified to account for the changing climate as well.

The effectiveness of the hinge-fit method for the JFM 2000 U.S. mean temperature forecast is shown in Fig. 6. The three panels in the figure are conditional mean temperature probabilities using a version of conventional methods (often referred to as composites; Barnston et al. 1999; Fig. 6a); conditional probabilities using the hinge for trend fitting and signal separation (Fig. 6b); and the verifying observations (Fig. 6c). The first steps to construct (Fig. 6b) consisted of hinge fits to the JFM time series through 1999, calculation of JFM residuals from the hinge fits for past La Niñas, 1-yr extrapolations of the fitted slopes, and addition of the La Niña residuals to the 1-yr extrapolations to obtain conditional frequency distributions. After some spatial

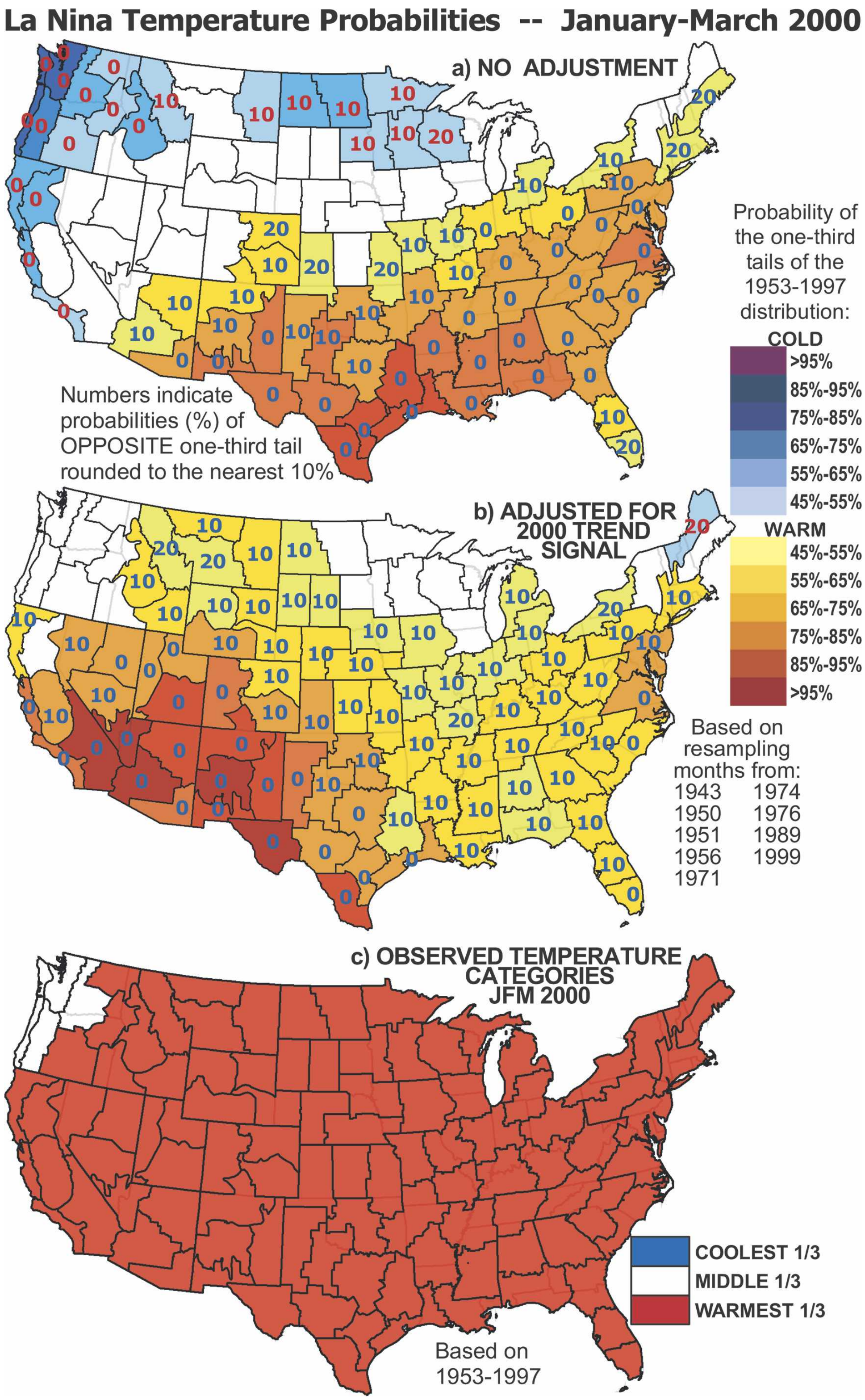

FIG. 6. Probabilities, (a) without and (b) with separate treatment of trend and La Niña, for three temperature categories (above-, near-, and below-normal equally probable for 1953–97 data) of January–March 2000 mean surface air temperatures for 102 U.S. climate divisions, and (c) the corresponding observations.

smoothing, these values were then referenced to three equally probable categories based on 1953–97.

Note the large differences between Figs. 6a and 6b and their implications for JFM and the extraordinary similarity between Figs. 6b and 6c, the forecast and observed conditions. The year 1966 was used as the hinge point in these 1999 calculations; use of a more appropriate mid-1970s point would have produced a forecast with even wider coverage of enhanced probabilities of a relatively warm JFM.

It is clear from CPC's and subsequent experience that composite studies of ENSO impacts that do not attempt to account for important trends are deficient from the outset. There fortunately are seasons/areas of the United States for which recent trends are still weak but the ENSO signature is strong, for example much of the Southeast in the winter (Fig. 1). In these instances the climate analyst can ignore trend to diagnose ENSO-related effects; otherwise trend consideration is a critical first step for useful results, regardless of the methods employed.

Here, to explore hinge-fit expected errors, Monte Carlo simulations are used to assess the reduction in error by using a hinge instead of a straight-line least squares fit. Our expectation is that hinge fits will have smaller overall error, simply because the use of 35 additional years (1940–74) of observations to estimate climate normals in the mid-1970s will constrain the starting value at the beginning of the trend period.

In effect, the hinge approach reduces the usual oversensitivity of least squares linear trend fits to one of the endpoints of the time series. A particularly important example of this problem is the pattern of U.S. winter temperature trends computed from the mid-1970s. The winters of 1976/77 and 1977/78 were unusually warm in the west with record cold in the east. Least squares linear trend fits starting from 1976 or 1977 consequently tend to overestimate warming in the east and underestimate it in the west, leading to maps with far more uniform warming than the pattern in Fig. 1.

Simulated time series 75 yr in length (to represent 1940–2014) were generated by adding random, stationary red noise with standard deviation of 1 and lag-1 autocorrelation g to a constant zero over the first 36 yr (to 1975) and to an upward linear trend with constant slope thereafter. Monte Carlo experiments, each consisting of 2500 simulations, were conducted for $\beta = 0.03$ and g ranging from 0.0 to 0.5. Straight lines and hinges were fit with ordinary least squares to each time series with data spanning 1975–2004 and 1940–2004, respectively. Each fit was then extrapolated linearly to 2014, and its difference from the specified value of the underlying hinge was computed. The results should not depend on slope, and this was confirmed by other calculations.

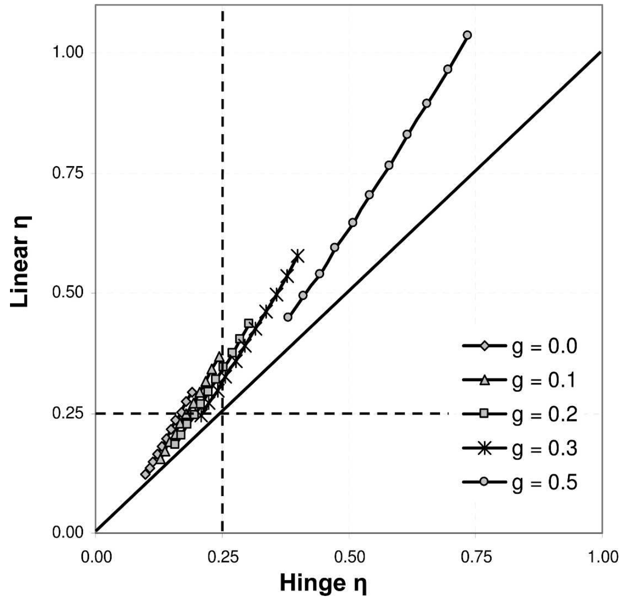

FIG. 7. Error η of climate normal estimates (with $\beta = 0.03$) at leads from zero to 10 yr for ordinary least squares straight-line and hinge fits to modeled climate time series.

Results in the form of error η for both fits at leads $\tau = 0, \ldots, 10$ are displayed in Fig. 7. The error η for the hinge is less than that for the straight-line fit for every point plotted, and its advantage increases with lead and (mostly) the autocorrelation in the residual noise.

Use of generalized least squares for hinge fits should reduce expected errors even further; therefore, these errors were also computed. The gains over the ordinary least squares results in Fig. 7 are small but meaningful, and therefore the generalized least squares results are shown in Table 3. Note that use of the hinge essentially eliminates OCN's advantage for all but $g = 0.5$ (rarely observed in U.S. climate-division data for $\beta \geq 0.03$), and even more so when OCN is implemented in a suboptimal fashion with fixed averaging periods. The results here suggest that a preferred approach would consist of the OCN (with variable averaging period) for cases with weak trends and the hinge for cases with moderate to strong trends. Such a strategy would require hinge fits everywhere first for a preliminary diagnosis of the strength of the trend and the redness of the residual climate noise, to guide the choice of final fits and for case-by-case specification of OCN averaging in weak trend situations, respectively.

As a service to the applied climatology community, maps of hinge-based trends for 3-month mean U.S. climate-division surface temperature and precipitation for 3 nonoverlapping periods, which, along with Fig. 1, span the year, are included in appendix A (a more complete set was available at the time of writing online at http://www.cpc.ncep.noaa.gov/trndtext.shtml). The data used in all of the maps and time series shown here and the reasons for their use are also described in appendix A.

c. Other shapes

Error estimates made in the previous four sections are directly applicable in practice only when it is reasonable to assume that changes in normals over the last 30 yr are dominantly linear. The possibility that the shape may be otherwise or unstable is likely the source of some reluctance to adopt a new, albeit simple, approach like the hinge fit to replace the OCN. In fact, a comparison of performances in Table 3 (that are overstated for CPC/OCN) for the stronger trends ($\beta > 0.03$) observed commonly for U.S. surface temperatures and precipitation over the last 30 yr suggest that the hinge will produce substantial gains even for trends linear to just first order.

Examples of two U.S. climate divisions (and there are many) for which β well exceeds 0.03 for JFM mean temperature but the climate normal since 1975 is not clearly tracking in a straight line are shown in Fig. 8. In both cases the mean temperatures seem to have leveled off (at much higher levels than pre-1980) over the last 20 yr so that the CPC/OCN gives lower estimates of the 2005 normals than does the hinge. For desert California and the Sierra Nevada (Fig. 8a; $\beta = 0.06$) the transition appears gradual from the mid-1970s, but for north central Montana (Fig. 8b; $\beta = 0.04$) it looks like it occurred more abruptly in the late 1970s.

The differences in the character of these time series and that for western Colorado (Fig. 5; $\beta = 0.06$) may be partially or mostly a consequence of climate noise. Western Colorado does not have much of a winter ENSO signal, but the other two locations do and the respective ENSO impacts are nonlinear (Livezey et al. 1997; Montroy et al. 1998). The possibility that the differences are also the result of real differences in local (or regional) processes also governing recent climate change cannot be discounted, however. In any case, climate models universally predict warming to continue.

Perhaps a better model for time-dependent U.S. seasonal temperature normals is a parabolic hinge, in which the data can dictate a flatter (semicubical parabola) or steeper (cubical parabola) growth after the mid-1970s. Such a model has all the advantages of the hinge—smooth piecewise continuous fits to a stationary climate followed by a changing one, utilizing all the data and allowing straightforward extrapolation—but with the flexibility to accommodate departures from linear growth. On the other hand, it is unclear whether there is a physical basis for this choice. Nevertheless, this and other techniques, including adaptive techniques that can accommodate changes in slopes, need to be explored more thoroughly.

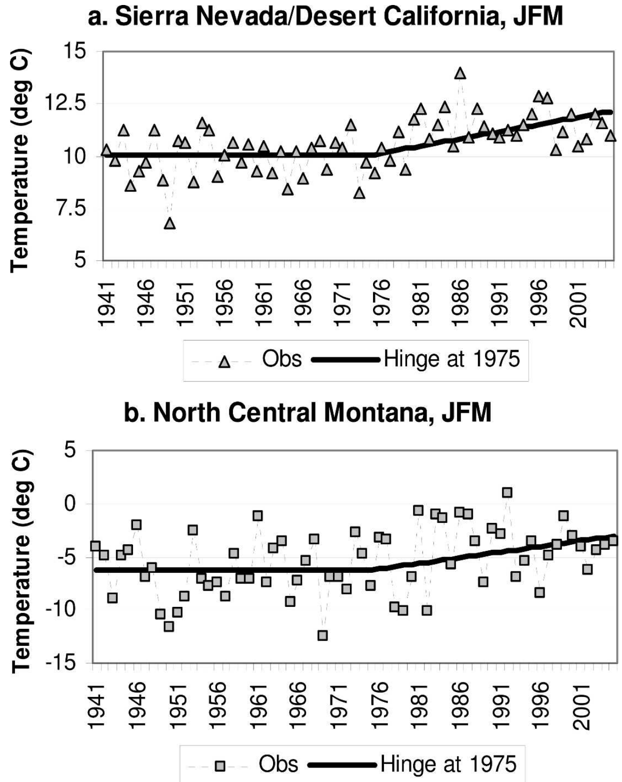

FIG. 8. January–March mean temperatures for (a) the Sierra Nevada and desert California and (b) north-central Montana, and the ordinary least squares hinge fits to the two time series.

More sophisticated low-pass filters than moving averages (i.e., OCN) are frequently used to smooth climate time series. These approaches are purely statistical and do not explicitly address normals as time-dependent expected values, either through use of collateral observational and dynamic model information or time series models to represent the physical processes. A good discussion of these methods that emphasizes the problem of fitting a climate time series near its current endpoint is by Mann (2004). In that paper, the best representations of the recent behavior of the Northern Hemisphere annual mean temperature are produced with use of different versions of the so-called minimum-roughness boundary constraint.

From the perspective of the discussions here and in section 3b, the resulting trends in Mann (2004) are likely modest overestimates of the rate of recent increases in temperature normals. This is a consequence of cooling trends between approximately 1950 and the mid-1970s in the low-pass filtered series that are dominantly a consequence of the exceptionally cold 1970s in North America (cf. Solomon et al. 2007), which in turn is dominantly a result of an exceptionally cold eastern United States (mentioned earlier). There is little evidence that these downturns in the filtered time series are a consequence of other than "climate" noise. In this context it is also difficult to justify the use of these smoothed series for separating ENSO impacts from those of a changing climate, which is another reason (in addition to overestimation of recent trends) to prefer hinge fits.

To round out a comprehensive overview of estimation and extrapolation of climate normals, the progress in developing techniques for the analytical approximation of seasonal and diurnal dependencies of $Y(t)$ from available observations is summarized in appendix B.

4. Concluding remarks

It is clear from the analysis here that WMO-recommended 30-yr normals, even updated every 10 yr, are no longer generally useful for the design, planning, and decision-making purposes for which they were intended. They not only have little relevance to the future climate, but are more and more often unrepresentative of the current climate. This is a direct result of rapid changes in the global climate over approximately the last 30 yr that most climate scientists agree will continue well into the future. As a consequence, it is crucial that climate services enterprises move quickly to explore and implement new approaches and strategies for estimating and disseminating normals and other climate statistics.

We have demonstrated that simple empirical alternatives already exist that, with one simple condition, can not only consistently produce normals that are reasonably accurate representations of the current climate but also often justify extrapolation of the normals several years into the future. The condition is that recent underlying trends in the climate are approximately linear, or at least have a substantial linear component. We are confident that this condition is generally satisfied for the United States and Canada and for much of the rest of the world but acknowledge that there will be situations for which it is not. In this context, two approaches need to be highlighted:

1) Optimal climate normals are multiyear averages not fixed at 30 yr like WMO convention but adapted climate record by climate record based on easily estimated characteristics (linear trend and 1-yr residual autocorrelation) of the climate records. The OCN method implemented with flexible averaging periods only begins to fail for very strong underlying trends (between 0.5 and 1 standard deviation of the residual noise per decade) or for longer extrapolations with more moderate background trend (see Tables 2 and 3). Least squares linear trend fits to the period since the mid-1970s are viable alternatives to OCN when it is expected to fail (Fig. 4 and Table 3), but there is an even better alternative.
2) Hinge-fit normals are based on modeling their time dependence on the known temporal evolution of the large-scale climate and are implemented with generalized least squares. They exploit longer records to stabilize estimates of modern trends in local and regional climates; therefore, they not only outperform straight-line fits (Fig. 7) but even OCN for underlying trends as small as 0.3 standard deviation of the climate noise per decade (Table 3).

Given these results, we make three recommendations:

1) The WMO and national climate services should formally address a new policy for changing climate normals and other climate statistics, using the results here as a starting point.
2) NOAA's Climate Office, NCDC, and CPC should cooperatively initiate an ongoing program to develop and implement improved estimates and forecasts of official U.S. normals.
3) As a first step, NCDC and CPC should work together to exploit quickly the potential improvements to their respective products demonstrated here. To be specific, the simple hybrid system described in section 3b that combines the advantages of both the OCN and the hinge fit should be implemented in regular operations as soon as possible to produce new experimental products.

As new work on climate normals and their use for forecasts of climate variability and change moves forward, climate analysts need to be cognizant of two points emphasized in sections 3a and 3b:

1) Linear or other trends should never be fit to a whole time series or a segment arbitrarily; the functional form of the trend should be based on examination of the time series and, to the extent possible, additional considerations.
2) Any assessment of the historical impacts of ENSO and their use in risk analysis or prediction *must* take into account climate change and, to the extent possible, separate its effects.

The additional considerations mentioned in the first point immediately above can include results or insight from state-of-the-art climate models. Until now a discussion of the role such models can play in the work and programs we are recommending above has been deferred. There are two potential uses for models that best track the large-scale climate and can replicate at least to first order the variability associated with ENSO and other important modes of interannual variability (i.e., the climate noise). Both uses depend on the fact that the time dependence of climate normals is "known" reasonably well (at least for some parameters, places, and seasons) if the ensemble of model runs is large enough and the runs do not span time scales on which long-term drift associated with, for example, the thermohaline circulation becomes important. In these instances a qualifying model can be used 1) to gain insight about the functional form of regional and subregional trends and 2) as a tool to test competing empirical methods for estimating and projecting these trends. Of course, efforts continue to improve the ability of climate models to replicate the climate comprehensively at smaller spatial and shorter temporal scales. We look forward to when these models can do this credibly and be directly exploited for computing climate normals and other climate statistics.

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APPENDIX A

U.S. Megadivision 3-Month Mean Temperature and Precipitation Trends

Maps of hinge-based trends (section 3b) of 3-month mean temperature and precipitation for 102 U.S. climate megadivisions (formed from the original 344) are shown in Figs. A1 and A2.

Climate-division data are often used at CPC (Barnston et al. 2000; Schneider et al. 2005) instead of station data because of the noise reduction inherent in aggregating nearby stations that strongly covary on intraseasonal to interannual time scales. The original 344 divisions are aggregated to 102 megadivisions mostly through combination of small adjacent divisions in the eastern half of the United States. Western divisions are essentially identical in both datasets. The reduction to 102 was originally done to approximate an equal-area representation for the United States, which is especially desirable for principal component–based studies; however, the additional aggregation provides further noise reduction for the adjacent, strongly covarying eastern divisions. Numerous studies reaffirm that the 102-division setup is more than sufficient to capture the spatial degrees of freedom in the coherent variability of U.S. seasonal mean temperature and precipitation. Megadivision normals are simple arithmetic averages of those for the divisions that compose them.

Data spanning from 1941 (1931) to 2005 with the hinge at 1975 are used to fit the temperature (precipitation) data at each division for each 3-month period. Combined with Fig. 1, Figs. A1 and A2 span the whole year. Based on arguments presented in sections 3a and 3b, we believe the trends displayed here more accurately represent modern U.S. climate change than any previously published.

On each temperature trend map the first color generally does not represent an important trend. The same is true for precipitation except for season/locations that are arid/semiarid. The overall bias for all maps is dominantly warming and significantly toward increasing precipitation. Note for temperature trends (Figs. 1a and A1) that 1) the Southwest has warming trends in every season; 2) west of the high plains the country has significant and consistent warming trends winter through summer (Figs. 1a and A1a,b), 3) trends are dominantly weak and inconsistent east of the high plains in summer (Fig. A1b) and autumn (Fig. A1c), and the Southeast has mostly a weak cooling trend in the spring (Fig. A1a); and 4) the wintertime trend map (Fig. 1a) is remarkable, reflecting almost-continent-wide warming (the exception is Maritime Canada, not shown).

For precipitation trends (Figs. 1b and A2), only the Northwest (autumn/winter; Figs. 1b and A2a,c) and Texas (spring/summer; Figs. A2b,c) have large areas of negative precipitation trends in more than one season and these are mostly small. Note that much of the crop-producing United States outside Texas and some of its surroundings has positive precipitation trends in the growing season (Figs. A2b,c). There is no indication in these results of a trend toward more drought nationwide. Among several area/seasons where trends are upward, the south-central region in the autumn (Fig. 1b) stands out as the most notable.

APPENDIX B

Annual and Diurnal Cycles in Climatic Trends

The annual cycle in seasonal mean normals is often much larger than typical day-to-day weather-related fluctuations. In addition to season-to-season variations in multiyear averages, climatic trends also display seasonality. The general approach to approximation of seasonal cycles in climatic trends has been formulated

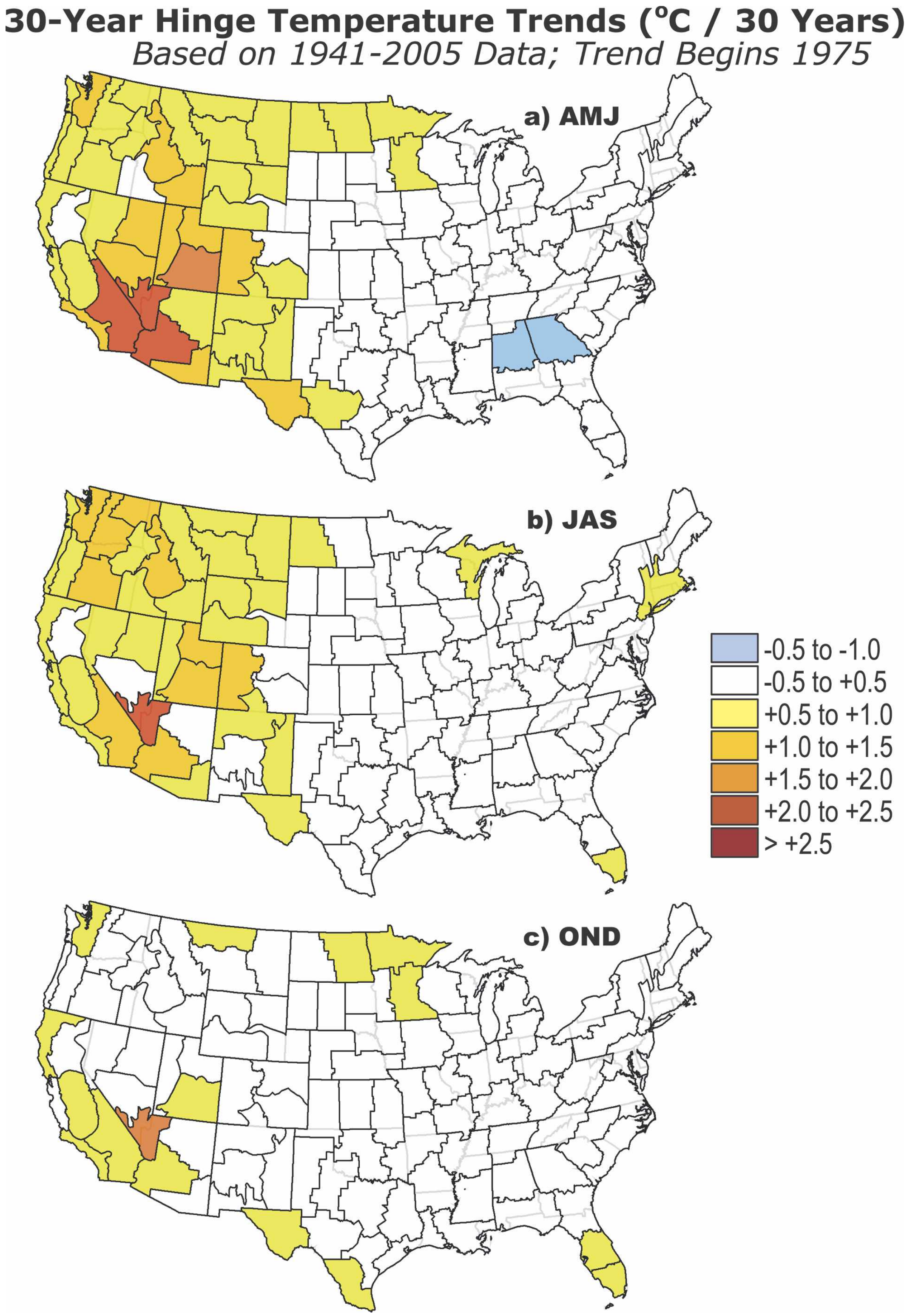

FIG. A1. As in Fig. 1, but for 3-month mean temperature for (a) April–June, (b) July–September, and (c) October–November.

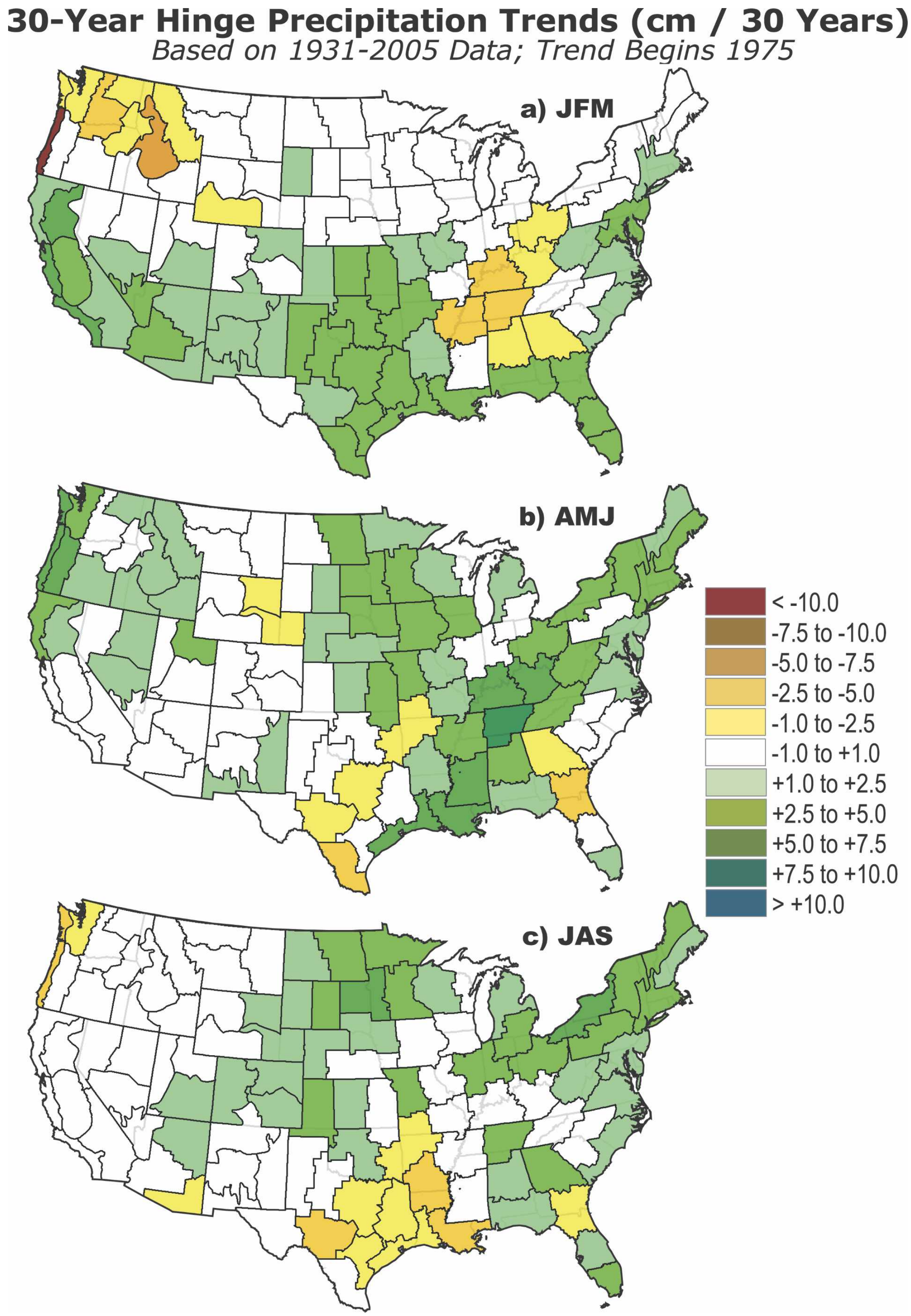

FIG. A2. As in Fig. 1, but for 3-month mean precipitation for (a) January–March, (b) April–June, and (c) July–September.

by Vinnikov et al. (2002b). The main idea is that instead of $Y(t) = a + bt + ct^2 + \cdots$ with constants a, b, c, and so on, the polynomial approximation of the expected value $Y(t)$ is written

$$Y(t) = A(t) + B(t)t + C(t)t^2 + \cdot \cdot \cdot, \qquad \text{(B1)}$$

where $A(t) = A(t + T)$, $B(t) = B(t + T)$, $C(t) = C(t + T)$, and so on, are unknown periodic functions with period $T = 1$ yr. Vinnikov et al. (2002a,b) and Cavalieri et al. (2003) used a linear trend assumption and a limited number of Fourier harmonics of the annual period to approximate $A(t)$ and $B(t)$ for daily observed hemispheric sea ice extents and surface air temperatures.

Different techniques need to be used for variables with seasonal cycles that cannot be approximated properly with a small number of harmonics of the annual cycle. Such techniques can be based, for example, on piecewise least squares approximation of periodic functions $A(t)$, $B(t)$, and so on, by algebraic polynomials in the vicinity of each specific phase of a seasonal cycle.

In addition to the seasonal cycle there is a diurnal cycle in most climatic records, and there can be diurnal cycles in trends as well. In such a case, the generalized coefficient functions $A(t)$, $B(t)$, and so on, in (B1) consist of short-time diurnal variations with a fundamental period of 1 day superimposed on the longer-period annual cycle (Vinnikov and Grody 2003; Vinnikov et al. 2004, 2006). Such processes are well known as amplitude-modulated signals in radio physics.

This approach has been tested using multidecadal time series of hourly observations of surface air temperature at selected meteorological stations (Vinnikov et al. 2004). In addition, application of this new technique to satellite microwave monitoring of mean tropospheric temperatures made it possible to resolve a contradiction between satellite and surface observations of contemporary global warming trends (Vinnikov and Grody 2003; Vinnikov et al. 2006).

A limited number of Fourier harmonics is often also not sufficient to obtain an accurate approximation of the shape of diurnal cycles. As before, other classes of periodic functions can be found or constructed to improve approximations of $Y(t)$. In this instance, estimation of $Y(t)$ can be based on patchwise least squares approximation of periodic functions $A(t)$, $B(t)$, and so on, by two-dimensional algebraic polynomials in the vicinity of each specific phase of seasonal and diurnal cycles.

These techniques can be used also for approximation and evaluation of climatic trends and cycles in variance, lag, and cross correlation and in higher moments of the statistical distribution of climatic variables, in the same way that the least squares technique is used for approximation of trends in expected value. Estimates of $Y(t)$ can be utilized to compute residuals $y'(t)$ for each t. Then, using the same technique for the variables $y'(t)^2$, $y'(t)^3$, $y'(t)^4$, $y'(t)y'(t \text{ lag})$, $x'(t)y'(t)$, and so on, we can evaluate trends in variance and other moments of the statistical distribution of the variables $y(t)$ and any other variable $x(t)$. This idea has been recently formulated and applied to study trends in variability of selected climatic variables (Vinnikov and Robock 2002; Vinnikov et al. 2002a). However, no statistically significant trends were found in twentieth-century variability of the large-scale climatic indices that were analyzed.

Studying seasonal (and diurnal) cycles in variances and lag correlations is necessary if we want to use the generalized least squares technique instead of the ordinary one to estimate unknown parameters in (B1). Taking into account the covariance matrix of observed data, the generalized least squares technique provides a more accurate estimate of $Y(t)$ and a much better estimate of its accuracy (Vinnikov et al. 2006).

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Date	year	month	k_10_i	Aggregate	Ratio	Correction	In EVIEWS	
5/31/2003	2003	5	706.2105				706.2105	-
6/30/2003	2003	6	701.3649				701.3649	-
8/31/2003	2003	8	685.3365				685.3365	-
9/30/2003	2003	9	690.1909				690.1909	-
5/31/2004	2004	5	885.9509				885.9509	-
6/30/2004	2004	6	884.0521				884.0521	-
8/31/2004	2004	8	911.803				911.803	-
9/30/2004	2004	9	847.0281				847.0281	-
5/31/2005	2005	5	835.7646				835.7646	-
6/30/2005	2005	6	848.153				848.153	-
8/31/2005	2005	8	838.6692				838.6692	-
9/30/2005	2005	9	887.7934				887.7934	-
5/31/2006	2006	5	795.3593				795.3593	-
6/30/2006	2006	6	872.3126				872.3126	-
8/31/2006	2006	8	892.3693				892.3693	-
9/30/2006	2006	9	808.0512				808.0512	-
5/31/2007	2007	5	833.7493				833.7493	-
6/30/2007	2007	6	823.7485				823.7485	-
8/31/2007	2007	8	860.3495				860.3495	-
9/30/2007	2007	9	838.3395				838.3395	-
5/31/2008	2008	5	810.1664				810.1664	-
6/30/2008	2008	6	836.749				836.749	-
8/31/2008	2008	8	862.2017	1704.878	50.57%		862.2017	-
9/30/2008	2008	9	842.6764		49.43%		842.6764	-
5/31/2009	2009	5	702.0867				702.0867	-
6/30/2009	2009	6	681.2052				681.2052	-
8/31/2009	2009	8	725.5585	1477.576	49.10%		725.5585	-
9/30/2009	2009	9	752.0176		50.90%		752.0176	-
5/31/2010	2010	5	710.9101				710.9101	-
6/30/2010	2010	6	687.3522				687.3522	-
8/31/2010	2010	8	1017.933	1819.171	55.96%		1017.933	-
9/30/2010	2010	9	801.2382		44.04%		801.2382	-
5/31/2011	2011	5	789.5447				789.5447	-
6/30/2011	2011	6	799.3559				799.3559	-
8/31/2011	2011	8	-39.0434	1560.913	50.09%	781.8481	781.7948	(0.05)
9/30/2011	2011	9	1599.956		49.91%	779.0649	779.1182	0.05
5/31/2012	2012	5	983.1988				983.1988	-
6/30/2012	2012	6	708.2287				708.2287	-
8/31/2012	2012	8	823.2392	1608.676	51.17%		823.2392	-
9/30/2012	2012	9	785.4364		48.83%		785.4364	-
5/31/2013	2013	5	845.3534				845.3534	-
6/30/2013	2013	6	784.2085				784.2085	-
8/31/2013	2013	8	826.7002	1669.954	49.50%		826.7002	-
9/30/2013	2013	9	843.2537		50.50%		843.2537	-
5/31/2014	2014	5	823.1214				823.1214	-

6/30/2014	2014	6	833.6043				833.6043	-
8/31/2014	2014	8	878.1443				878.1443	-
9/30/2014	2014	9	819.8816				819.8816	-
5/31/2015	2015	5	551.3649				551.3649	-
6/30/2015	2015	6	1070.031				1070.031	-
8/31/2015	2015	8	827.3837				827.3837	-
9/30/2015	2015	9	935.5238				935.5238	-
5/31/2016	2016	5	813.1851	1614.607	50.36%		813.1851	-
6/30/2016	2016	6	801.422		49.64%		801.422	-
8/31/2016	2016	8	858.0277				858.0277	-
9/30/2016	2016	9	794.4815				794.4815	-
5/31/2017	2017	5	836.353	1693.456	49.39%		836.353	-
6/30/2017	2017	6	857.1032		50.61%		857.1032	-
8/31/2017	2017	8	907.295				907.295	-
9/30/2017	2017	9	851.7259				851.7259	-
5/31/2018	2018	5	-329.271	1797.565	45.46%	817.2564	817.2564	(0.00)
6/30/2018	2018	6	2126.836		54.54%	980.3085	980.3085	0.00
8/31/2018	2018	8	880.6411				880.6411	-
9/30/2018	2018	9	926.8095				926.8095	-
5/31/2019	2019	5	525.5963	1541.051	34.11%		525.5963	-
6/30/2019	2019	6	1015.455		65.89%		1015.455	-
8/31/2019	2019	8	867.3404				867.3404	-
9/30/2019	2019	9	814.2842				814.2842	-
5/31/2020	2020	5	710.4234	1480.03	48.00%		710.4234	-
6/30/2020	2020	6	769.6069		52.00%		769.6069	-
8/31/2020	2020	8	852.5598				852.5598	-
9/30/2020	2020	9	809.3218				809.3218	-
5/31/2021	2021	5	799.5879				799.5879	-
6/30/2021	2021	6	752.521				752.521	-
8/31/2021	2021	8	806.9494				806.9494	-
9/30/2021	2021	9	926.0377				926.0377	-
5/31/2022	2022	5	754.4269				754.4269	-
6/30/2022	2022	6	777.9707				777.9707	-
8/31/2022	2022	8	807.2059				807.2059	-
9/30/2022	2022	9	766.0378				766.0378	-
5/31/2023	2023	5	714.6971				714.6971	-
6/30/2023	2023	6	732.0515				732.0515	-
8/31/2023	2023	8	777.4585				777.4585	-
9/30/2023	2023	9	797.0447				797.0447	-
5/31/2024	2024	5	767.719				767.719	-
6/30/2024	2024	6						
8/31/2024	2024	8						
9/30/2024	2024	9						
5/31/2025	2025	5						
6/30/2025	2025	6						
8/31/2025	2025	8						

9/30/2025	2025	9
5/31/2026	2026	5
6/30/2026	2026	6
8/31/2026	2026	8
9/30/2026	2026	9
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5/31/2048	2048	5
6/30/2048	2048	6
8/31/2048	2048	8
9/30/2048	2048	9
5/31/2049	2049	5

6/30/2049	2049	6
8/31/2049	2049	8
9/30/2049	2049	9
5/31/2050	2050	5
6/30/2050	2050	6
8/31/2050	2050	8
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9/30/2051	2051	9
5/31/2052	2052	5
6/30/2052	2052	6
8/31/2052	2052	8
9/30/2052	2052	9