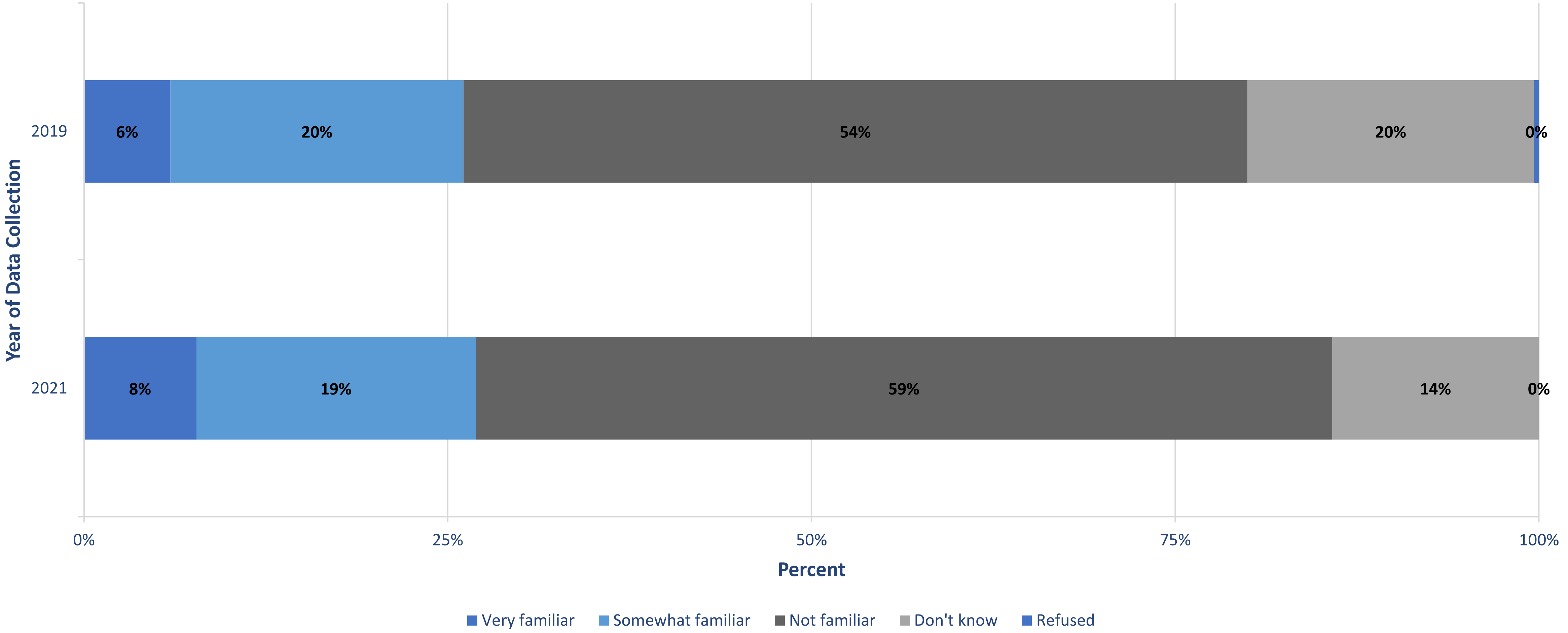
How familiar are you with the percentage of your electricity bill that went to Tillsonburg Hydro? So, NOT the portions allocated to power generation companies, transmission companies, the provincial government and regulatory agencies.



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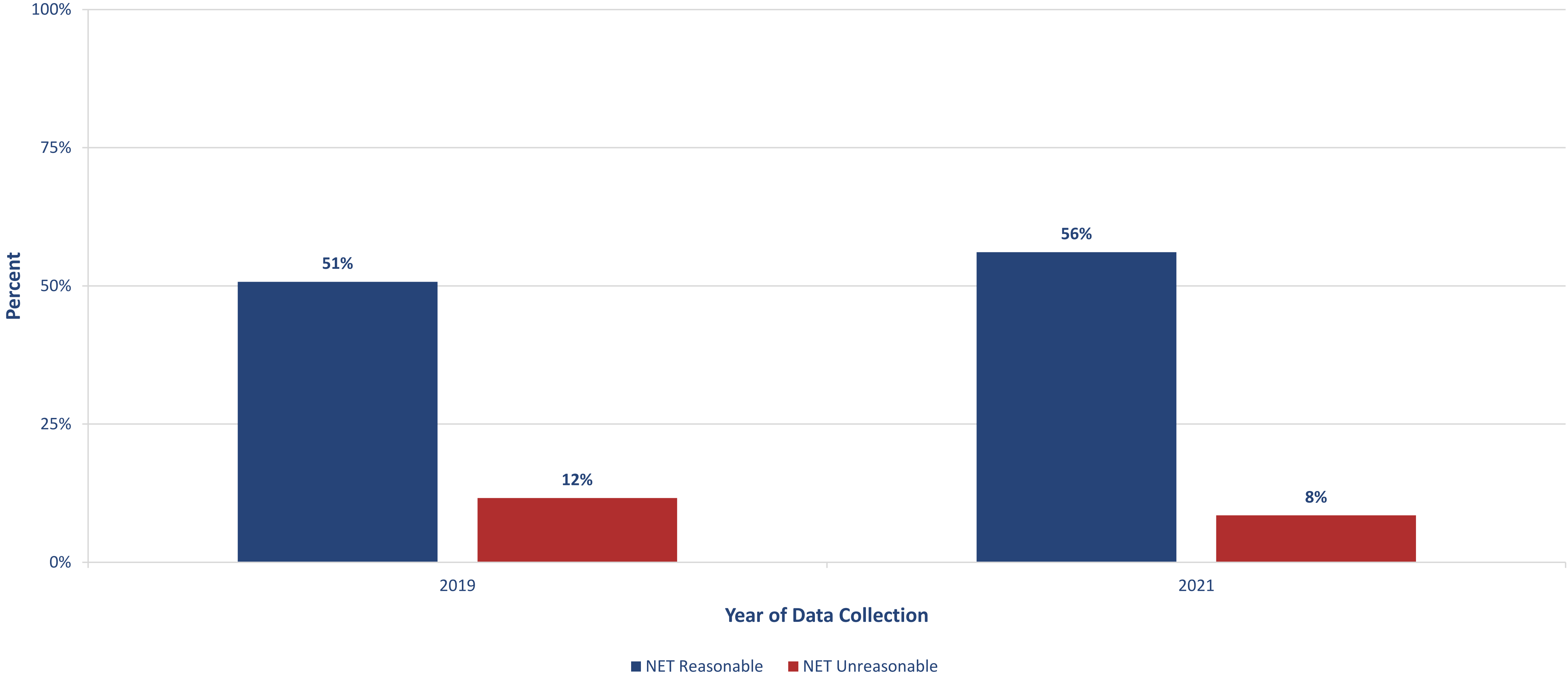
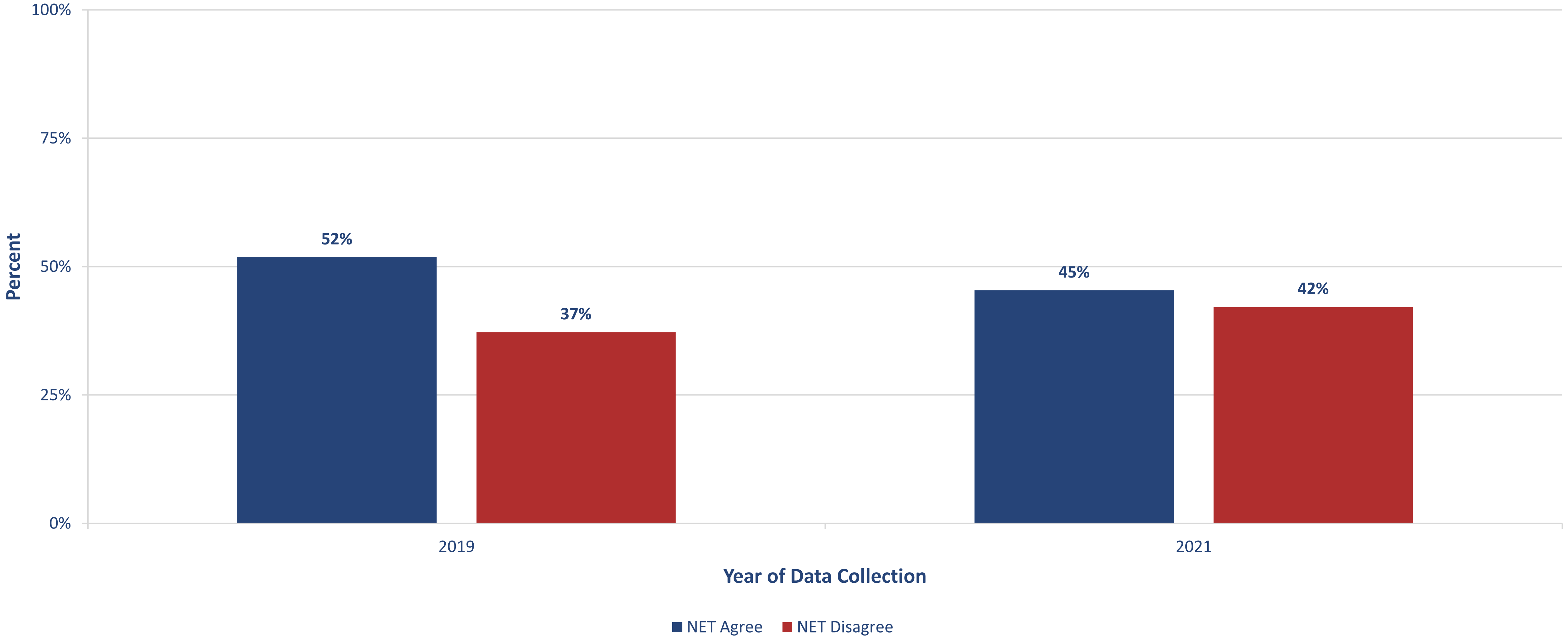
Do you feel that the percentage of your total electricity bill that you pay to Tillsonburg Hydro for the services they provide is...?



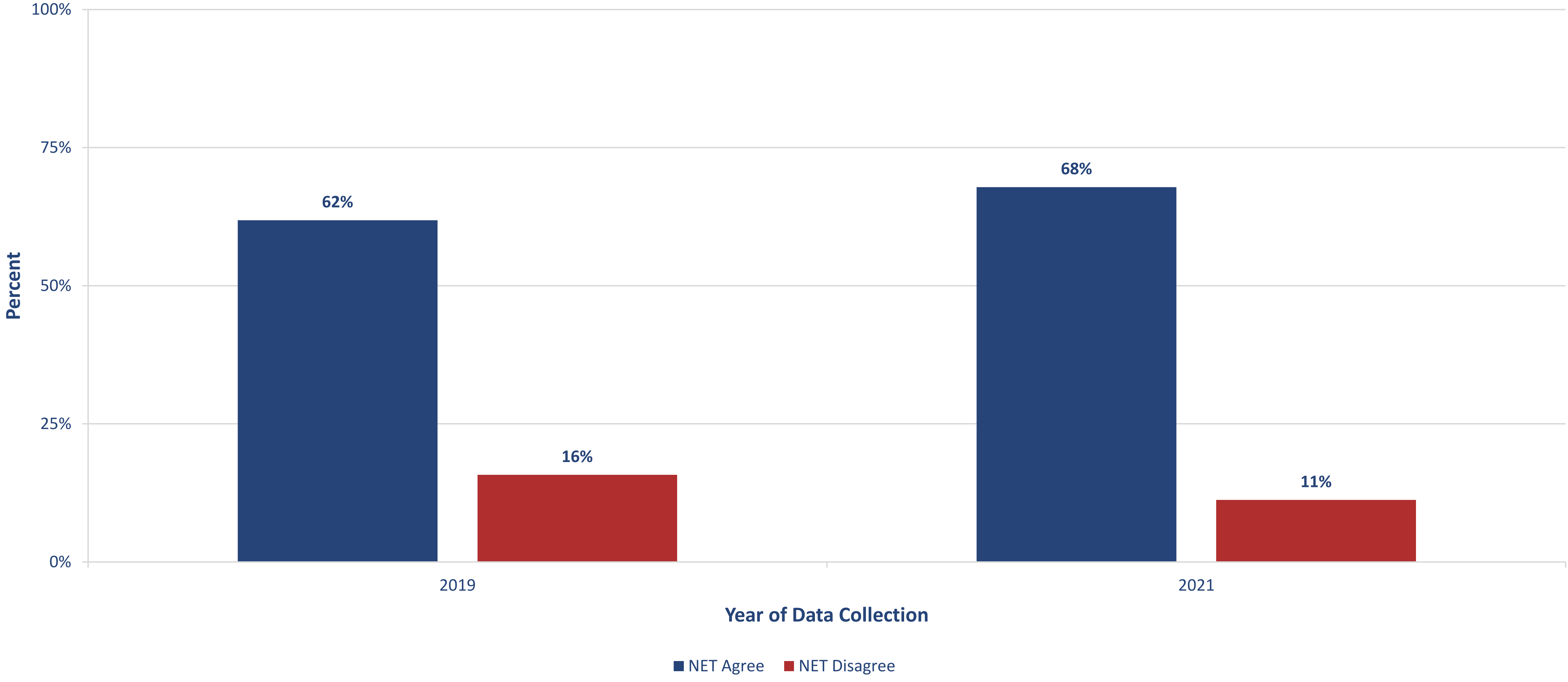
REDHEAD MEDIA SOLUTIONS INC

The cost of my electricity bill has a major impact [on personal finances OR bottom line of organization]: To what extent do you agree with the following statements regarding the electricity system in Ontario?



REDHEAD MEDIA SOLUTIONS INC

Customers are well served by the electricity system in Ontario: To what extent do you agree with the following statements regarding the electricity system in Ontario?



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METHODOLOGY

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Methodology Summary

Commissioned by	Tillsonburg Hydro Inc.
Sample size	401 randomly selected customers
Margin of error	±4.7 percentage points, 19 times out of 20
Survey mode	Random telephone survey of customer base, CATI data collection
Survey sample	Residential and GS <50kWh customer lists provided by Tillsonburg Hydro
Time of calling	4PM-9PM Weekdays, 10AM-5PM Saturdays, scheduled callbacks
In-field dates	January 11-February 17, 2021
Language	English only
Survey author	Innovative Research/Electricity Distributors Association
Question Order	Report shown in order
Question Wording	Questions shown in report as asked
Survey Company	Redhead Media Solutions Inc/Advanis

Methodology Details

Target Respondents

The respondents of the survey were Ontario residents who are the primary bill payer or share the responsibility if residential or the person in-charge of managing the electricity bill at the organization if general service, and who resided within one of Tillsonburg Hydro's service territory(ies). Service territories were determined based on customer lists provided by Tillsonburg Hydro.

Sample Size and Statistical Reliability

The final total completed surveys by LDC, and the associated margin of error for each, are shown below.

All margins of error are shown at a 95% confidence level.

- E.g., the margin of error associated with a sample size of 400 for a large (infinite) population is ±4.7 percentage points, 19 times out of 20.

Since Tillsonburg Hydro has a finite population, we used the specific population sizes (i.e., the number of samples records received from Tillsonburg Hydro) in the calculation of margin of error. Doing so is more accurate, and results in a narrower margin of error than if we simply assumed large (infinite) population for each.

Sample sizes were set according to the *LDC Customer Satisfaction Survey: Methodology & Survey Implementation Guide*, prepared for the Electrical Distributors Association (April 19, 2016 revision):

Where possible, sample size of n=400.
Distributors with 3000 to 4999 customers (residential + GS<50), n=300
Distributors with <3000 customers (residential + GS<50), n=200

Methodology Details

Sampling Methodology

Redhead was provided sample lists from Tillsonburg Hydro. Customer lists included all basic information required such as name, telephone number, region (where applicable), customer type (residential or GS<50), LDC fee, Annual or Monthly consumption values. Redhead then calculated which quartile group each resident belonged to by evenly dividing them into four groups within each region and customer type. These quartiles were calculated based on annual consumption value.

To minimize low response:

- Sample was loaded in batches to ensure the sample was fully utilized before moving onto fresh sample records;
- Calls were made between the hours of 4pm and 9pm ET; and
- Call backs were scheduled and honored between the hours of 9am and 9pm ET.

Sample Cleaning

Redhead cleaned the customer lists individually once received from each LDC to ensure the customer list counts reflected actual individual records that could be called. The following steps were taken during sample cleaning.

- All records with no phone numbers were removed.
- All phone numbers were checked to see if they were valid numbers (i.e. 10 digits, all numerical, etc.) and any bad cases were removed.
- When duplicates were detected based on phone number, the average of the consumption value was calculated and kept for one consolidated record. All others were removed.
- Residential and GS<50KW were separated into their own lists to be loaded and managed separately in the calling system.

Regions within each customer list were given a numerical value to be used for calling quotas.

Methodology Details

Questionnaire

The survey instrument was provided by the Electricity Distributors Association (EDA) developed in conjunction with Innovative Research. The survey consisted of an introduction, overall satisfaction, power quality and reliability, billing and payment, customer service experience, communications, price, optional deeper dive questions, and final personal finance / sector mood measures. Additional questions were provided individually by Tillsonburg Hydro. These questions are not required as part of the survey and, as outlined in the methodology guideline, were asked after all the standard and required questions.

Data Collection

Computer aided telephone interviews (CATI) were conducted from January 11-February 17, 2021.

Quality Control

- Advanis, on behalf of Redhead, trained the interviewers to understand the study's objectives;
- Detailed call records are kept by the automated CATI system, and are supplemented by output files to SPSS for productivity analysis (i.e., not subject to human error);
- The survey was soft launched in LDCs that had the most available sample, and the data was then checked before calling began in full for Tillsonburg Hydro;
- 100% of all surveys are digitally recorded for potential review (see next bullet);
- Advanis' Quality Assurance team listened to the actual recordings of five percent of completed surveys and compared the responses to those entered by the interviewer to ensure that responses from respondents are properly recorded;
- Team Supervisors conduct regular more formal evaluations with each interviewer, in addition to nightly monitoring of each interviewer on their team;
- Project Managers closely monitored the progress of data collection, including call record dispositions;
- All SPSS code is reviewed by a more senior researcher;
- All Report Builder output is reviewed by a more senior researcher; and
- All values in the report are reviewed by another team member to ensure accuracy.

Methodology Details

Analysis of Findings & Data Weighting

Results were weighted to match the proportion of low volume rate class records as provided to Redhead after cleaning of the sample file. Where a region flag was also provided, results were weighted to the low volume rate class within each region and regions were weighted proportionately to one another based on the customer base as provided in the cleaned sample file.

The Customer Satisfaction index scores have been highlighted and were calculated as described below, based on instructions in the Survey Methodology Guidelines. The "response values" referenced in the description below were also determined and provided by the survey authors.

Data analysis and cross-tabulation have been conducted using SPSS and Report Builder software.

This **index score** is calculated using the following process:

Step 1: Weight data to n=400 with each low volume rate class proportionate to its share of LDC customer base.

Step 2: Rescale the index score variables onto the 0 to 1 scale as indicated by the response values detailed below.

Step 3: The average result of the questions asked for each OEB topic and the overall satisfaction score will be added together[3].

	B5
+	**[C6+C7+C8]** divided by 3
+	**[D9+D10]** divided by 2
+	**E11**
+	**F12**
+	**G14**
=	**Total cumulative scores**

Step 4: The total cumulative score from Step 2 will be divided by 6 to generate the **Customer Satisfaction Index Score** (bound between 0-1).

The chart on the following page illustrates how the **Customer Satisfaction Index Score** will be calculated.

As noted above, LDCs without a region flag were weighted to their low volume rate class proportion based on the cleaned sample file. LDCs with a region flag were weighted to their low volume rate class proportion within each region based on the cleaned sample file, and then regions were weighted proportionately to one another based on the customer base as provided in the cleaned sample file.

Specific values of the number of sample records, estimated population proportions, and final weighted sample counts within Tillsonburg Hydro are provided below. The sum of the regional population proportions within an LDC may not equal 100% due to rounding.

Methodology Tables

Margin of error

LDC	Customer Records from LDC	Completed Surveys	Sample Size as % of Customer list	Margin of Error @ 95% confidence level
Tillsonburg Hydro	6,727	401	5.96%	+/- 4.7%

Sample weighting

Tillsonburg Hydro						
Regions Flagged in Sample	Low Volume Rate Class	Clean, Deduplicated Sample Received	Rate Class Proportion	Estimated Customer Proportion	Weighted Sample Count	Unweighted Sample Count
TOTAL	Residential	6,312	94%	100%	376	376
	General Service < 50 kW	415	6%		25	25
					401	401

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Thank You

We greatly appreciate working on this important project for Tillsonburg Hydro and hope we have met or exceeded your expectations.

We are happy to present this data to your staff or Board members upon request. If you wish to do so, please contact us for an appointment.

We look forward to working with you on future projects, including the Electricity Safety Awareness Survey later in 2021. Please note if you have any other projects that we may be able to help you with, don't hesitate to be in touch.

Graydon Smith - President
Redhead Media Solution Inc.
505 Hwy 118 W.
Suite 416
Bracebridge, ON
P1L 2G7

TILLSONBURG HYDRO INC.

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Appendix A-4 – 2023 Customer Survey

ADVANIS for TILLSONBURG HYDRO INC.

2023 Customer Satisfaction Survey

March 2023

Deliverables

Advanis is pleased to provide **this report with results of the 2023 Customer Satisfaction study**.

- We include comparisons to previous years of the study, where applicable.

In addition to this report, you have access to **Advanis' Online Reporting Environment** (ORE) which allows you to:

- create charts and tables like those contained in this report
  - you will be able to do much more analysis than we had space for in this overall report (e.g., look at results comparing segments of the annual consumption index or the regions within your LDC, if applicable)
- review the verbatim responses to:
  - the open-ended question "Is there anything you would like your LDC to do to improve its services to you?"; and
  - questions where respondents could "specify" a response to one of your custom questions (if applicable).
  - Note that you can export the verbatim responses to Excel at the click of a button; and
  - search for key words or filter the results by different segments (e.g., customer type, region) or other questions in the survey.

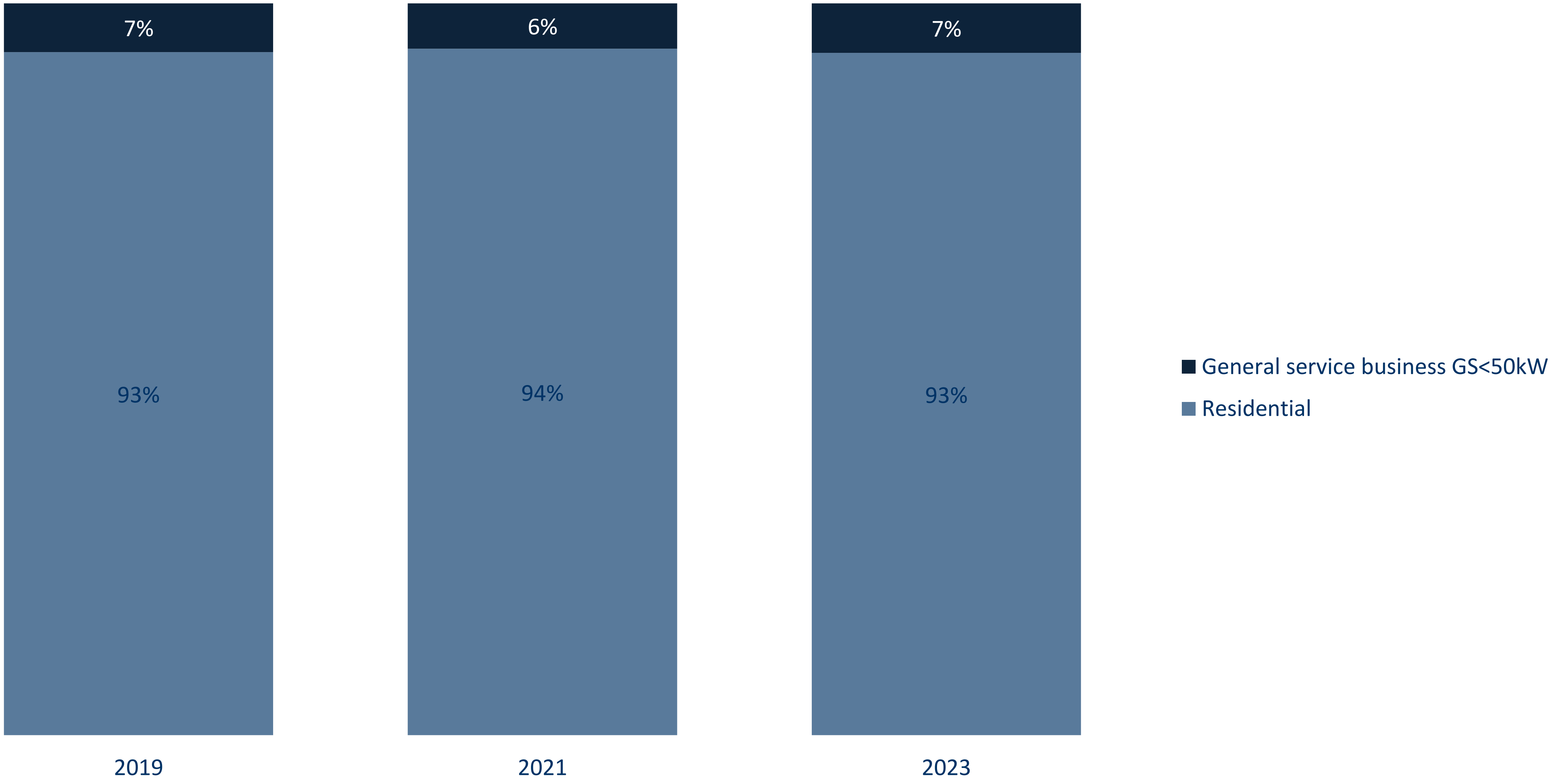
To access the ORE, visit this link: portal.advanis.net and enter your username in the format firstname_lastname. If you've forgotten your password, there is a link to reset it on the login page. If you have any questions, please contact Gary.Offenberger@advanis.net.

Contents

Lead Consultant: Gary.Offenberger@advanis.net // 780.229.1140

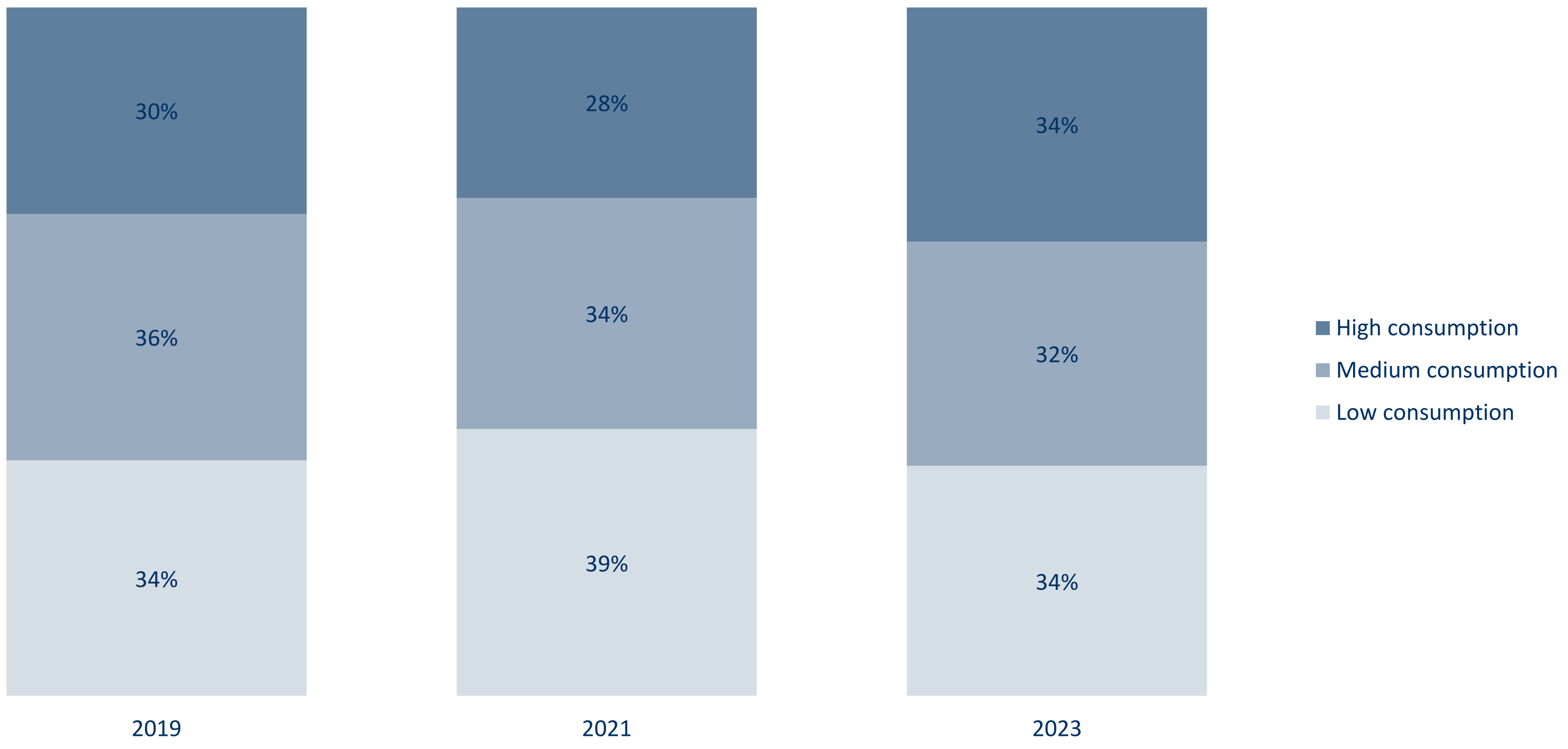
Customer (i.e., Survey Respondent) Profile

Customer Type - information provided by Tillsonburg Hydro



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

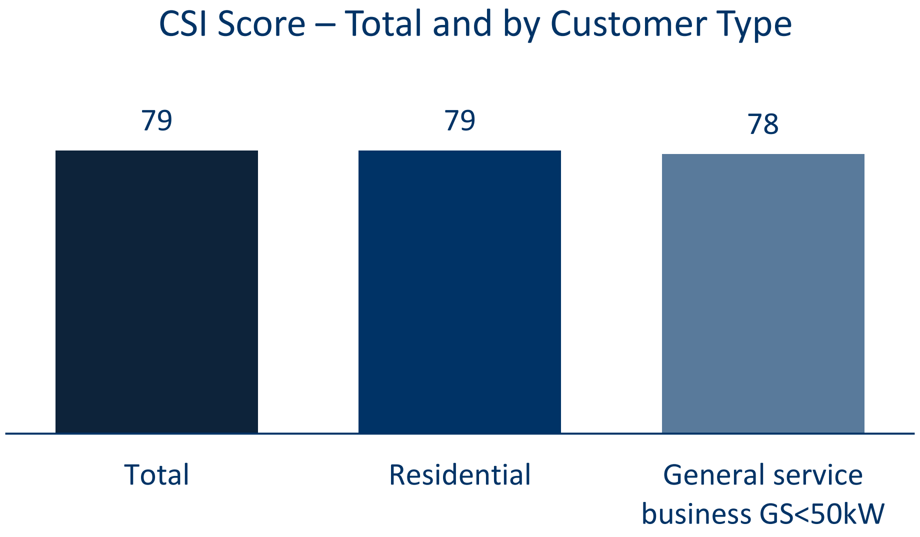
Indexed score of annual consumption (Only have GS data for 2023 onwards) - information provided by Tillsonburg Hydro

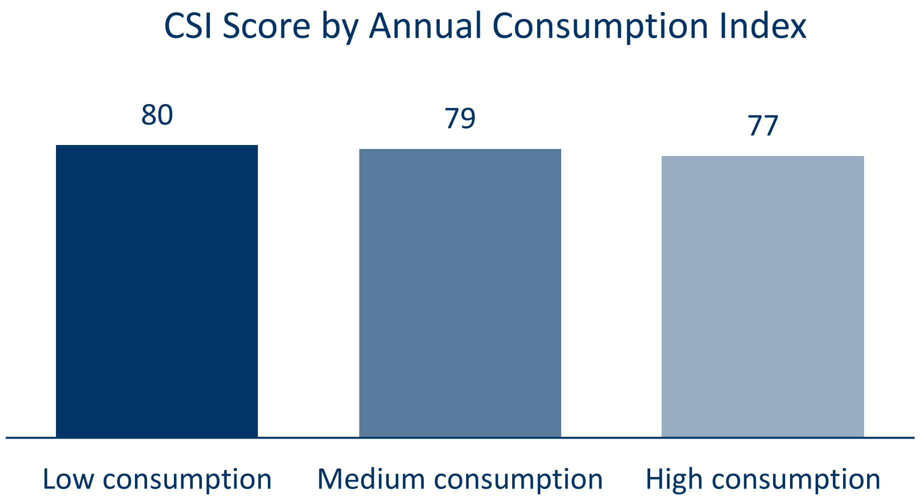


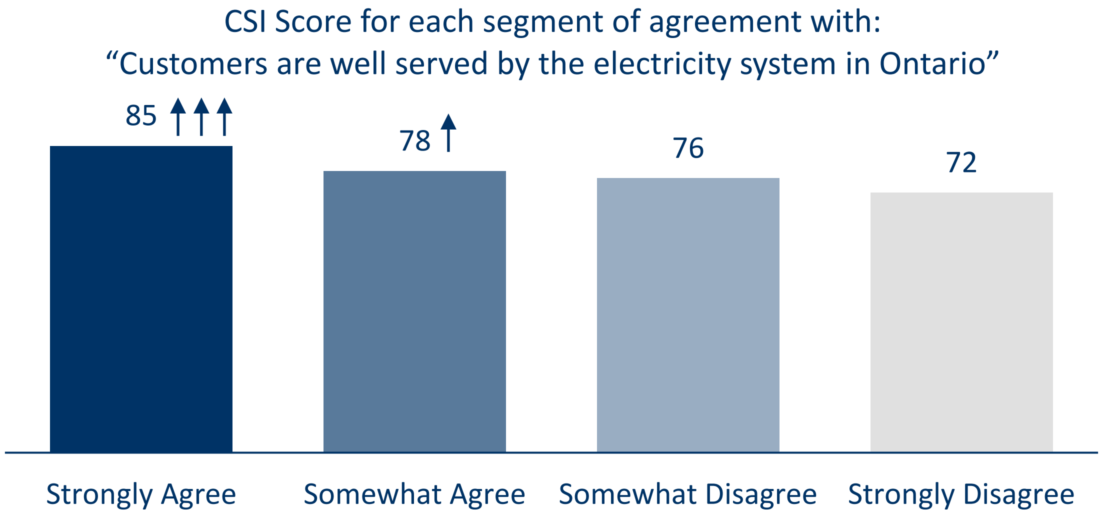
Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

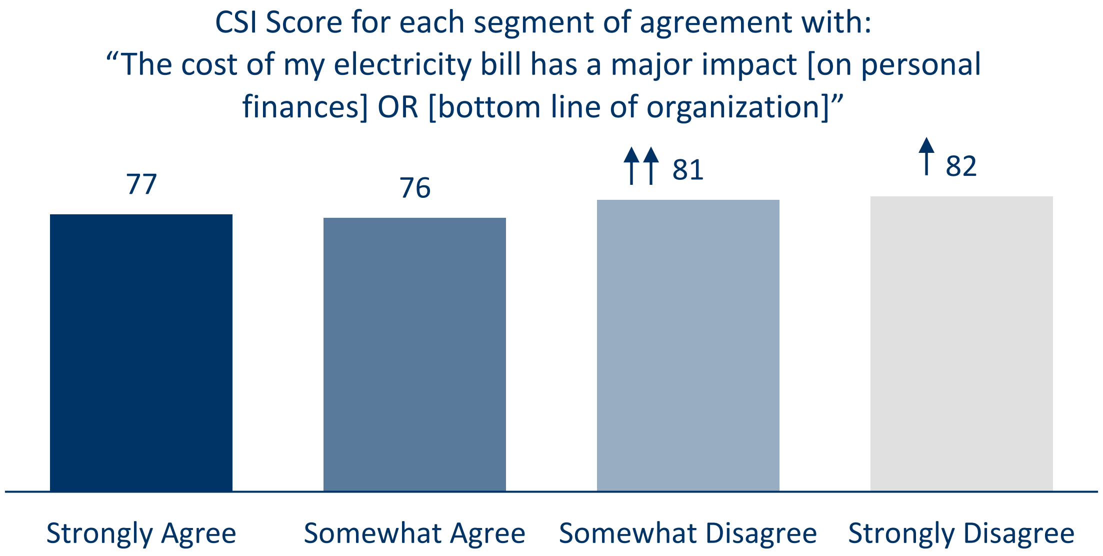
Customer Satisfaction Index Score – 2023 Results & Trend

Customer Satisfaction Index: Tillsonburg Hydro for 2023





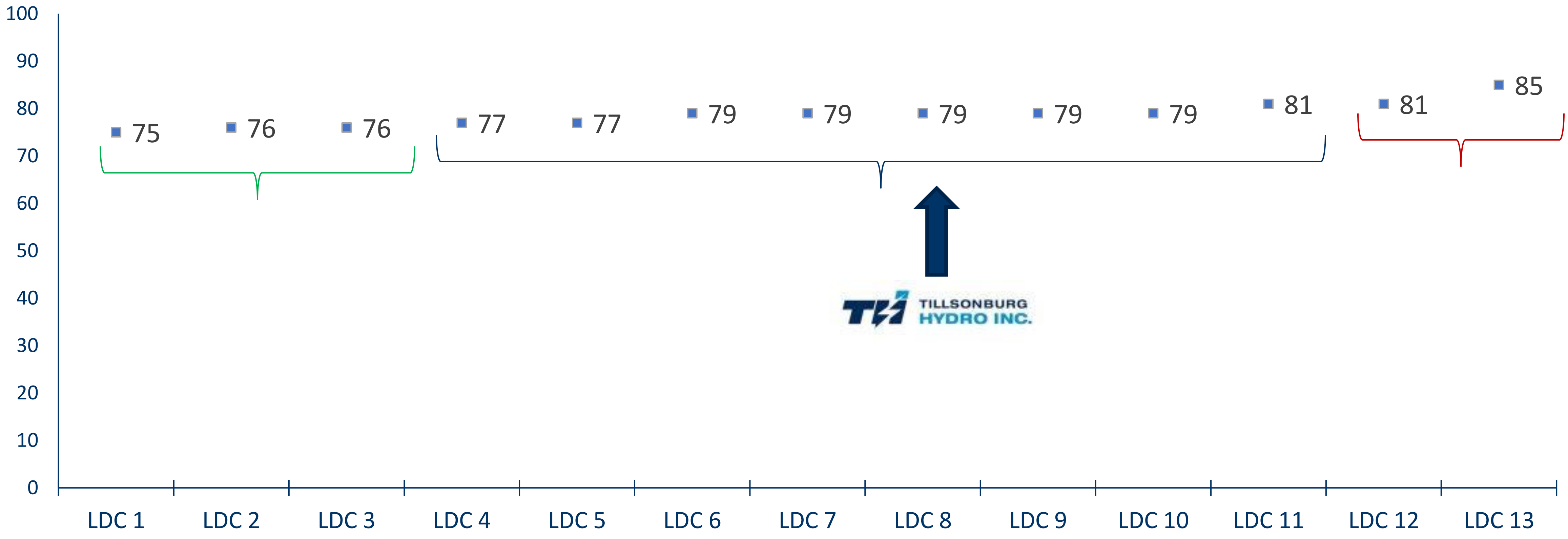




Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro
Note: Arrows denote statistically higher than other segment(s) at 95% confidence level; sometimes an apparent difference is not statistically significant because of low base size in a segment

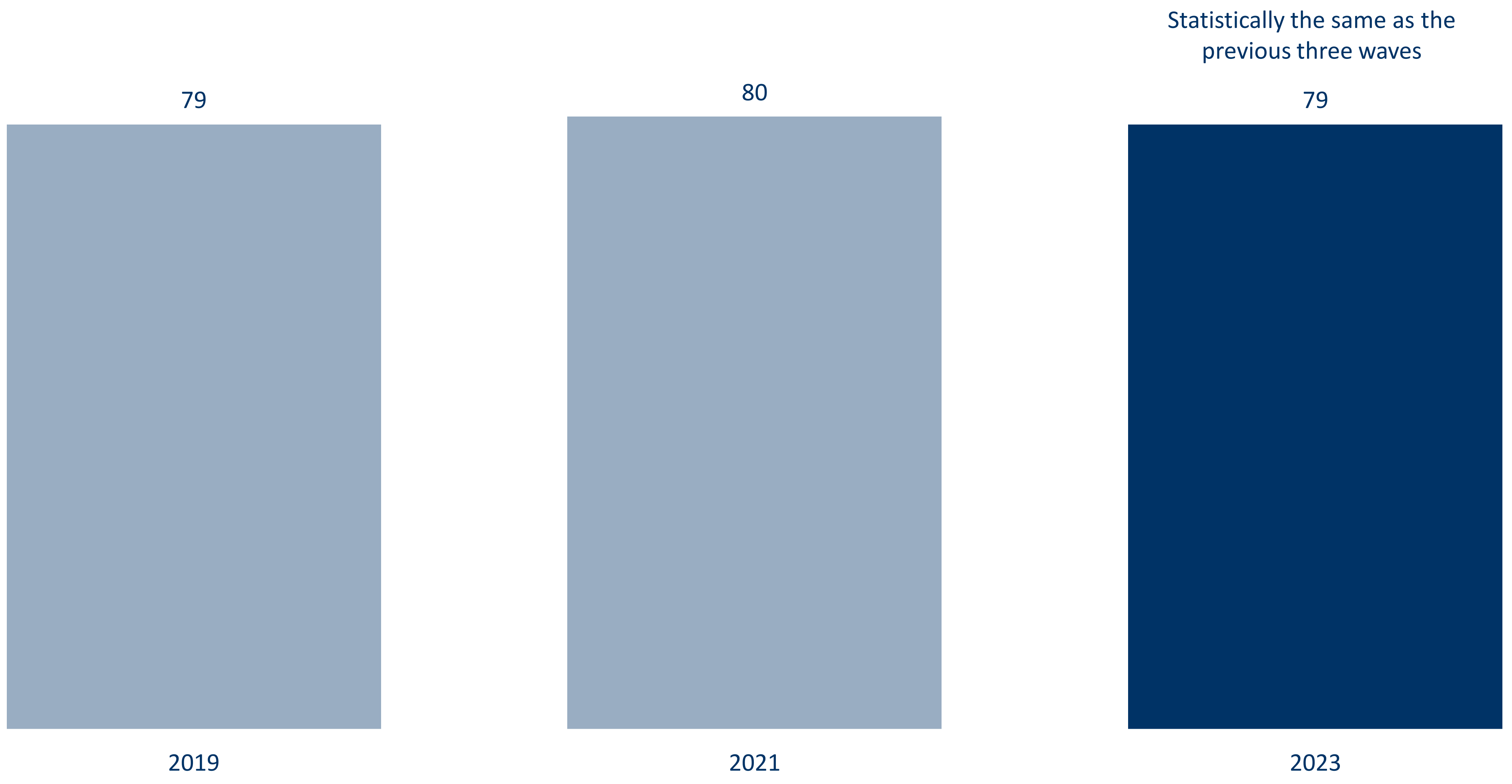
Customer Satisfaction Index: Compared to Other CHEC Members

- In 2023, Tillsonburg's score of 79 is *statistically* the same as that of 7 other LDCs.
- Tillsonburg's score is *statistically* higher than that of 3 other LDCs.
- Tillsonburg's score is *statistically* lower than that of 2 other LDC (the score of 81 for one of the LDCs is not statistically higher than Tillsonburg's).



Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023
Note: Statistical differences at 95% confidence level; sometimes an apparent difference is not statistically significant because of low base size in a segment

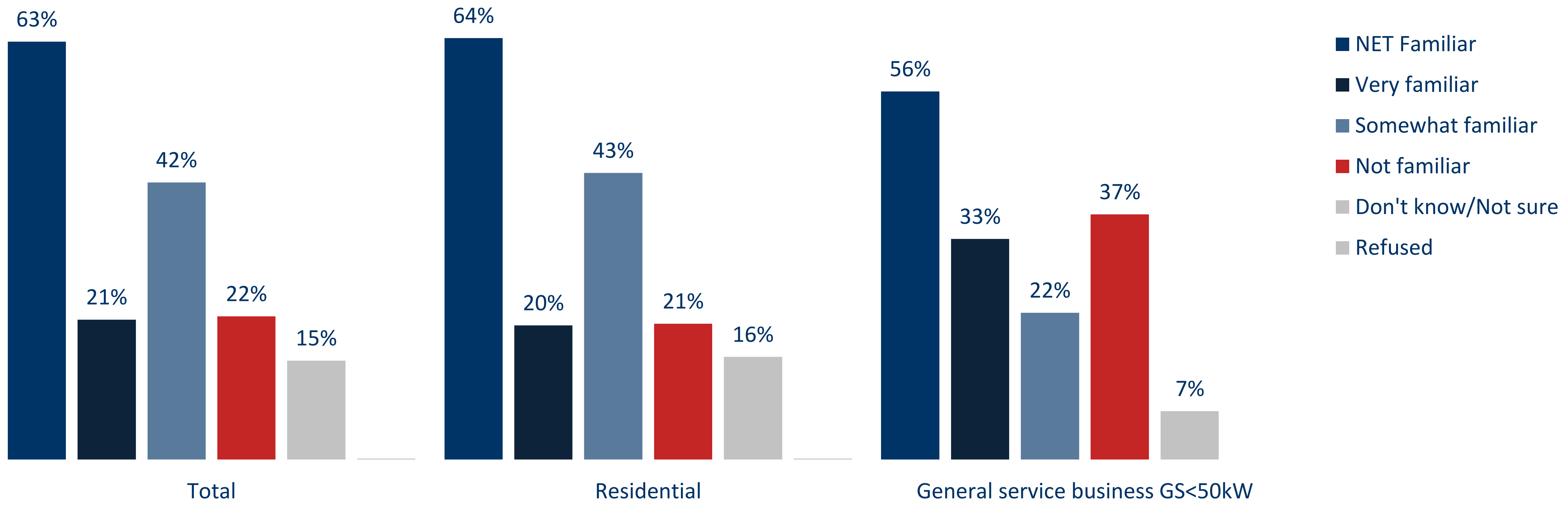
Tillsonburg Hydro's Customer Satisfaction Index by Year



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro
Note: Statistical differences at 95% confidence level; sometimes an apparent difference is not statistically significant because of low base size in a segment

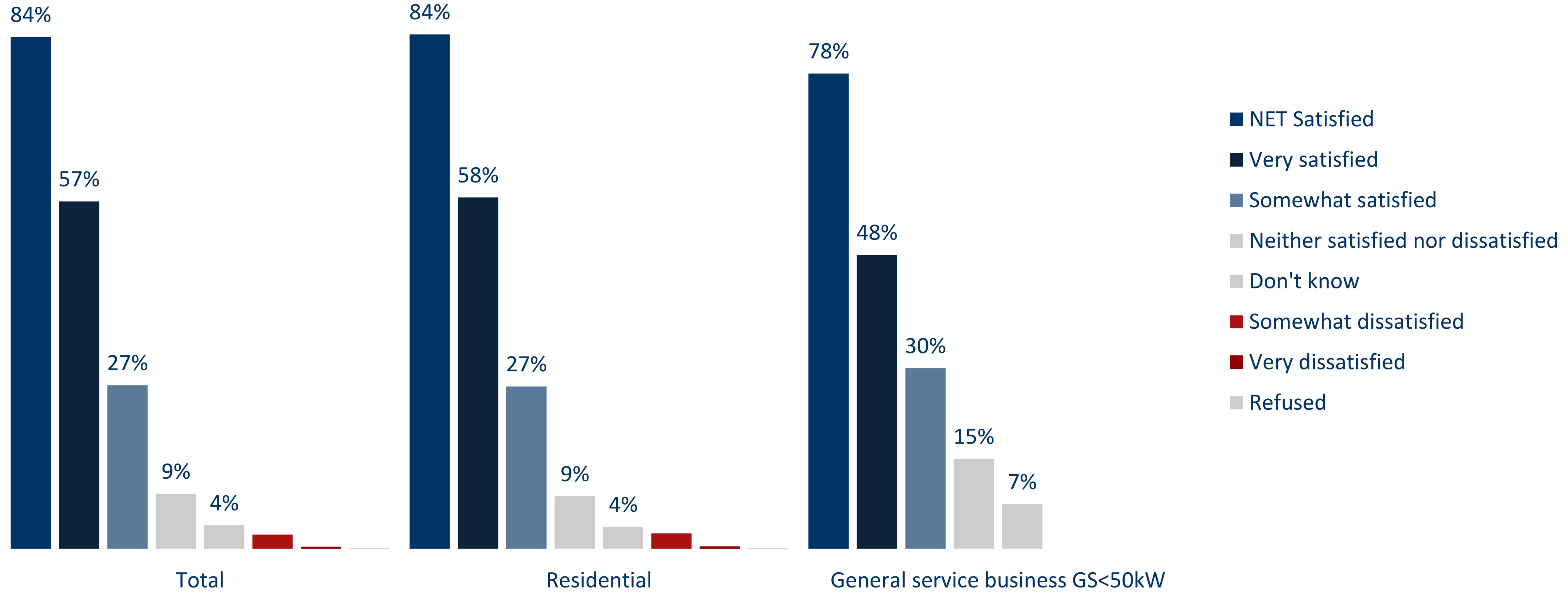
Core (OEB) Survey Questions – 2023 Results

How familiar are you with Tillsonburg Hydro, which operates the electricity distribution system in your community?



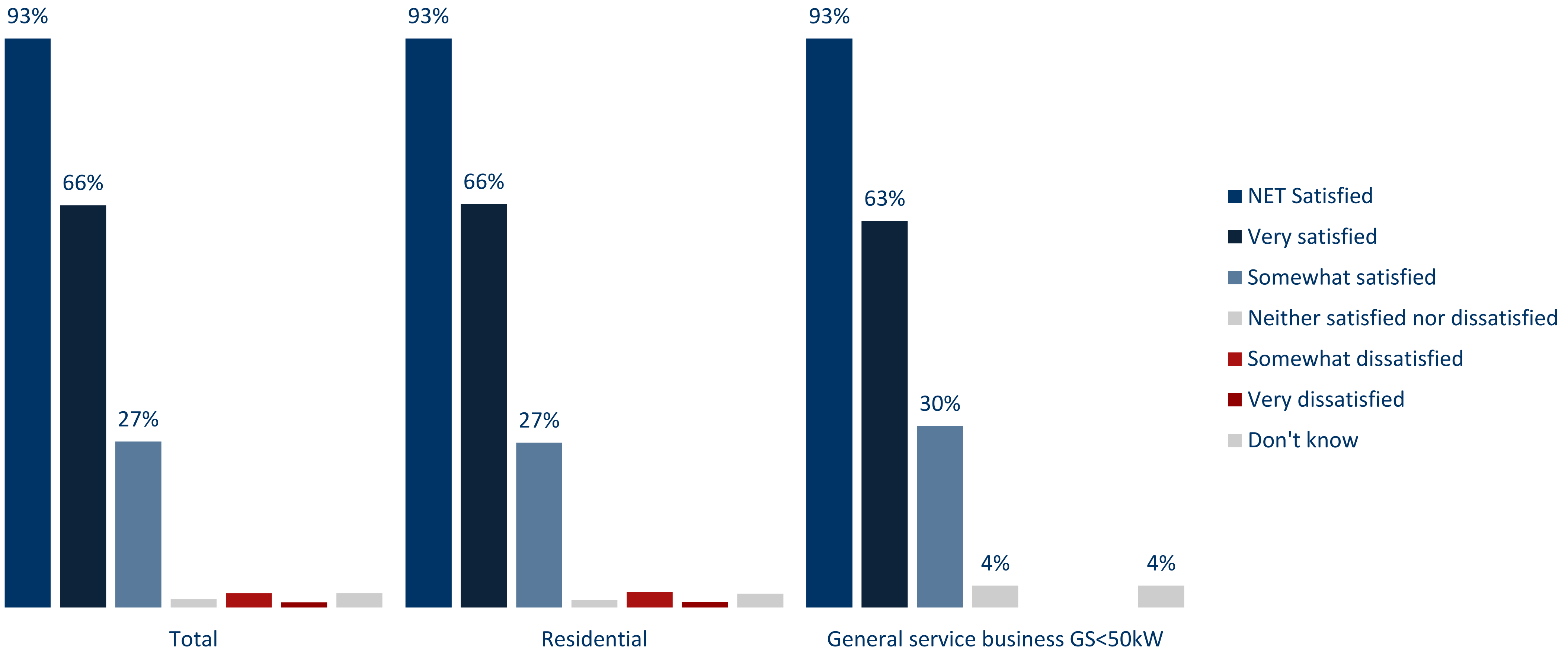
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

Thinking specifically about the services provided to you and your community by Tillsonburg Hydro, OVERALL, how satisfied are you with the services that you receive?



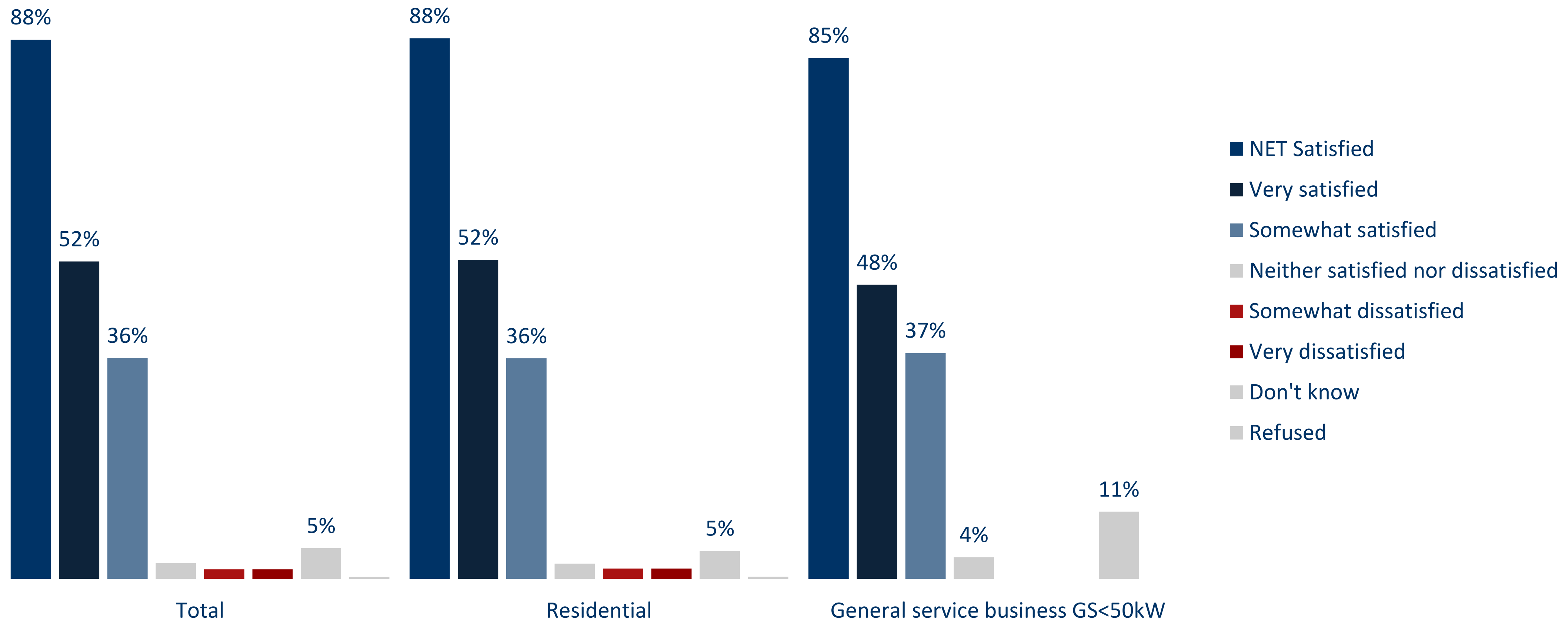
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

How satisfied are you with the electrical service that you receive from Tillsonburg Hydro - based on the RELIABILITY of your electrical service as judged by the number of outages you experience?



Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

How satisfied are you with the electrical service that you receive from Tillsonburg Hydro - based on the amount of TIME IT TAKES TO RESTORE POWER when outages occur?



Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

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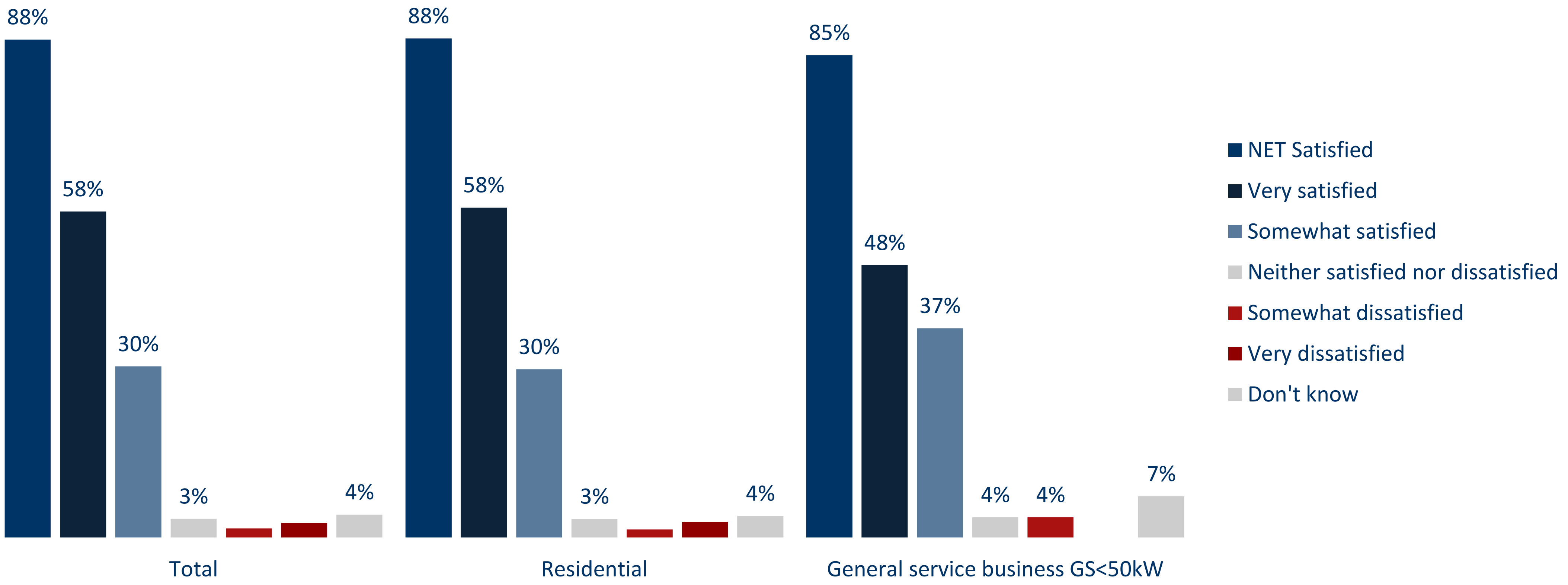
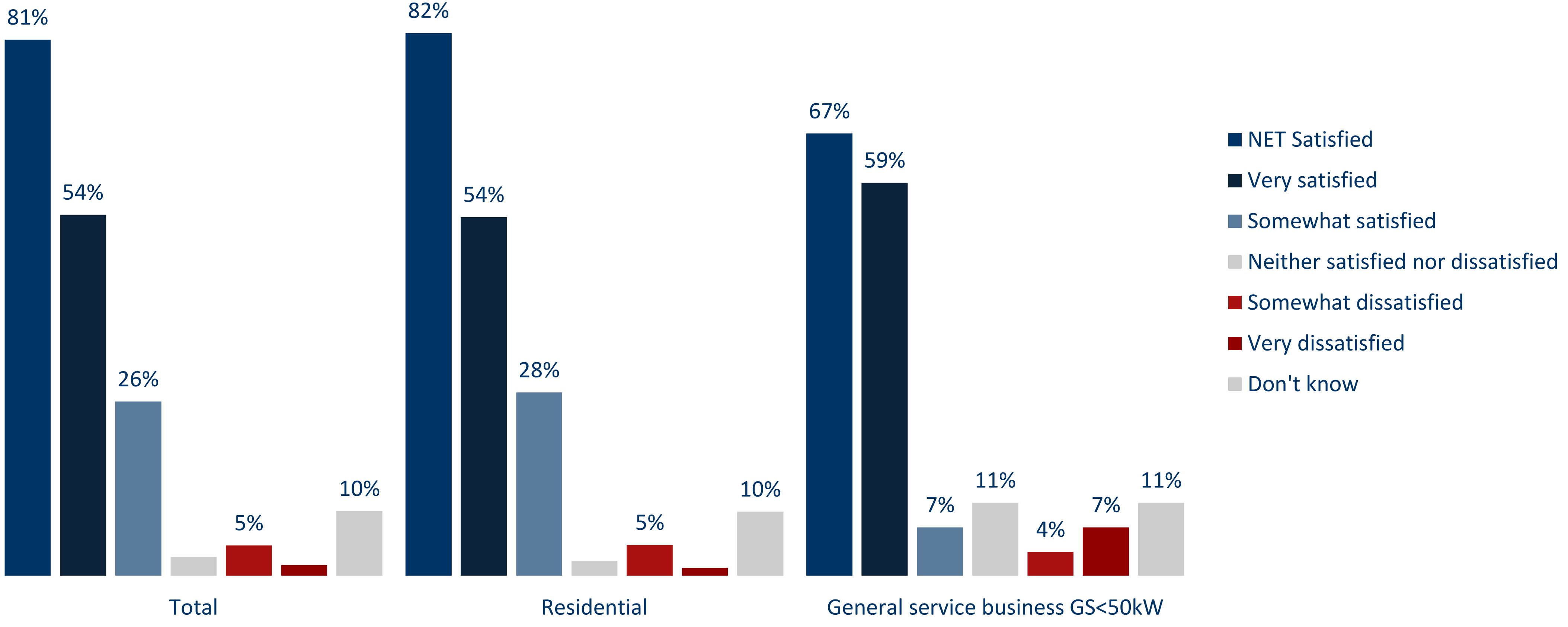
How satisfied are you with the electrical service that you receive from Tillsonburg Hydro - based on the QUALITY OF THE POWER delivered to you as judged by the absence of voltage fluctuations that can result in flickering/dimming of lights / an affect on



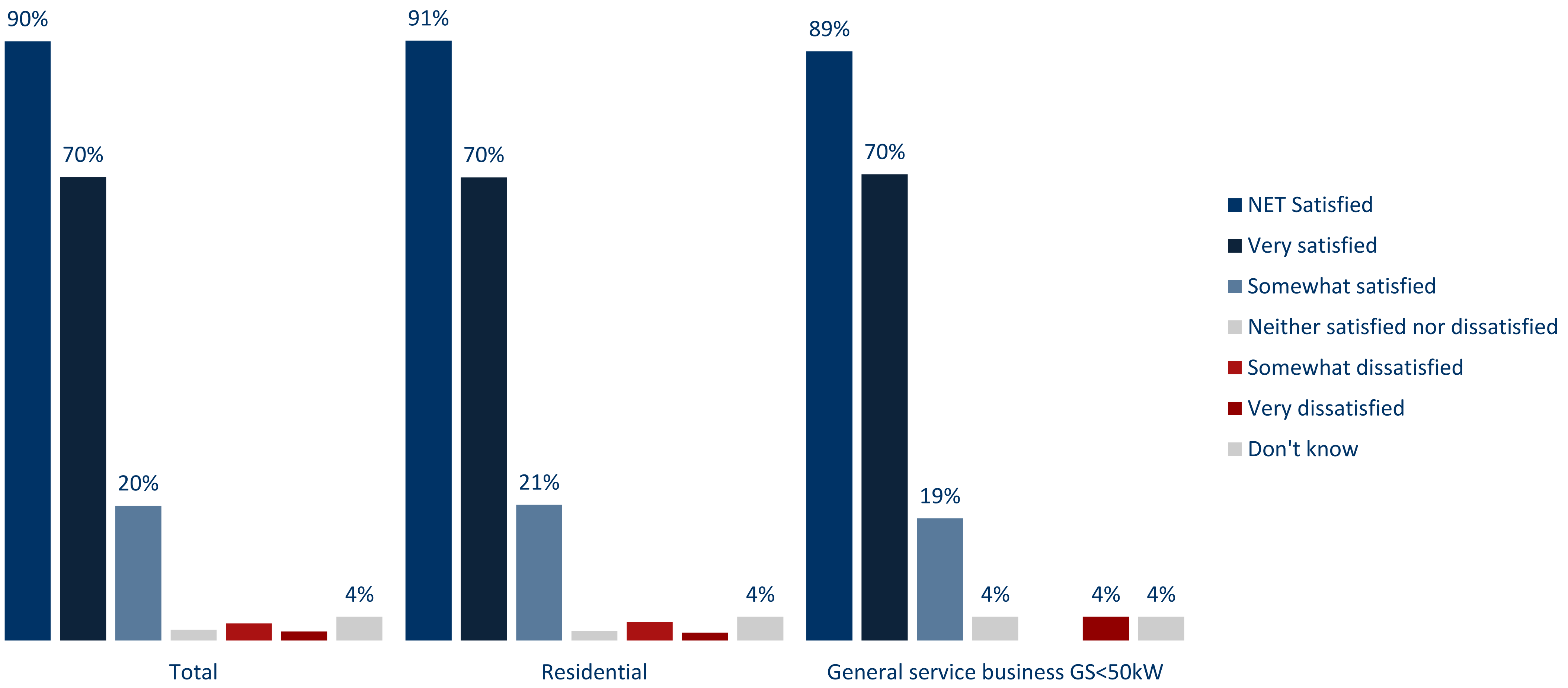
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

How satisfied are you with the bills that you receive from Tillsonburg Hydro - based on them providing ACCURATE BILLS?



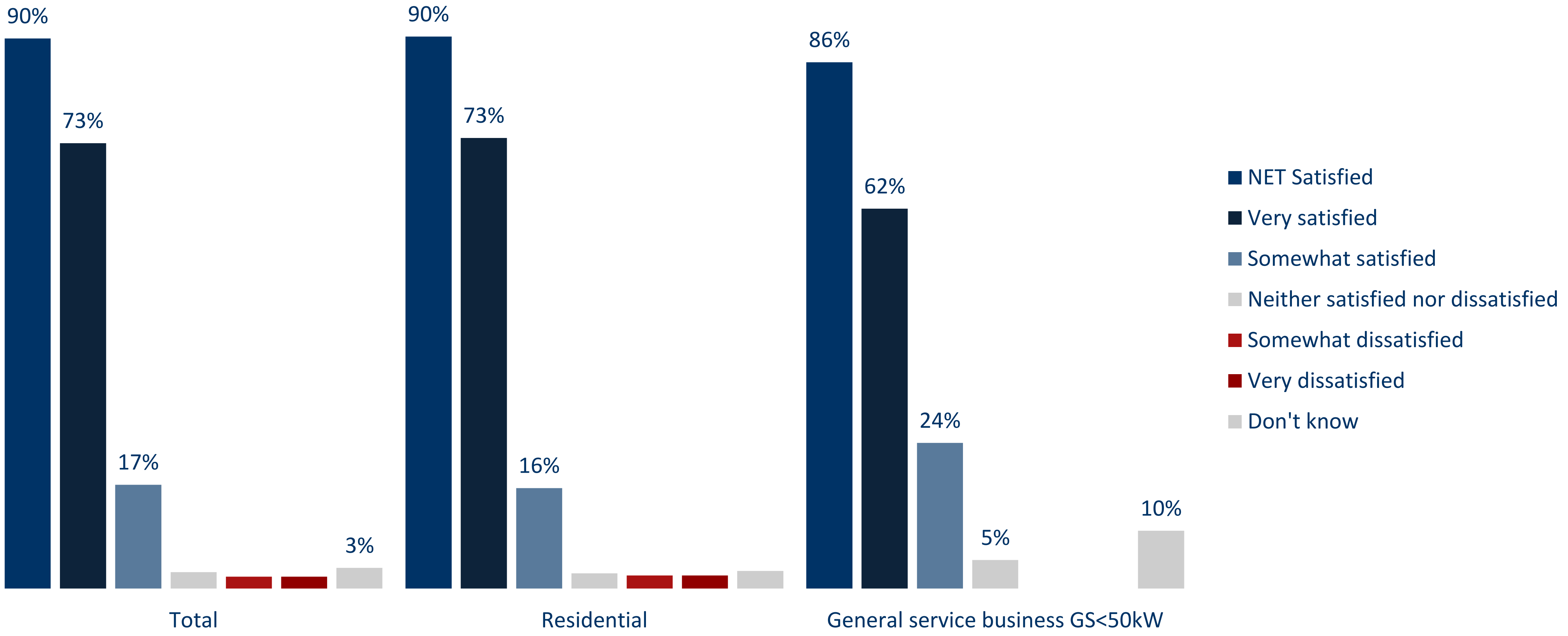
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

How satisfied are you with the bills that you receive from Tillsonburg Hydro - based on them providing CONVENIENT OPTIONS TO RECEIVE AND PAY BILLS?



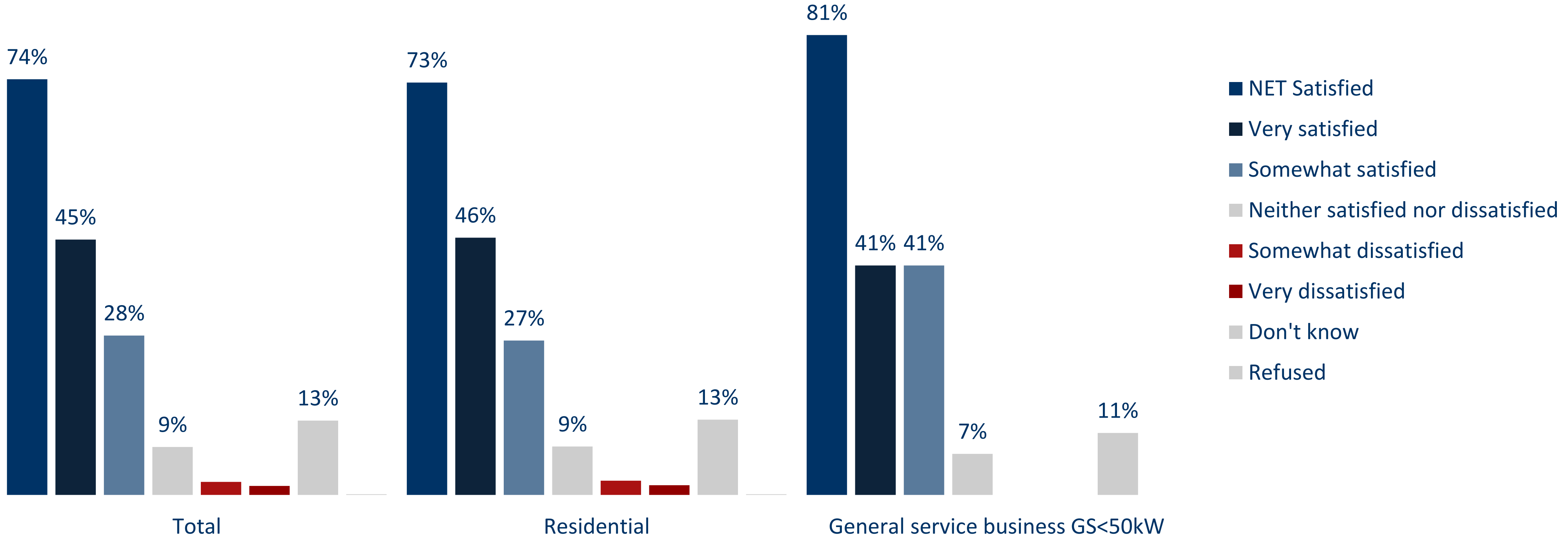
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

How satisfied are you with the CUSTOMER SERVICE you have received when dealing with employees of Tillsonburg Hydro, whether on the telephone, via email, in person or through online conversations including social media?



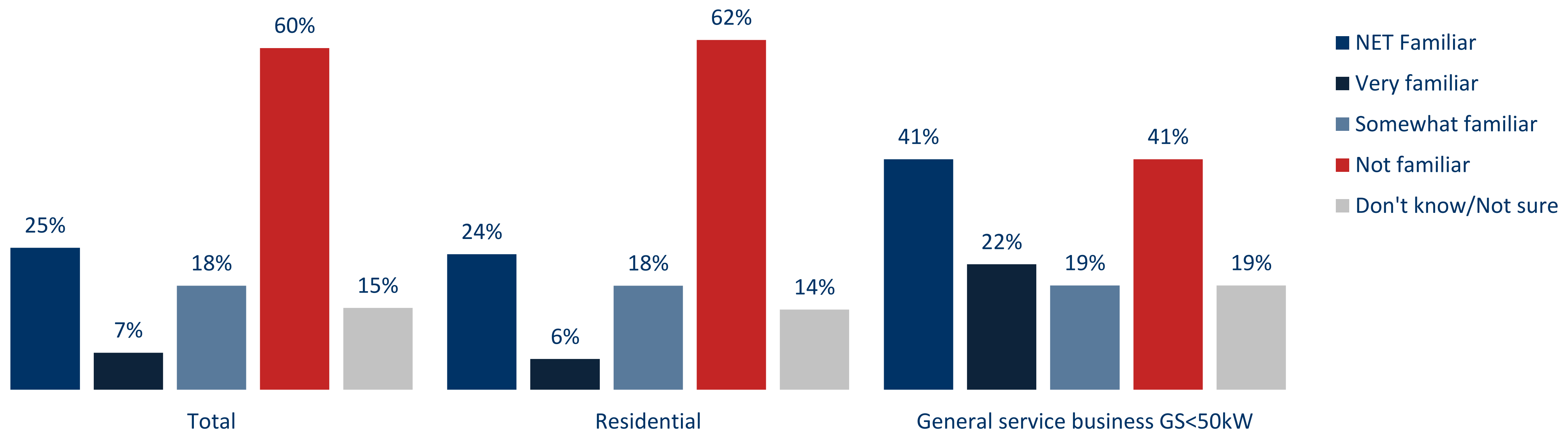
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro
Note: Base excludes those who indicated that they had not contacted customer service, thus could not provide an assessment

How satisfied are you with the COMMUNICATIONS that you may receive from Tillsonburg Hydro without talking directly to an employee, including information found on their website, bill inserts, advertising, notices, emails, or social media sites?



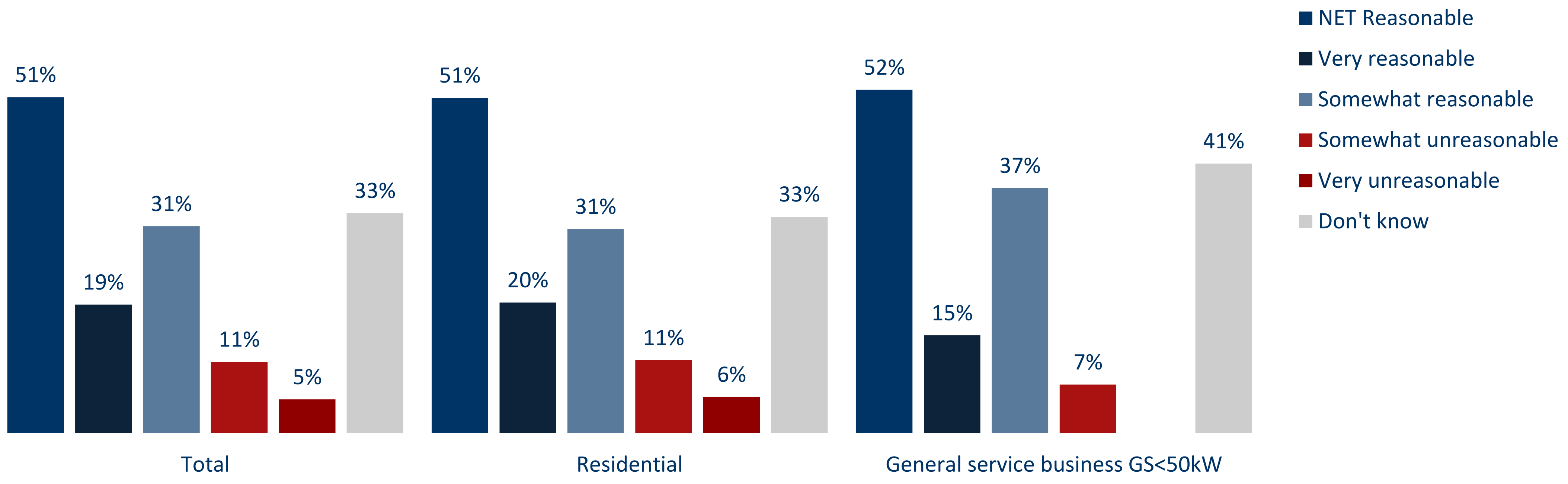
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

How familiar are you with the percentage of your electricity bill that went to Tillsonburg Hydro? So, NOT the portions allocated to power generation companies, transmission companies, the provincial government and regulatory agencies.



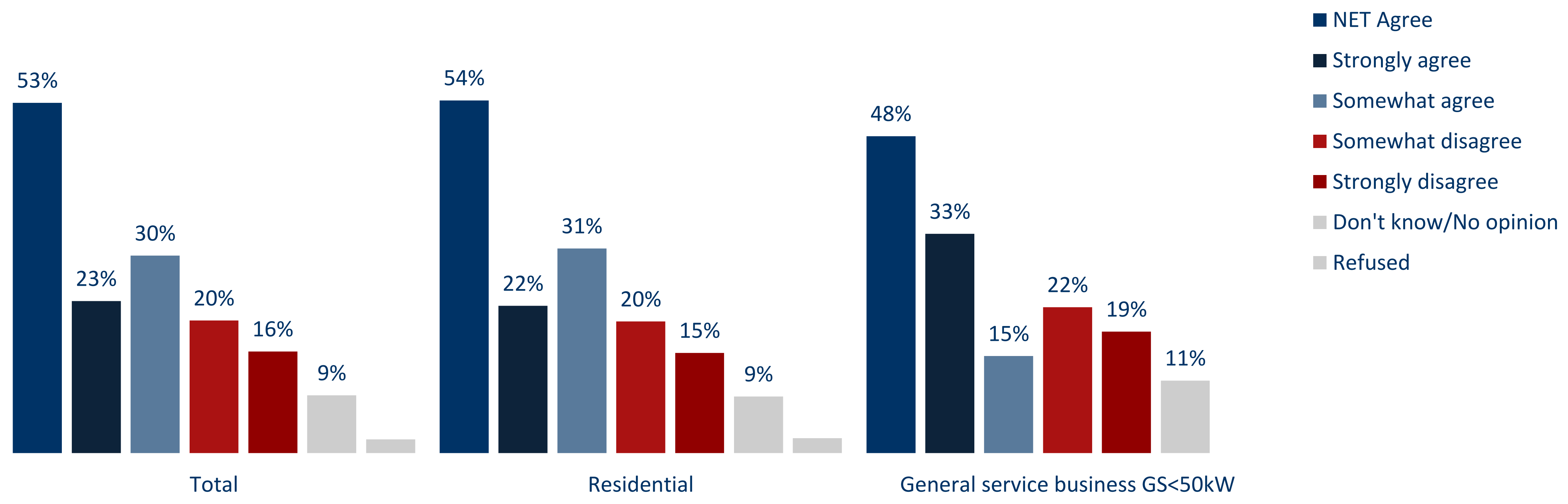
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

Do you feel that the percentage of your total electricity bill that you pay to Tillsonburg Hydro for the services they provide is...?



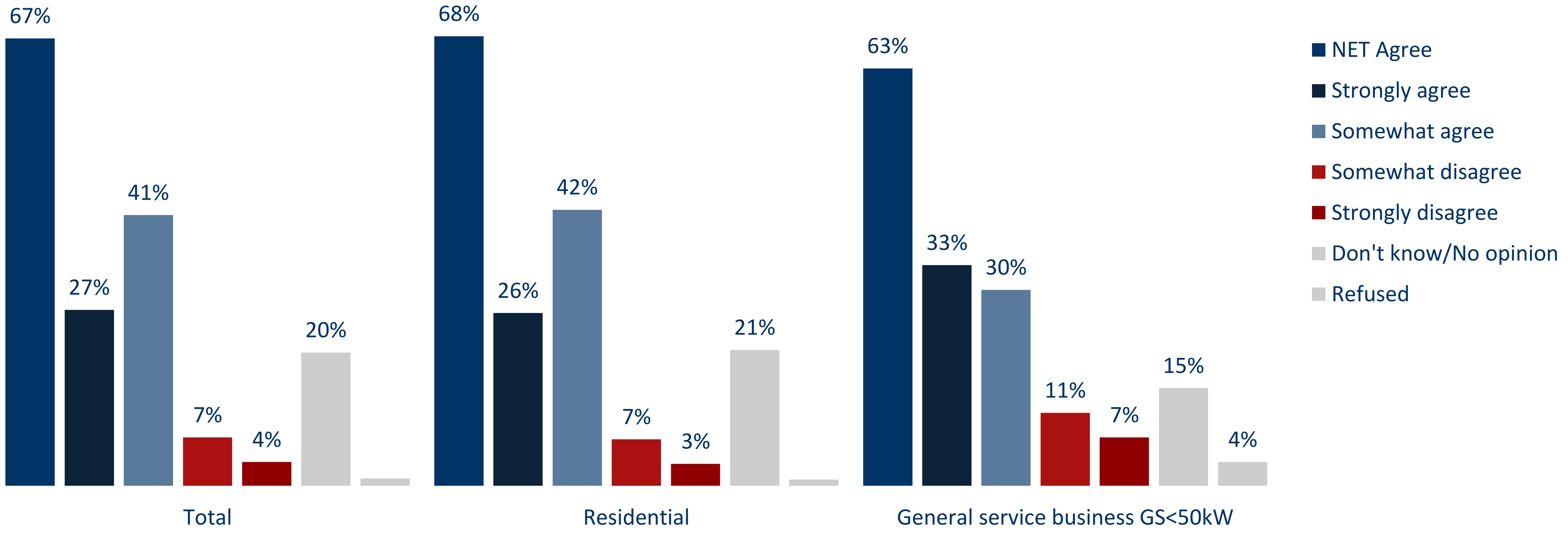
Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

To what extent do you agree with "The cost of my electricity bill has a major impact [on personal finances OR bottom line of organization]"?



Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

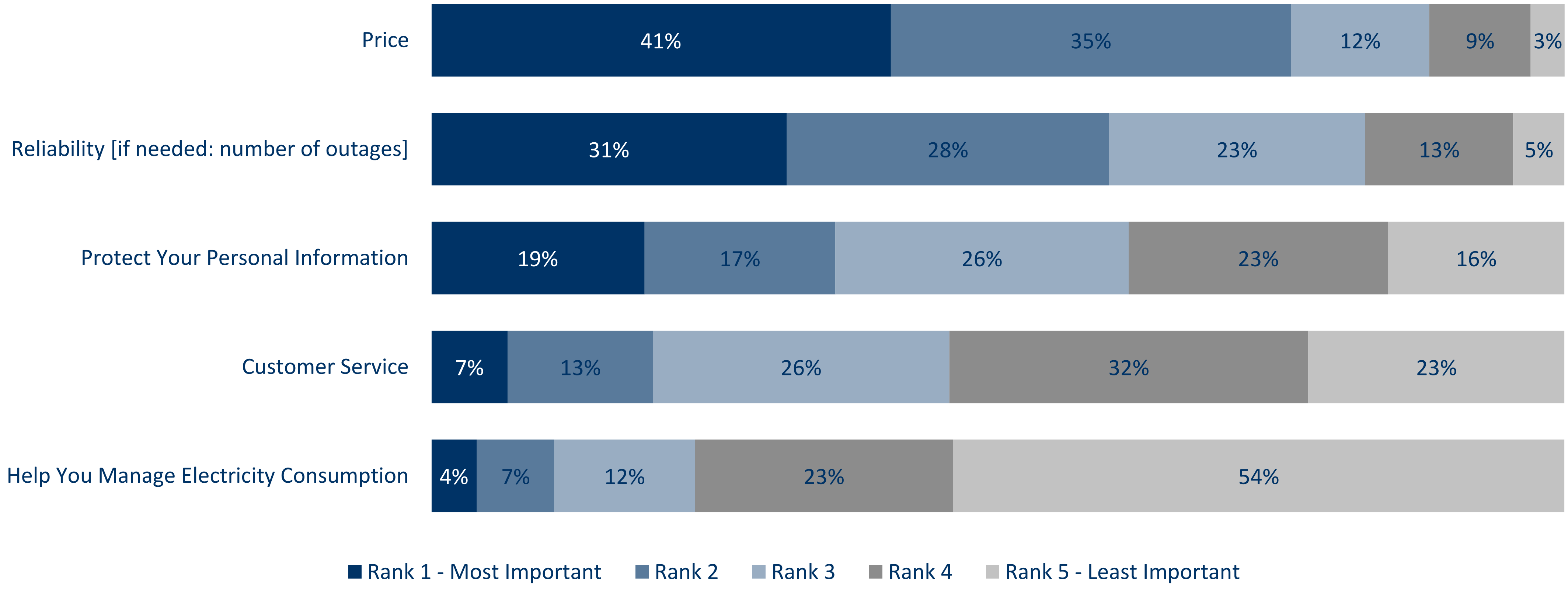
To what extent do you agree with "Customers are well served by the electricity system in Ontario"?



Weight: Aggregate weight for LDC based on customer_type
Filters: Year of Data Collection: 2023, LDC: Tillsonburg Hydro

Tillsonburg Hydro’s Custom Survey Questions – 2023 Results

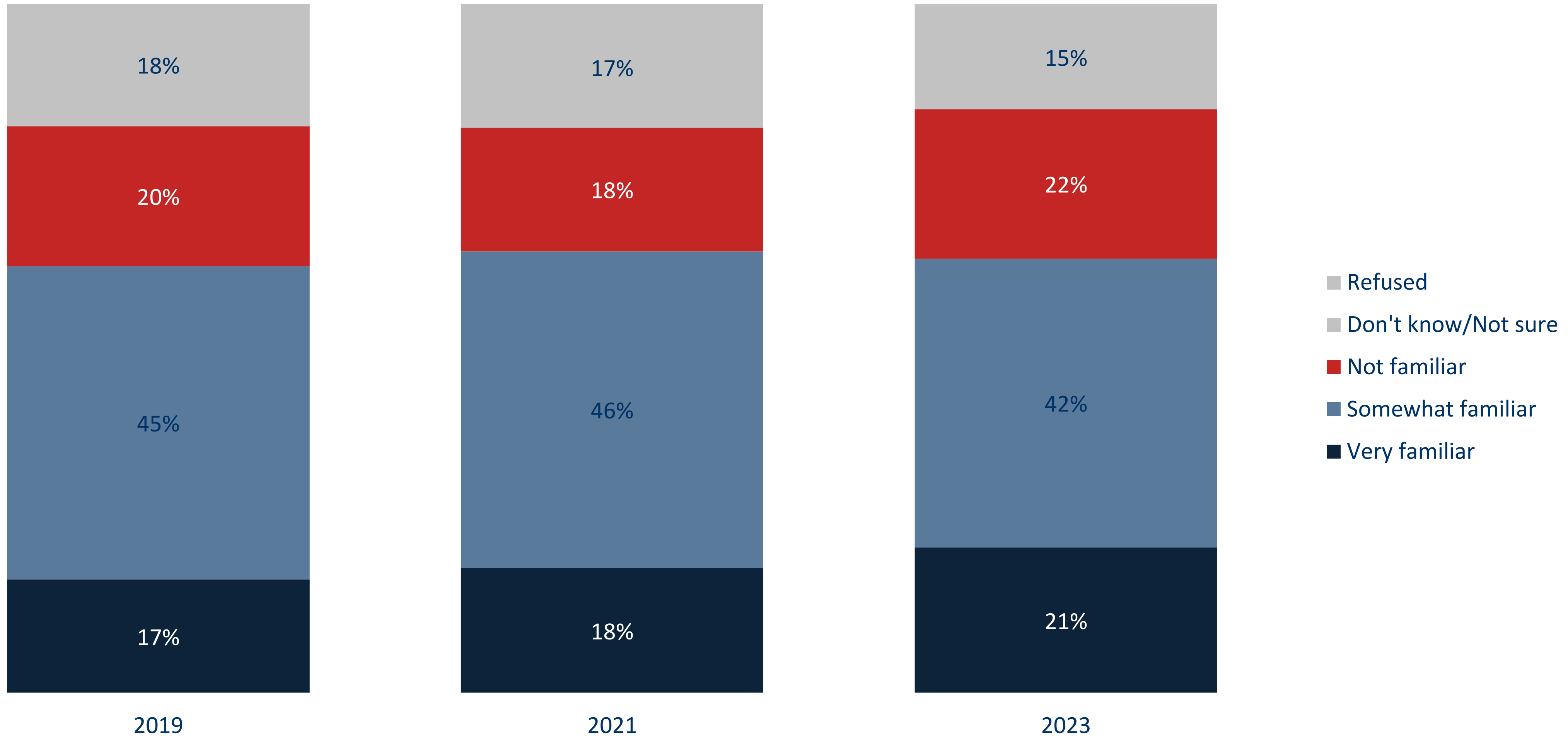
Tillsonburg Hydro is in the process of preparing a rate application to the Ontario Energy Board for 2024 and would like to get feedback from its customers to help set its priorities. Please rank the following 5 items from most important to you [1] to leas



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro
Base Size: 402

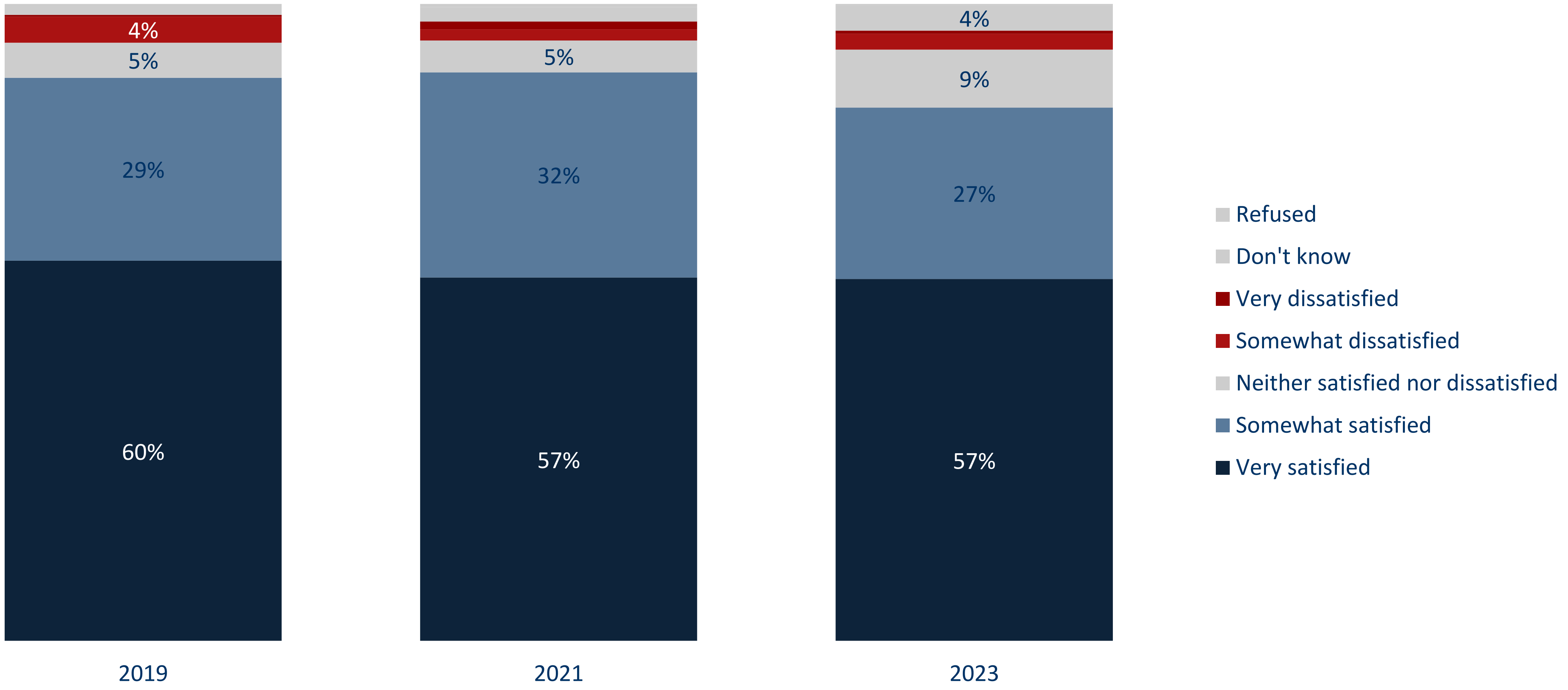
Core (OEB) Survey Questions – Trend over Time

How familiar are you with Tillsonburg Hydro, which operates the electricity distribution system in your community?



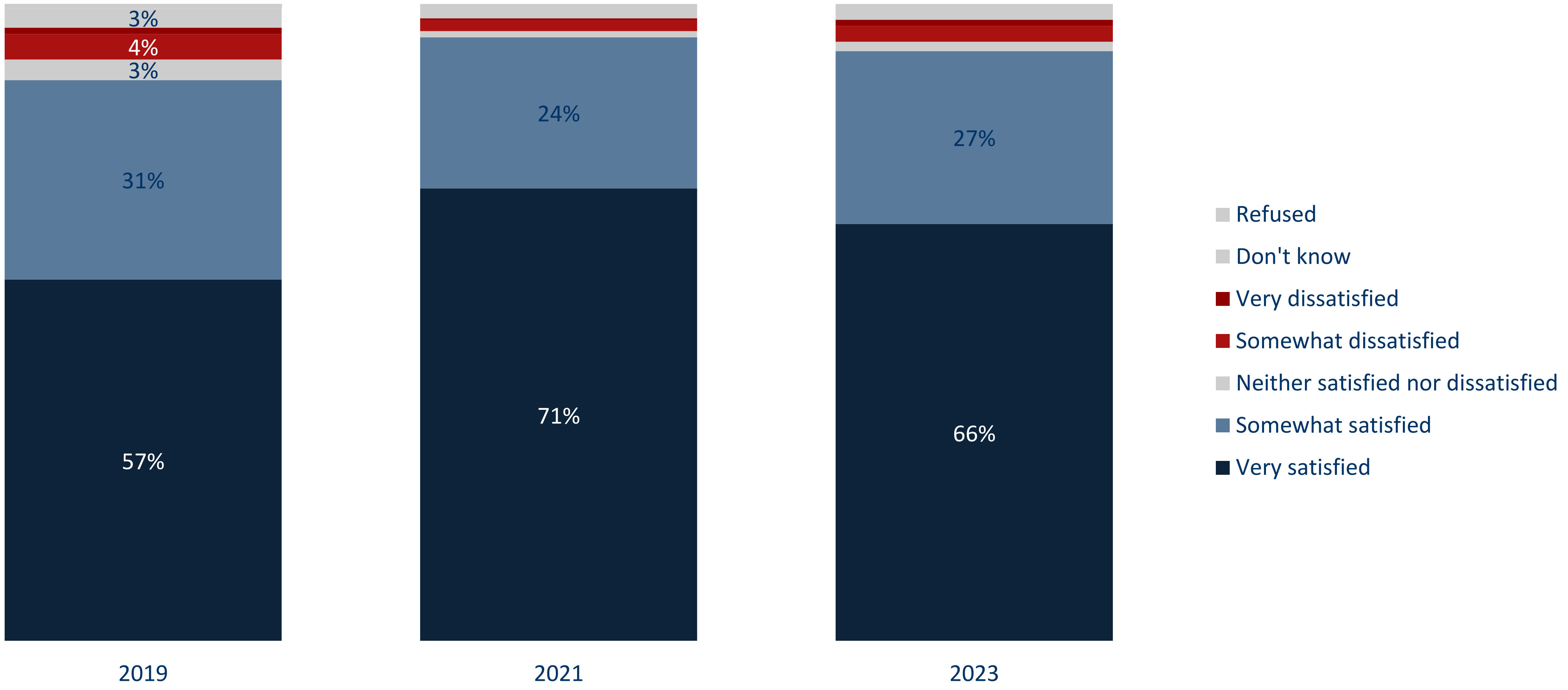
Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

Thinking specifically about the services provided to you and your community by Tillsonburg Hydro, OVERALL, how satisfied are you with the services that you receive?



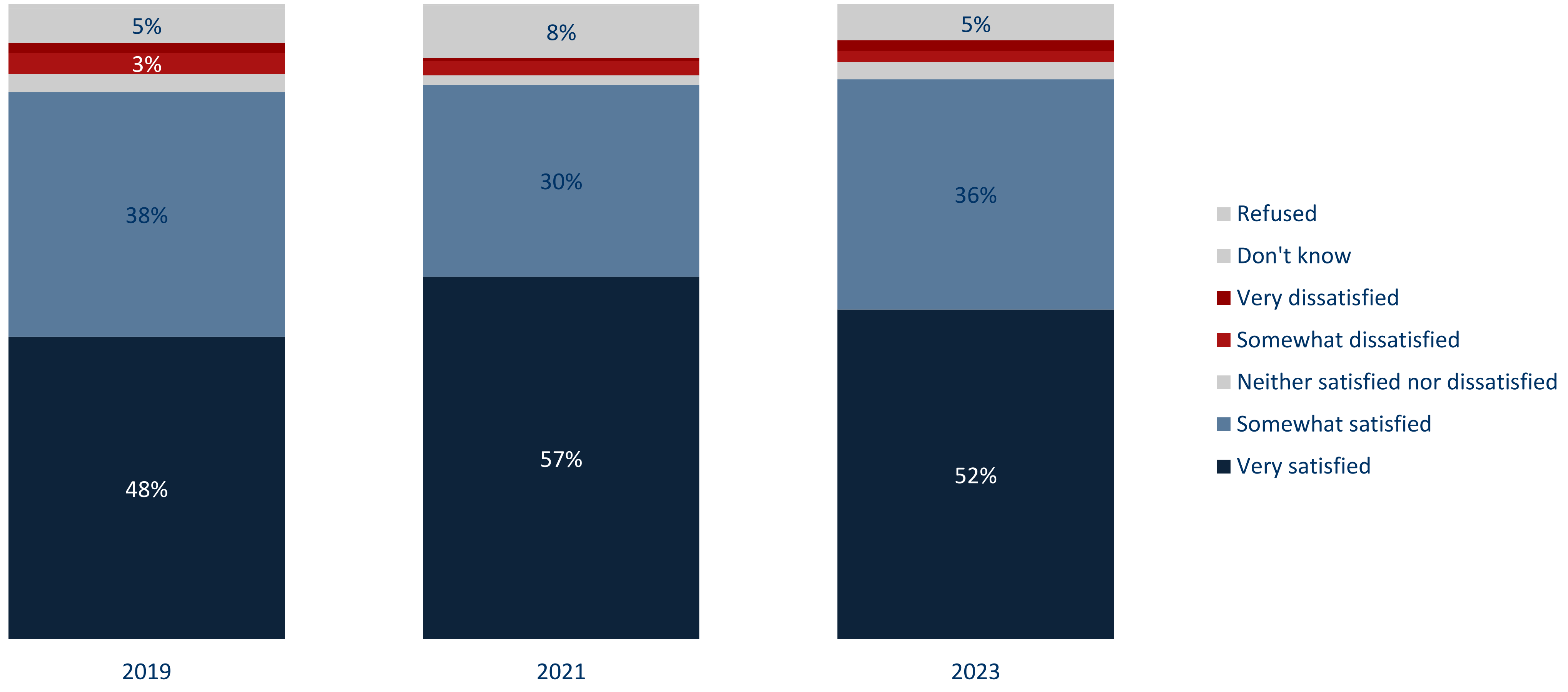
Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

How satisfied are you with the electrical service that you receive from Tillsonburg Hydro - based on the RELIABILITY of your electrical service as judged by the number of outages you experience?



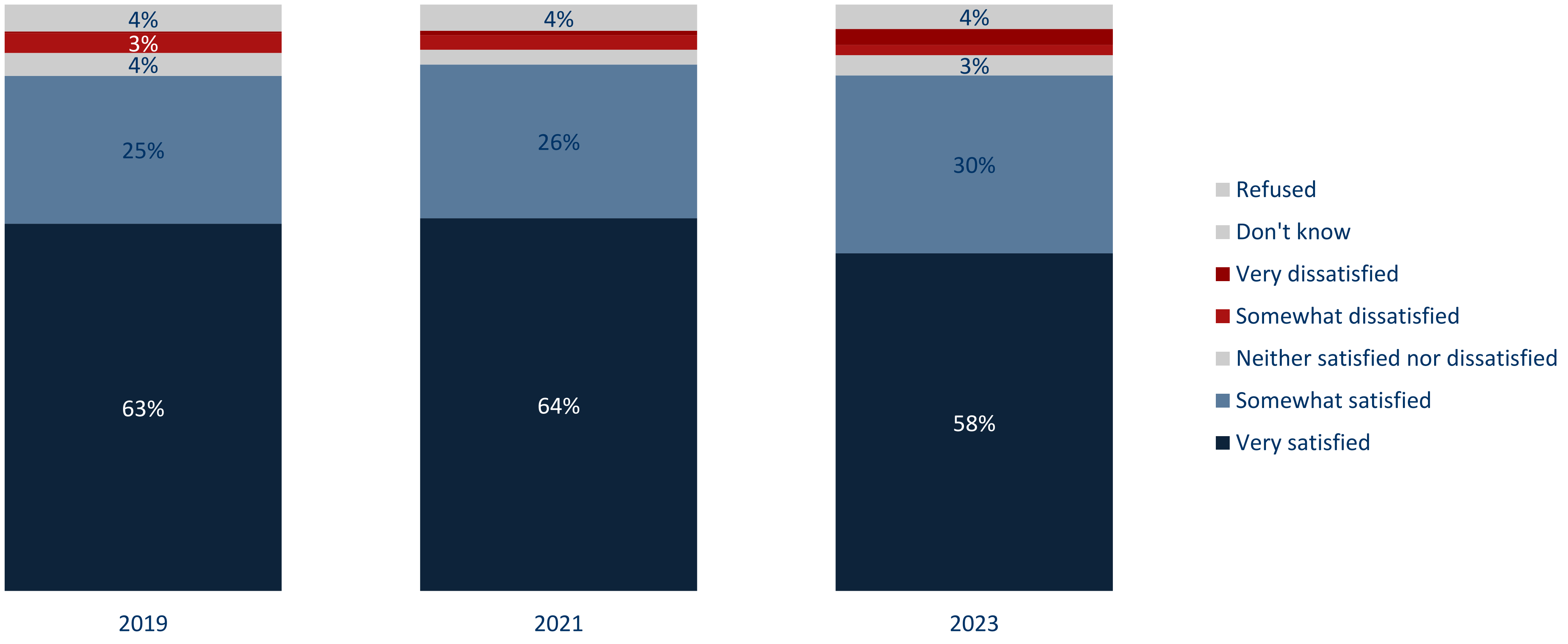
Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

How satisfied are you with the electrical service that you receive from Tillsonburg Hydro - based on the amount of TIME IT TAKES TO RESTORE POWER when outages occur?



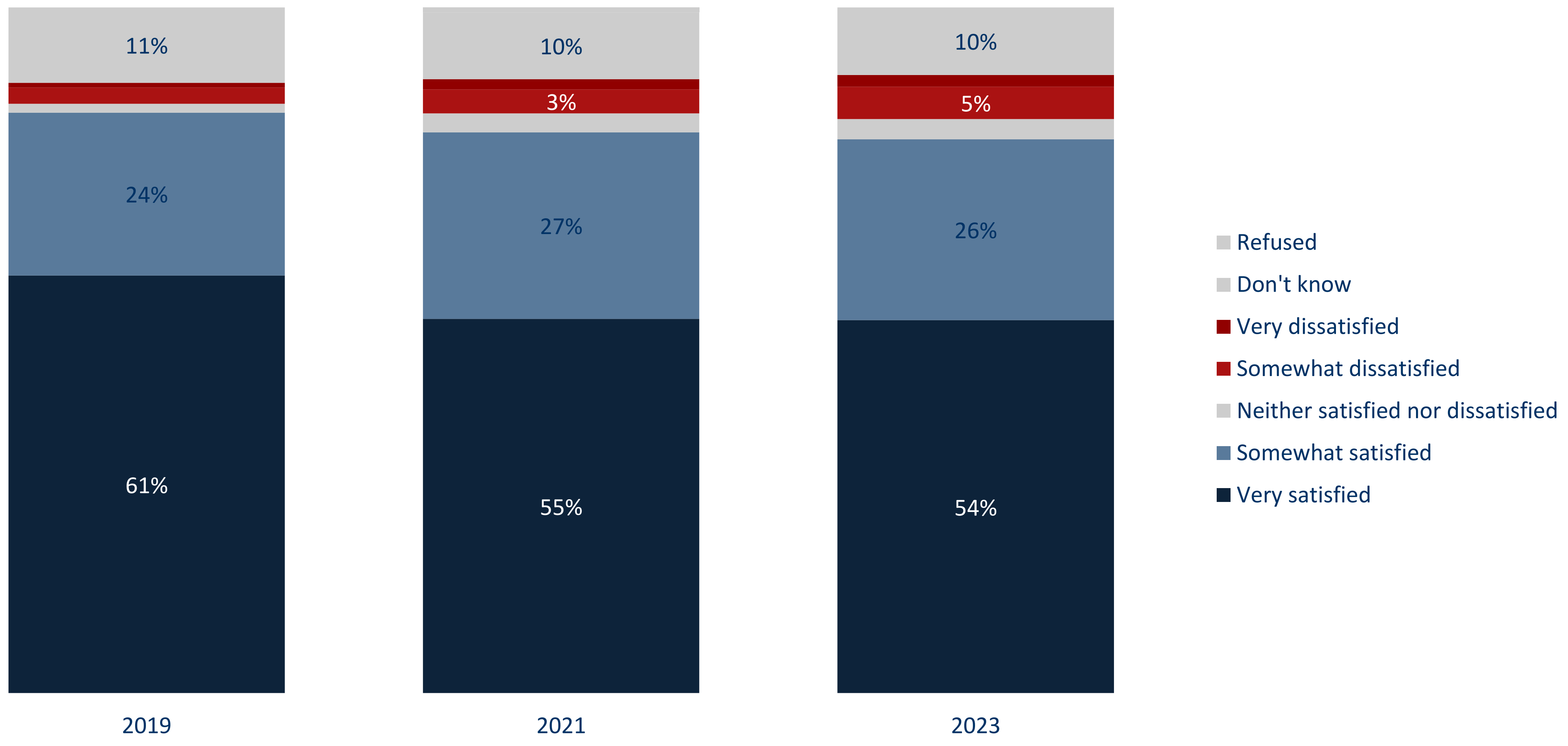
Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

How satisfied are you with the electrical service that you receive from Tillsonburg Hydro - based on the QUALITY OF THE POWER delivered to you as judged by the absence of voltage fluctuations that can result in flickering/dimming of lights / an affect on



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

How satisfied are you with the bills that you receive from Tillsonburg Hydro - based on them providing ACCURATE BILLS?



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

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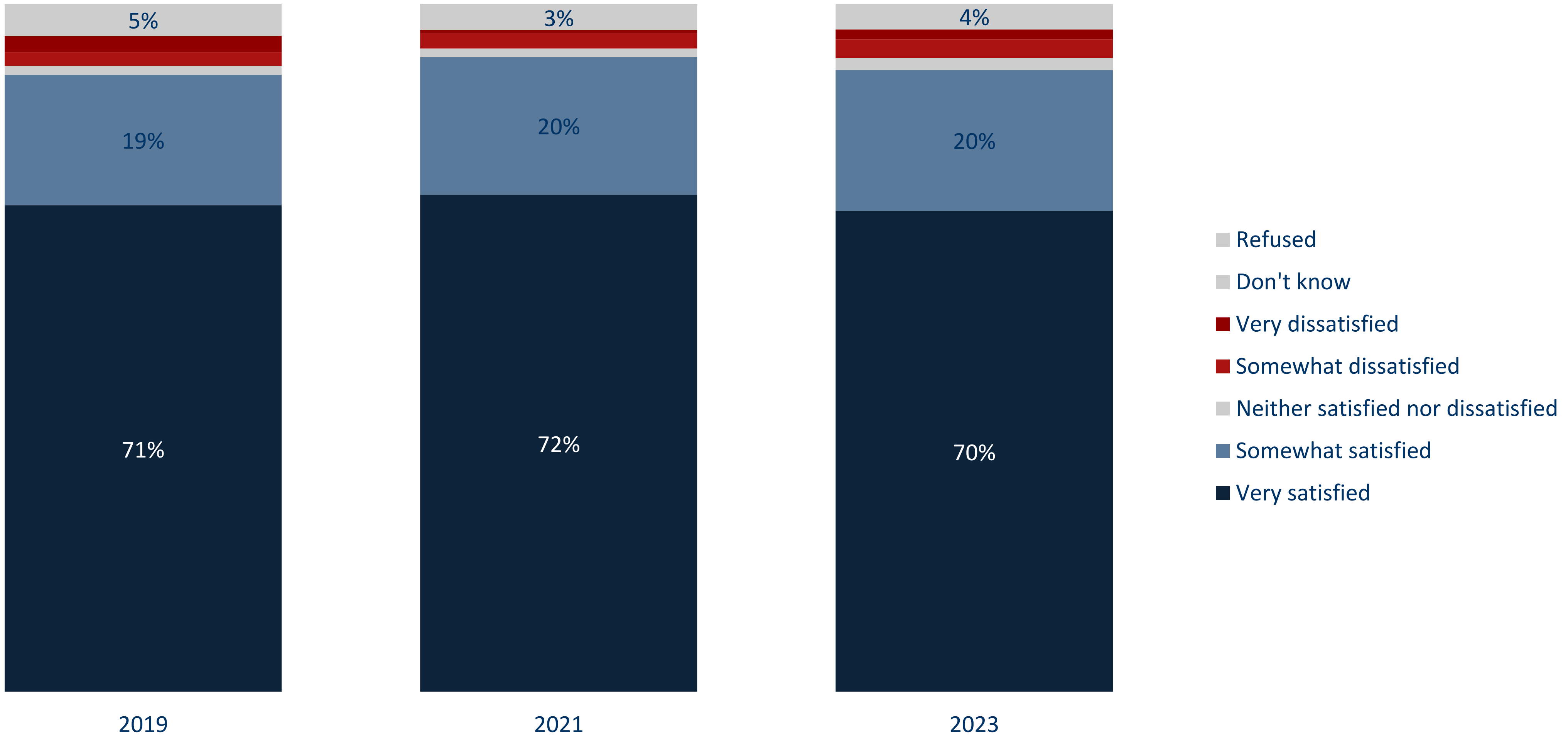
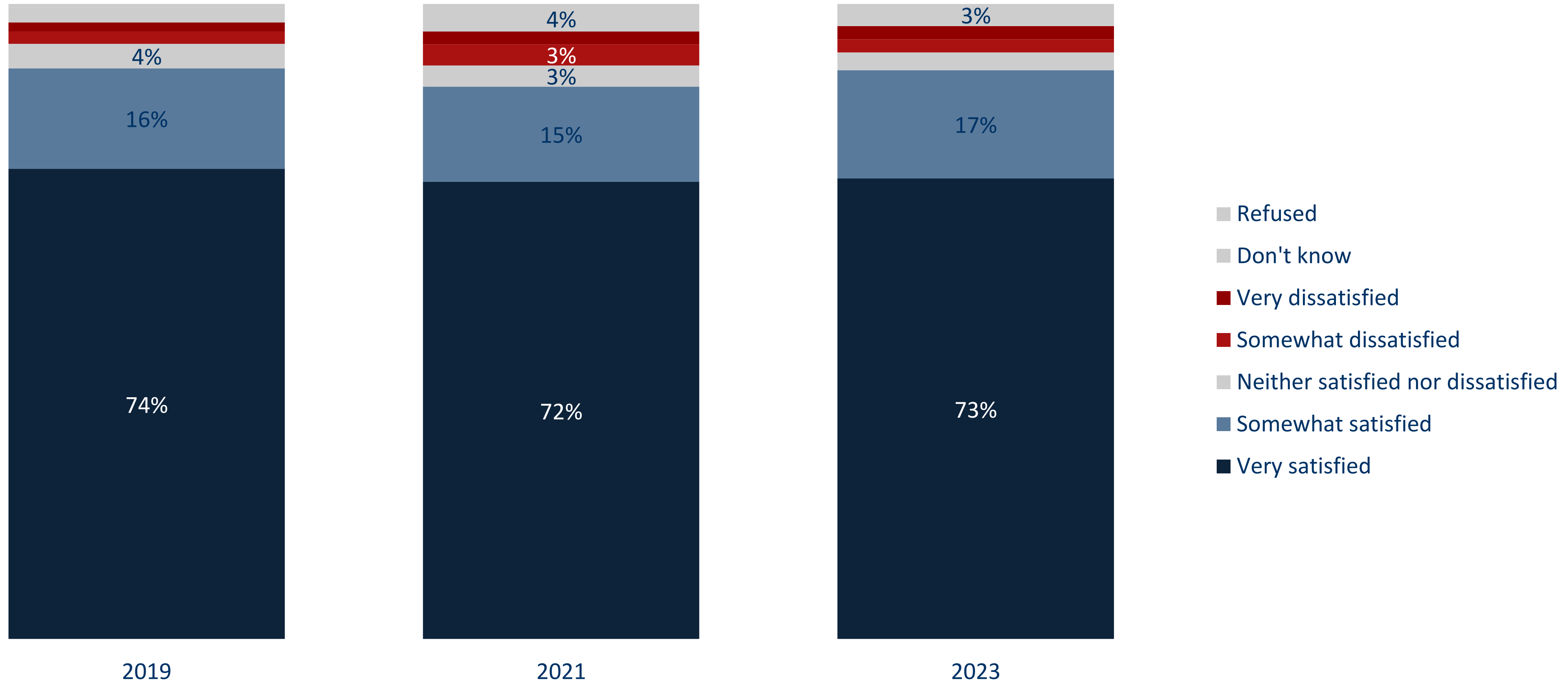
How satisfied are you with the bills that you receive from Tillsonburg Hydro - based on them providing CONVENIENT OPTIONS TO RECEIVE AND PAY BILLS?



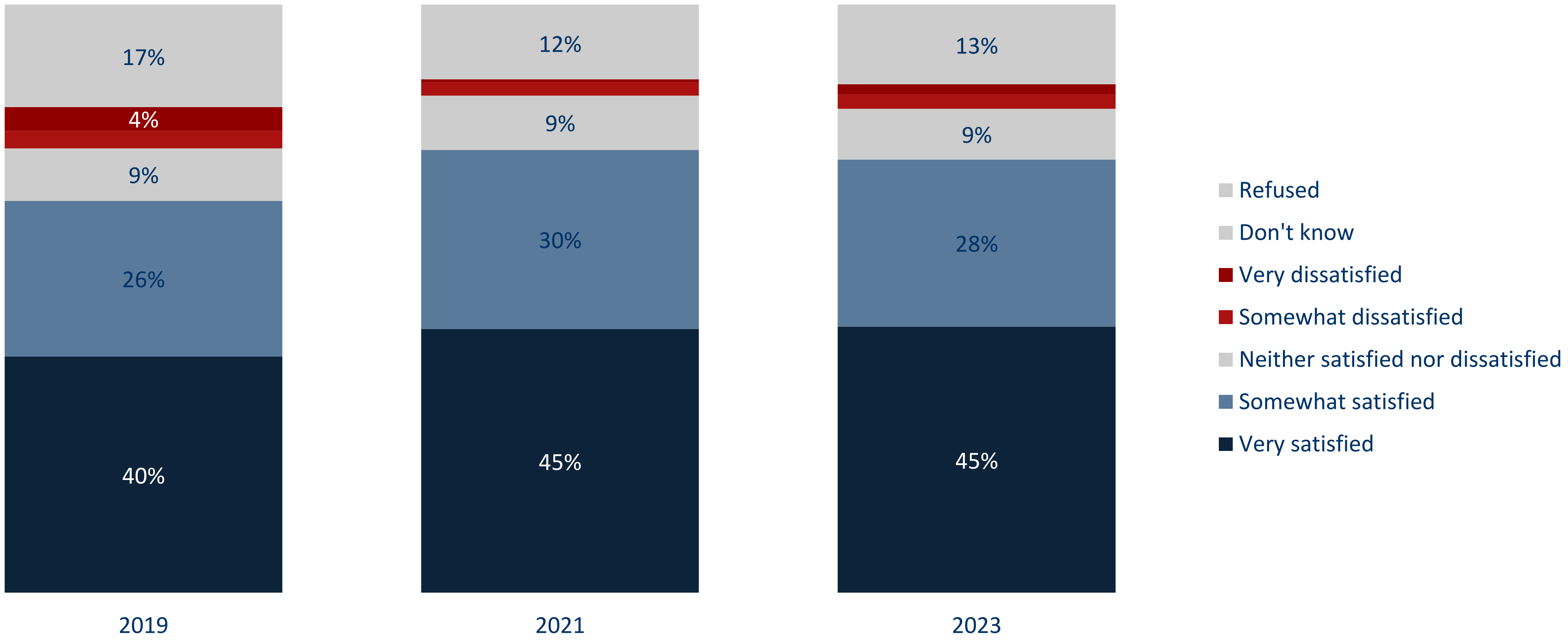
Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

How satisfied are you with the CUSTOMER SERVICE you have received when dealing with employees of Tillsonburg Hydro, whether on the telephone, via email, in person or through online conversations including social media?



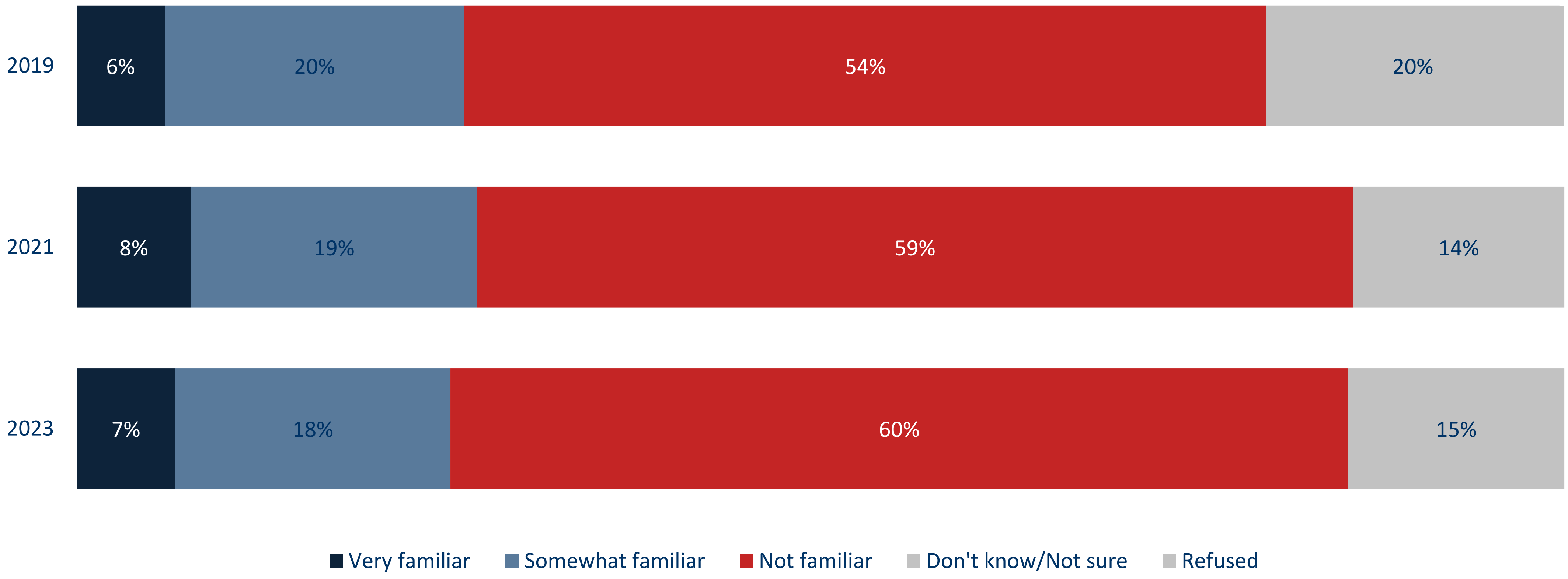
Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro
Note: Base excludes those who indicated that they had not contacted customer service, thus could not provide an assessment

How satisfied are you with the COMMUNICATIONS that you may receive from Tillsonburg Hydro without talking directly to an employee, including information found on their website, bill inserts, advertising, notices, emails, or social media sites?



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

How familiar are you with the percentage of your electricity bill that went to Tillsonburg Hydro? So, NOT the portions allocated to power generation companies, transmission companies, the provincial government and regulatory agencies.



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

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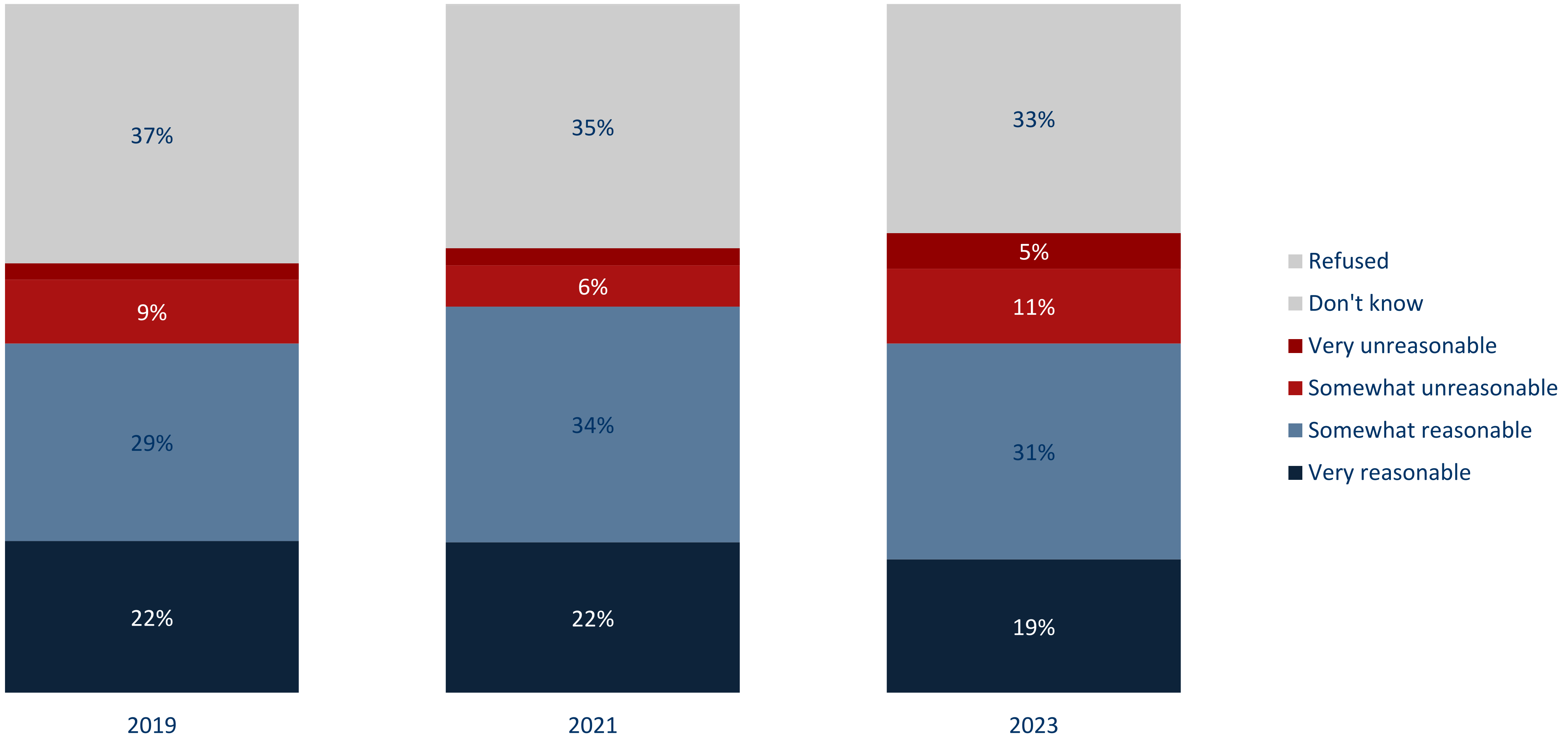
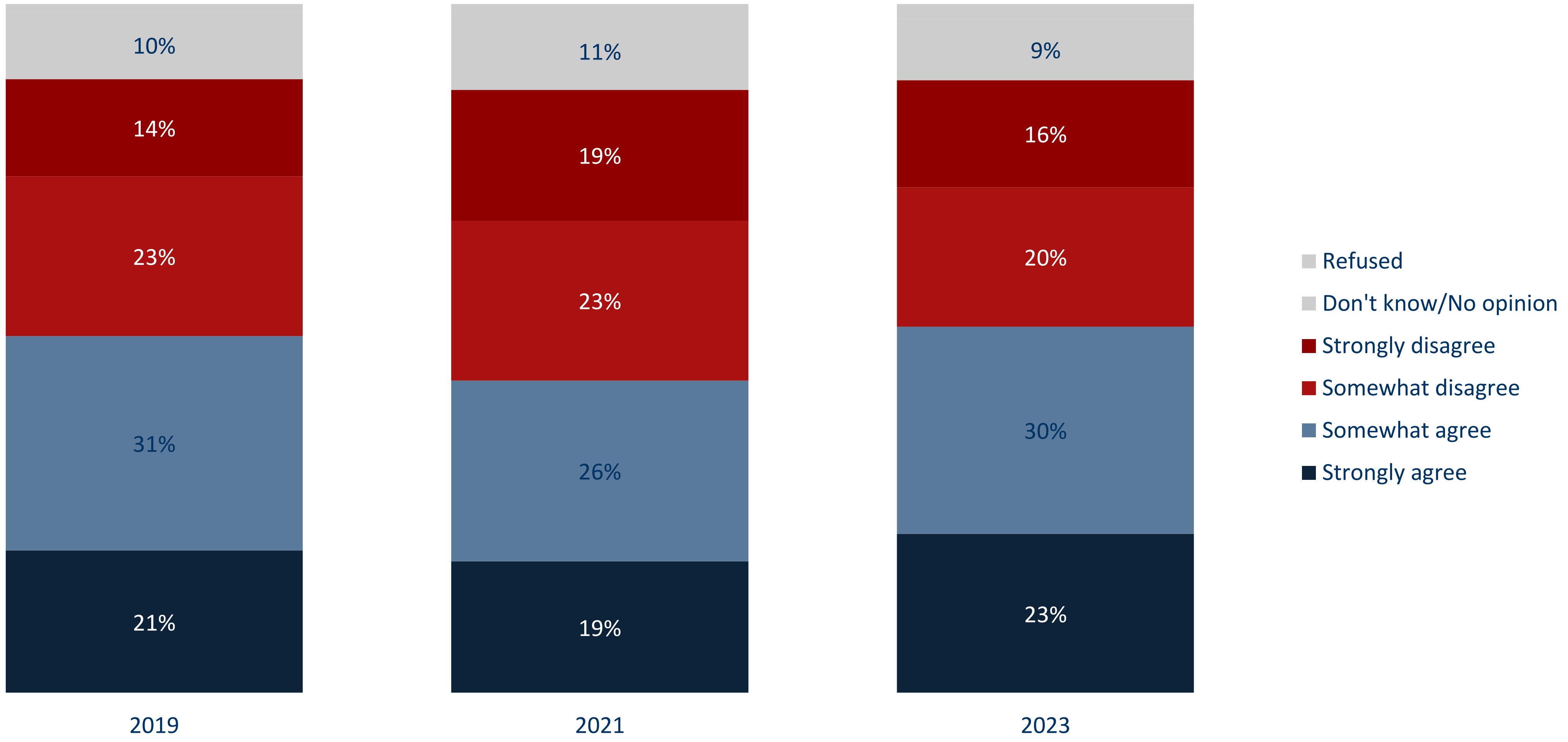
Do you feel that the percentage of your total electricity bill that you pay to Tillsonburg Hydro for the services they provide is...?



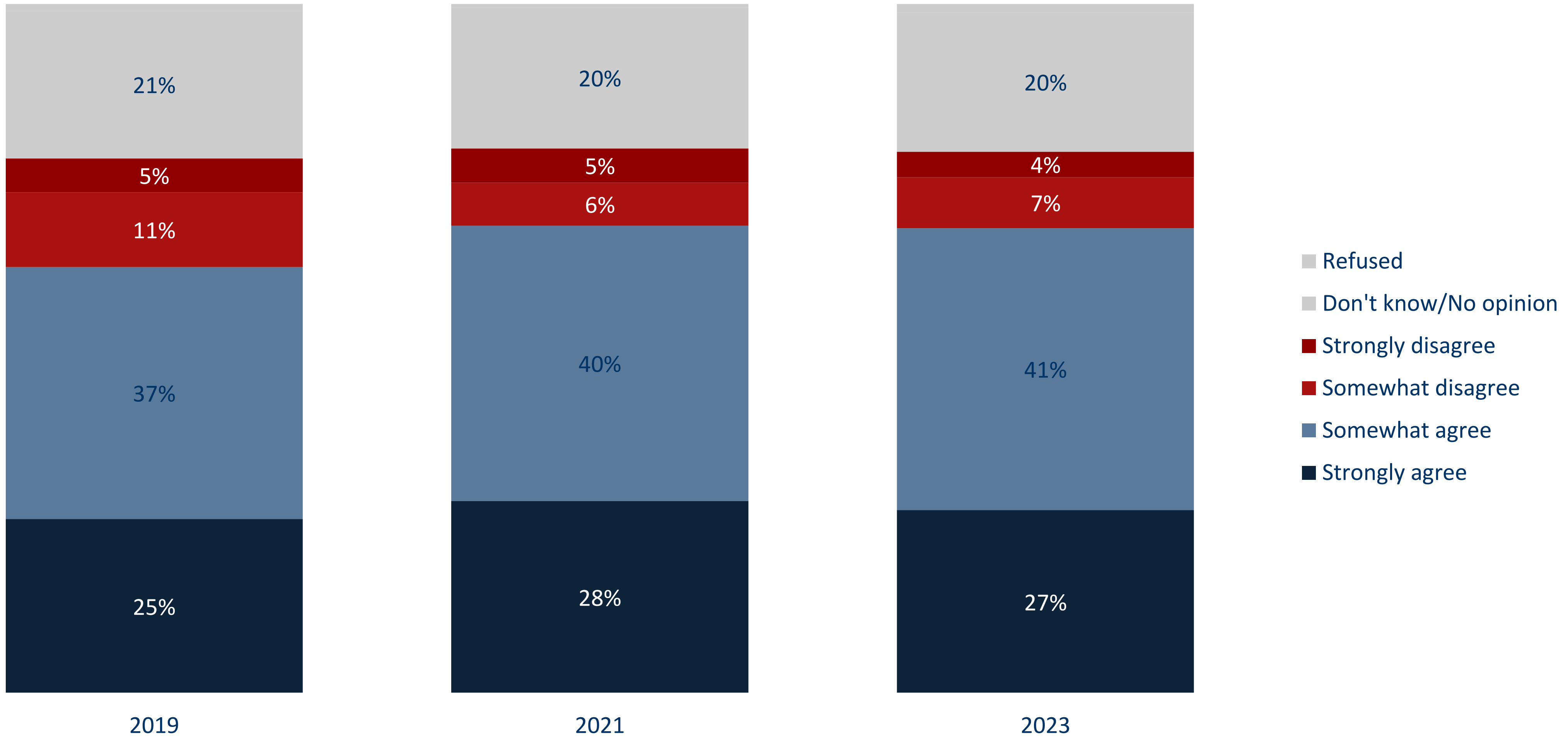
Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

To what extent do you agree with "The cost of my electricity bill has a major impact [on personal finances OR bottom line of organization]"?



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

To what extent do you agree with "Customers are well served by the electricity system in Ontario"?



Weight: Aggregate weight for LDC based on customer_type
Filters: LDC: Tillsonburg Hydro

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Methodology

Methodology Summary

Commissioned by	Tillsonburg Hydro
Sample size	406 randomly selected customers
Margin of error	±4.7 percentage points, 19 times out of 20
Survey mode	Random telephone survey of customer base, CATI data collection
Survey sample	Residential and GS <50kWh customer lists provided by Tillsonburg Hydro
Time of calling	4PM-9PM Weekdays, 10AM-5PM Saturdays, scheduled callbacks
In-field dates	January 23-February 22, 2023
Language	English only
Survey author	Innovative Research/Electricity Distributors Association
Question Order	Core (OEB) questions then LDC-specific questions
Question Wording	Questions shown in report largely as asked; exact questionnaire available upon request
Survey Company	Advanis Gary.Offenberger@advanis.net

Methodology Details (1/4)

Target Respondents

The respondents of the survey were Ontario residents who are the primary bill payer or share the responsibility if residential or the person in-charge of managing the electricity bill at the organization if general service, and who resided within one of LDC's service territory(ies). Service territories were determined based on customer lists provided by the LDC.

Sample Size and Statistical Reliability

The final total completed surveys by LDC, and the associated margin of error for each, are shown below.

All margins of error are shown at a 95% confidence level.

- E.g., the margin of error associated with a sample size of 400 for a large (infinite) population is ±4.9 percentage points, 19 times out of 20.

Since each LDC has a finite population, we used the specific population sizes (i.e., the number of sample records received from each LDC) in the calculation of margin of error. Doing so is more accurate, and results in a narrower margin of error than if we simply assumed large (infinite) population for each.

Sample sizes were set according to the *LDC Customer Satisfaction Survey: Methodology & Survey Implementation Guide*, prepared for the Electrical Distributors Association (April 19, 2016 revision):

Where possible, sample size of n=400.
Distributors with 3000 to 4999 customers (residential + GS<50), n=300
Distributors with <3000 customers (residential + GS<50), n=200

Methodology Details (2/4)

Sampling Methodology

Advanis was provided sample lists from each LDC. Customer lists included all basic information required such as name, telephone number, region (where applicable), customer type (residential or GS<50), LDC fee, Annual or Monthly consumption values. Redhead then calculated which quartile group each resident belonged to by evenly dividing them into four groups within each region and customer type. These quartiles were calculated based on annual consumption value.

To minimize low response:

- Sample was loaded in batches to ensure the sample was fully utilized before moving onto fresh sample records;
- Calls were made between the hours of 4pm and 9pm ET; and
- Call backs were scheduled and honored between the hours of 9am and 9pm ET.

Sample Cleaning

Redhead cleaned the customer lists individually once received from each LDC to ensure the customer list counts reflected actual individual records that could be called. The following steps were taken during sample cleaning.

- All records with no phone numbers were removed.
- All phone numbers were checked to see if they were valid numbers (i.e., 10 digits, all numerical, etc.) and any bad cases were removed.
- When duplicates were detected based on phone number, the average of the consumption value was calculated and kept for one consolidated record. All others were removed.
- Residential and GS<50KW were separated into their own lists to be loaded and managed separately in the calling system.

Regions within each customer list were given a numerical value to be used for calling quotas.

Methodology Details (3/4)

Questionnaire

The survey instrument was provided by the Electricity Distributors Association (EDA) developed in conjunction with Innovative Research. The survey consisted of an introduction, overall satisfaction, power quality and reliability, billing and payment, customer service experience, communications, price, optional deeper dive questions, and final personal finance / sector mood measures. Additional questions were provided individually by some LDCs. These questions are not required as part of the survey and, as outlined in the methodology guideline, were asked after all the standard and required questions.

Data Collection

Computer aided telephone interviews (CATI) were conducted from **January 23-February 22, 2023.**

Quality Control

- Advanis trained its interviewers to understand the study's objectives;
- Detailed call records are kept by the automated CATI system, and are supplemented by output files to SPSS for productivity analysis (i.e., not subject to human error);
- The survey was soft launched in LDCs that had the most available sample, and the data was then checked before calling began in full for each;
- 100% of all surveys are digitally recorded for potential review (see next bullet);
- Advanis' Quality Assurance team listened to the actual recordings of five-ten percent of completed surveys and compared the responses to those entered by the interviewer to ensure that responses from respondents are properly recorded;
- Team Supervisors conduct regular more formal evaluations with each interviewer, in addition to nightly monitoring of each interviewer on their team;
- Project Managers closely monitored the progress of data collection, including call record dispositions;
- All SPSS code is reviewed by a more senior researcher;
- All report output is reviewed by a more senior researcher; and
- All values in the report are reviewed by another team member to ensure accuracy.

Methodology Details (4/4)

Analysis of Findings & Data Weighting

Results were weighted to match the proportion of low volume rate class records as provided to Advanis after cleaning of the sample file. Where a region flag was also provided, results were weighted to the low volume rate class within each region and regions were weighted proportionately to one another based on the customer base as provided in the cleaned sample file.

The Customer Satisfaction index scores have been highlighted and were calculated as described below, based on instructions in the Survey Methodology Guidelines. The "response values" referenced in the description below were also determined and provided by the survey authors.

Data analysis and cross-tabulation have been conducted using SPSS and Advanis' proprietary Online Reporting Environment software.

This **index score** is calculated using the following process:

Step 1: Weight data to n=400 with each low volume rate class proportionate to its share of LDC customer base.

Step 2: Rescale the index score variables onto the 0 to 1 scale as indicated by the response values detailed below.

Step 3: The average result of the questions asked for each OEB topic and the overall satisfaction score will be added together[3].

	B5
+	**[C6+C7+C8]** divided by 3
+	**[D9+D10]** divided by 2
+	**E11**
+	**F12**
+	**G14**
=	**Total cumulative scores**

Step 4: The total cumulative score from Step 2 will be divided by 6 to generate the **Customer Satisfaction Index Score** (bound between 0-1).

The chart on the following page illustrates how the **Customer Satisfaction Index Score** will be calculated.

As noted above, LDCs without a region flag were weighted to their low volume rate class proportion based on the cleaned sample file. LDCs with a region flag were weighted to their low volume rate class proportion within each region based on the cleaned sample file, and then regions were weighted proportionately to one another based on the customer base as provided in the cleaned sample file.

Specific values of the number of sample records, estimated population proportions, and final weighted sample counts within LDC are provided on the next slide.
The sum of the regional population proportions within an LDC may not equal 100% due to rounding.

Methodology Tables

Margin of error

LDC	Clean Customer Records from LDC	Completed Surveys	Sample Size as % of Customer list	Margin of Error @ 95% confidence level
Tillsonburg Hydro	6,639	406	6.12%	+/- 4.7%

* Since each LDC has a finite population, we used the specific population sizes (i.e., the number of sample records received from each LDC) in the calculation of margin of error. Doing so is more accurate, and results in a narrower margin of error than if we simply assumed large (infinite) population for each.

Sample weighting

Tillsonburg Hydro						
Regions Flagged in Sample	**Low Volume Rate Class**	**Sample Received** (Cleaned, Deduplicated)	**Rate Class Proportion**	**Estimated Customer Proportion**	**Weighted Sample Count**	**Unweighted Sample Count**
TOTAL	**Residential**	**6,190**	**93%**	**100%**	**379**	**379**
	General Service < 50 kW	**449**	**7%**		**27**	**27**
					406	**406**

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Appendix B-1 – 2020 Needs Assessment Report London Area

Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

NEEDS ASSESSMENT REPORT

Region: London Area

Date: May 29, 2020

Prepared by: London Area Study Team

Disclaimer

This Needs Assessment Report was prepared for the purpose of identifying potential needs in the London Area Region and to recommend which needs may require further assessment and/or regional coordination to develop a preferred plan. The results reported in this Needs Assessment are based on the input and information provided by the Study Team.

The Study Team participants, their respective affiliated organizations, and Hydro One Networks Inc. (collectively, "the Authors") shall not, under any circumstances whatsoever, be liable to each other, to any third party for whom the Needs Assessment Report was prepared ("the Intended Third Parties") or to any other third party reading or receiving the Needs Assessment Report ("the Other Third Parties"). The Authors, Intended Third Parties and Other Third Parties acknowledge and agree that: (a) the Authors make no representations or warranties (express, implied, statutory or otherwise) as to this document or its contents, including, without limitation, the accuracy or completeness of the information therein; (b) the Authors, Intended Third Parties and Other Third Parties and their respective employees, directors and agents (the "Representatives") shall be responsible for their respective use of the document and any conclusions derived from its contents; (c) and the Authors will not be liable for any damages resulting from or in any way related to the reliance on, acceptance or use of the document or its contents by the Authors, Intended Third Parties or Other Third Parties or their respective Representatives.

Executive Summary

REGION London Area Region ("the Region")

LEAD Hydro One Networks Inc.

START DATE: April 1, 2020 **COMPLETION DATE:** May 29, 2020

1. INTRODUCTION

The first cycle of Regional Planning for the London Area Region was completed in August 2017 with the publication of the Regional Infrastructure Plan (RIP) which provided a description of needs and recommendations of preferred wires plans to address near-term needs. This is the second cycle of Regional Planning and the purpose of this Needs Assessment is to identify any new need that emerged since the conclusion of previous London Area Regional Planning cycle.

2. REGIONAL ISSUE/TRIGGER

In accordance with the Regional Planning process as mandated by the Ontario Energy Board, the Regional Planning process should be triggered at least every five years. The first cycle of Regional Planning for the London Area Region began in February 2015 and given five years have elapsed, the second Regional Planning cycle for London Area was officially initiated in April 2020.

3. SCOPE OF NEEDS ASSESSMENT

The assessment's primary objective is to identify the electrical infrastructure needs over the ten-year study period and recommend which needs require further regional coordination.

4. & 5. LONDON AREA TRANSMISSION SYSTEM & INPUTS AND DATA

The Needs Assessment focuses on the adequacy of the 230 kV and 115 kV transmission system supplying the London Area. The Study Team representatives from Local Distribution Companies (LDCs), the Independent Electricity System Operator (IESO), and Hydro One provided input and relevant information for the London Area Region regarding capacity needs, reliability needs and replacement plan of major assets approaching end-of-life.

6. ASSESSMENT METHODOLOGY

The assessment methodology includes the review of planning information such as load forecast, conservation and demand management (CDM) forecast and available distributed generation (DG) information, any system reliability and operation issues, and major high voltage equipment identified to be at or near end of life. A technical assessment of needs was undertaken based on:

- Current and future station capacity and transmission adequacy; and
- Reliability needs and operational concerns.

7. RESULTS

I. Previously identified needs as part of first cycle of Regional Planning

- **A. Load Restoration:** Ensure load interrupted can be restored in a reasonable time following simultaneous loss of M31W/M32W or loss of W36/W37
- **B. Voltage Constraint:** Insufficient voltage at Tillsonburg TS 115 kV
- **C. Thermal Constraint:** Thermal constraint on 115kV line W8T
- **D. Delivery Point Performance:** Poor delivery point performance at Tillsonburg TS

II. Newly identified needs in the region

- **A. 230/115 kV Autotransformers**

The 230/115 kV autotransformers (Buchanan TS and Karn TS) supplying the London Area are adequate over the study period for the loss of a single 230/115 kV autotransformer.

B. 230 kV Transmission Lines
The 230 kV circuits supplying the London Area are adequate over the study period for the loss of a single 230 kV circuit.

C. 115 kV Transmission Lines
The 115 kV circuits supplying the London Area are adequate over the study period for the loss of a single 115 kV circuit.

D. 230 kV and 115 kV Connection Facilities
Loading at Clarke TS will exceed its transformer 10-Day Limited Time Rating (LTR) in 2022 based on the net load forecast. Talbot TS T3/T4 is forecasted to exceed its 10-Day LTR throughout the study period. These needs were primarily driven by load transfer from Nelson TS during the construction period of the station refurbishment and voltage conversion project. London Hydro confirmed the load will be transferred back to Nelson TS over time and no additional transformation capacity is required at this time.

E. System Security and Restoration Review
Based on the latest load forecast, the loss of one element will not result in load interruption greater than 150 MW. The maximum load interrupted by configuration due to the loss of two elements is below the load loss limit of 600 MW by the end of the ten-year study period.

For the loss of two elements M31W/M32W on the 230 kV system, the load interrupted by configuration may exceed 150 MW. Hydro One Distribution estimated there is sufficient distribution transfer capability to address the restoration requirement for loss of M31W/M32W. For the loss of two elements W36/W37, the load interrupted by configuration may exceed 250 MW. As there are a number of projects currently underway which will affect loading at Talbot TS, it was recommended London Hydro and Hydro One to further examine this restoration need in Local Planning and devise an action plan for when all these projects are completed. For the loss of two elements W44LC/W45LS, the load interrupted by configuration may exceed 150 MW. There is sufficient capability on the existing system to restore interrupted within the targeted time period.

F. Aging Infrastructure and Replacement Plan of Major Equipment
During the study period, equipment replacement plans do not affect the needs identified.

8. RECOMMENDATIONS

Based on the findings of the Needs Assessment, the study team recommends that load restoration need following the loss of W36 and W37 should be further assessed as part of Local Planning by Hydro One and relevant LDC and that no further regional coordination is required to address needs in the London area.

Table of Contents

List of Tables and Figures

1 INTRODUCTION

The first cycle of the Regional Planning for the London Area Region began in 2015 and was completed in August 2017 with the publication of the Regional Infrastructure Plan (RIP). The RIP provided a description of needs and recommendations of preferred wires plans to address near- and medium-term needs.

The purpose of this Needs Assessment is to identify any new need that emerges since the completion of the previous London Area Regional Planning cycle.

This report was prepared by the London Area Region Study Team (Study Team), led by Hydro One Networks Inc. Participants of the Study Team are listed below in Table 1. This report presents the results of the assessment based on information provided by the Local Distribution Companies (LDC), Hydro One and the Independent Electricity System Operator (IESO).

Table 1: London Area Region Study Team Participants

Companies	
Entegrus Power Lines lnc.	London Hydro Inc.
ERTH Power Inc.	Tillsonburg Hydro Inc.
Hydro One Networks Inc. (Distribution)	Independent Electricity System Operator
Hydro One Networks Inc. (Lead Transmitter)	

2 REGIONAL ISSUE/TRIGGER

In accordance with the Regional Planning process as mandated by the Ontario Energy Board, Regional Planning cycle should be take place every five years. The first cycle of Regional Planning for the London Area Region began in February 2015 and given five years have elapsed, the second Regional Planning cycle for London Area was initiated in April 2020.

3 SCOPE OF NEEDS ASSESSMENT

The scope of this Needs Assessment includes a review of needs identified in the previous cycle and assessment to identify any new needs (e.g. system capacity, reliability, security and restoration) that may emerge in the next ten years.

The Study Team may identify additional needs during the subsequent phases of the Regional Planning process shown in Figure 1, namely Scoping Assessment, Local Planning, Integrated Regional Resource Plan (IRRP) and RIP.

Figure 1 – Regional Planning process at a glance

4 LONDON AREA TRANSMISSION SYSTEM

The London Area includes the municipalities of Oxford County (comprising Township of Blandford-Blenheim, Township of East Zorra-Tavistock, Town of Ingersoll, Township of Norwich, Township of South-West Oxford, Town of Tillsonburg, Township of Zorra), City of Woodstock, Middlesex County (comprising Municipality of Adelaide Metcalfe , Municipality of Lucan Biddulph, Municipality of Middlesex Centre, Municipality of North Middlesex, Municipality of Southwest Middlesex, Municipality of Strathroy-Caradoc, Municipality of Thames Centre, Village of Newbury), City of London, Elgin County (comprising Municipality of Town of Aylmer, Municipality of Bayham, Municipality of Central Elgin, Municipality of West Elgin, Municipality of Dutton/Dunwich, Township of Malahide, Township of Southwold), City of St. Thomas. In addition, the facilities located in the London Region supply part of Norfolk County. The boundaries of the London Area are shown below in Figure 2.

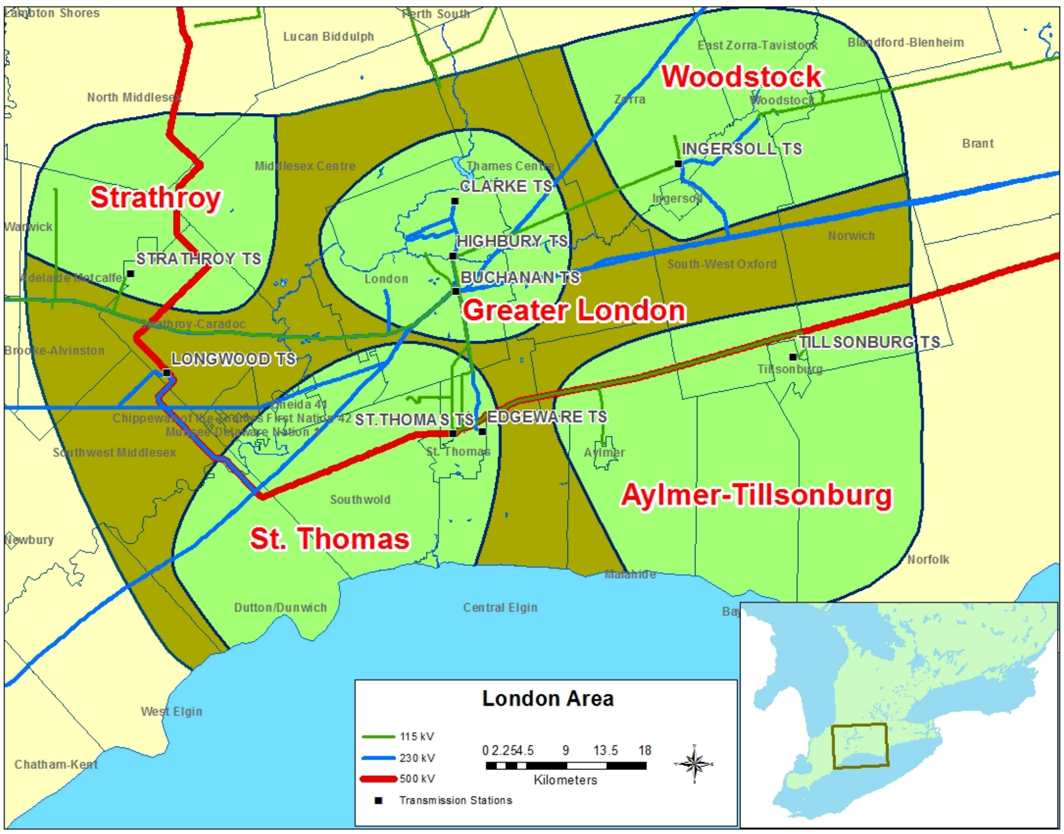


Figure 2: London Area Region

Electrical supply to the London Area is provided through a network of 230 kV and 115 kV circuits supplied by 500/230 kV autotransformers at Longwood Transformer Station (TS) and 230/115 kV autotransformers at Buchanan TS and Karn TS. Step-down transformer stations are connected to both 230 kV and 115 kV systems to bring the power to distribution level of 27.6 kV to serve the area. There are thirteen Hydro One step-down TS's, three transmission connected industrial load customers and three transmission connected generators in the London Area.

The existing facilities in the London Area are summarized below and depicted in the single line diagram shown in Figure 3. The 500 kV system is part of the bulk power system and is not studied as part of this Needs Assessment. Also, although depicted, Duart TS is not included in the London Area study and will be studied as part of the Chatham-Kent/Lambton/Sarnia Area Regional Planning.

- Longwood TS is the major transmission station that connects the 500kV network to the 230 kV system via two 500/230 kV autotransformers.
- Buchanan TS and Karn TS house 230/115 kV autotransformers which provide the necessary transformation from the 230 kV system to the 115 kV system.
- Thirteen step-down transformer stations supply the London Area load: Aylmer TS, Buchanan TS, Clarke TS, Commerce Way TS, Edgeware TS, Highbury TS, Ingersoll TS, Nelson TS, Strathroy TS, Talbot TS (Dual Element Spot Network or DESN 1 and DESN 2), Tillsonburg TS, Wonderland TS, and Woodstock TS.
- Three directly connected industrial customer loads are connected in the London Area: Enbridge Keyser CTS, Lafarge Woodstock CTS and Toyota Woodstock TS.
- There are three existing Transmission-connected generating stations in the London Area as follows:
    - Suncor Adelaide GS is a 40 MW wind farm connected to 115 kV circuit west of Strathroy TS
    - Port Burwell GS is a 99 MW wind farm connected to 115 kV circuit near Tillsonburg TS
    - Silver Creek GS is a 10 MW solar generator connected to 115 kV circuit near Aylmer TS
- There is a network of 230 kV and 115 kV circuits that provides supply to the London Area, as shown in Table 2 below:

Table 2: Transmission Lines in London Area

Voltage	Circuit Designations	Location
230 kV	N21W, N22W	Scott TS to Buchanan TS
	W42L, W43L	Longwood TS to Buchanan TS
	W44LC	Longwood TS to Chatham TS to Buchanan TS
	W45LS	Longwood TS to Spence SS to Buchanan TS
	W36, W37	Buchanan TS to Talbot TS and Clarke TS
	D4W, D5W	Buchanan TS to Detweiler TS
	M31W, M32W, M33W	Buchanan TS to Middleport TS
115 kV	W2S	Buchanan TS to Strathroy TS
	W5N	Buchanan TS to Nelson TS
	W6NL	Buchanan TS to Highbury TS to Nelson TS
	W9L	Buchanan TS to Highbury TS
	W7, W12	Buchanan TS to CTS
	WW1C	Buchanan TS to CTS
	W8T	Buchanan TS to ESWF JCT
	WT1T	ESWF JCT to Tillsonburg TS
	W3T, W4T	Buchanan TS to St. Thomas TS[1]
	WT1A	Aylmer TS to Lyons JCT
	K7, K12	Karn TS to Commerce Way TS

[1] St. Thomas TS will be decommissioned, work is underway but is currently on hold due to COVID-19, retermination work is currently planned to be completed in Q4 2020 subject to resource availability.

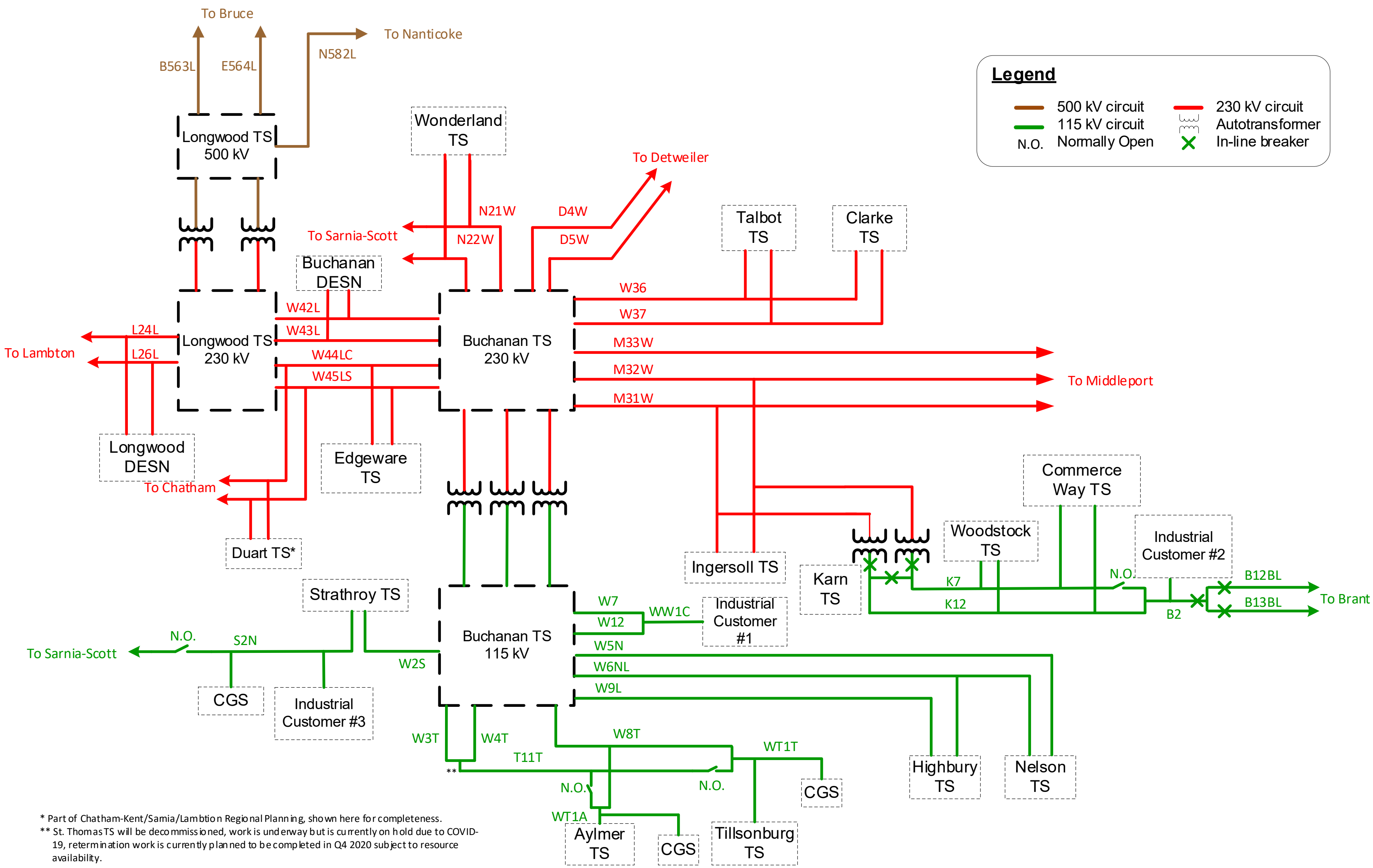


Figure 3: London Area Region Transmission System

* Part of Chatham-Kent/Samia/Lambtion Regional Planning, shown here for completeness.

** St. Thomas TS will be decommissioned, work is underway but is currently on hold due to COVID-19, retermination work is currently planned to be completed in Q4 2020 subject to resource availability.

5 INPUTS AND DATA

In order to conduct the Needs Assessment, Study Team participants provided the following information and data:

- IESO provided:
    i. List of existing reliability and operational issues
    ii. Forecasted contributions from Conservation and Demand Management (CDM) and Distributed Generation (DG) as well as seasonal capacity factors for different resources
- LDCs provided historical load data (2017 – 2019) and gross load forecast (2020 –2029)
- Hydro One (Transmission) provided transformer and circuit ratings, historical station load data (2017 – 2019), regional extreme weather correction factor and replacement plan for major assets approaching the end of their useful life.
- LDCs and Hydro One (Transmission) provided relevant planning information, including planned transmission and distribution investments.
- The study assumes Aylmer-Tillsonburg transmission reinforcement project as recommended in the previous Regional Planning cycle and St. Thomas decommissioning project will be implemented as planned.

6 ASSESSMENT METHODOLOGY

In general, a forecast of the peak demand to 2029 was developed based on the information listed in Section 5. From the forecast demand, the amount of available distributed generation and conservation & demand management was then deducted, and the remaining demand was compared to the supply capability of the existing system. The determination of need was consistent with the assumptions, consideration and criteria contained in the IESO Ontario Resource and Transmission Assessment Criteria (the "IESO ORTAC"). The section below provides more details about methodology and assumptions made in this Needs Assessment:

1. The assessment is based on summer peak loads.

2. Load data for transmission-connected industrial customers in the region was assumed to be consistent with historical peak loads.

3. The 2019 summer station peak load is considered as a reference point and was adjusted for extreme weather impact (7.34% in 2019). All LDCs' load forecasts are translated into load growth rates and are applied onto to the reference point to develop a gross load forecast.

   Distributed generation (DG) refers to small-scale power generation connected in the distribution system which is located close to where the electricity is consumed. Both conservation & demand management (CDM) as well as DG can reduce the amount of load that needs to be supplied and their contributions are directly net against the gross load forecast from Step (3) to develop a net load station forecast. A non-coincident version of the net load forecast was used to assess the station capacity as stated in Step (6).

As not all of the utility peaks are coincident with the regional peak. A coincident version of the net load forecast was used to assess the 230 kV transmission line needs (Section 7.1.2), 115 kV transmission line needs (Section 7.1.3), system security and restoration needs (Section 7.2).

The demand forecast for transformer stations in London Area are shown in Appendix A. Overall, the London Area is expected to grow at an average rate of approximately 0.9% annually from 2020 – 2029.

4. Review impact of any on-going and/or planned development projects in the London Area during the study period.

5. Review and assess impact of any critical/major elements planned to be replaced at the end of their useful life such as autotransformers, transformers and transmission lines.

6. Station capacity adequacy is assessed by comparing the non-coincident peak load with the station's normal planning supply capacity assuming a 90% lagging power factor for stations. Normal planning supply capacity for transformer stations in this Region is determined by the summer 10-Day limited time rating (LTR).

7. To identify emerging need in the Region and determine whether or not further coordinated regional planning should be undertaken, the study was performed observing all elements in-service and only one element out of service.

8. Transmission adequacy assessment is consistent with the IESO ORTAC and below is a brief summary:
    - With all elements in service, the system is to be capable of supplying forecast demand with equipment loading within continuous ratings and voltages within normal range.
    - With one element out of service, the system is to be capable of supplying forecast demand with circuit loading within their long-term emergency (LTE) ratings and transformers within their summer 10-Day LTR.
    - All voltages must be within pre and post contingency ranges as per ORTAC Sections 4.2 and 4.3 criterion.
    - With one element out of service, no more than 150 MW of load is lost by configuration. With two elements out of service, no more than 600 MW of load is lost by configuration.
    - With two elements out of service, the system is capable of meeting the load restoration time stated ORTAC Section 7.2 criteria.

7 RESULTS

This section summarizes needs identified in the London Area Region. Status of the previously identified needs is summarized in Table 3 and the newly identified/emerging needs pertaining to this Needs Assessment will be discussed further in the remaining of this section.

Table 3: Needs Identified in the Previous Regional Planning Cycle

Needs identified in the previous Regional Planning cycle	Details	Current Status
Load Restoration for loss of M31W/M32W	Previous assessments indicated in case of simultaneous loss of two transmission elements (M31W/M32W), the load interrupted with current circuit configuration during peak periods will exceed 150 MW.	This need remains as the load interrupted will reach 158 MW in 2029 and is elaborated further in Section 7.2.
Load Restoration for loss of W36/W37	Previous assessments indicated for the simultaneous loss of two transmission elements (W36/W37), the load interrupted with the current circuit configuration during peak periods will exceed 250 MW.	This need remains as the load interrupted will reach over 390 MW in 2029. The last cycle of London Area regional planning recommended installing automated switching as well as extending feeders in the distribution system to improve the load restoration capability. London Hydro confirmed that these capital projects are currently underway. This need is further discussed in Section 7.2.
Voltage Violation at Tillsonburg TS	Pre-contingency voltage on Tillsonburg 115kV side falls below the permissible levels outlined in ORTAC.	The last cycle of London Area Regional Planning recommended Hydro One to proceed with the Aylmer-Tillsonburg project to address these needs, which among other things, will include installing two new 10 MVar capacitor banks at Tillsonburg TS. The additional reactive power support will address the voltage issue at Tillsonburg 115 kV and W8T thermal overload. Together with the impacted LDCs, a number of options were explored to address the delivery point performance need. It was agreed that reversing the existing normal operating points at Cranberry Junction will be the most cost-effective option. Upon the completion of the Aylmer-Tillsonburg project, Tillsonburg TS will be normally supplied by W3T/W4T/T11T while Aylmer TS will remain normally supplied by W8T. This project is currently underway with in-service date of Q2 2022.
Thermal constraint on 115kV line W8T	Thermal constraints are observed on 115 kV circuit W8T between Buchanan TS and Edgeware JCT. Under pre-contingency conditions, the thermal loading on this section line will exceed its planning rating.	
Poor delivery point performance at Tillsonburg TS	Historical data indicated that the frequency of outages to Tillsonburg Hydro and Hydro One Distribution exceed level prescribed in Hydro One's "Customer Delivery Point Performance Standard".	

7.1 Transmission Capacity Needs

Sections 7.1.1 to 7.1.3 summarize the Needs Assessment study results based the London Area region coincident load forecast.

7.1.1 230/115 kV Autotransformers

The 230/115 kV autotransformers (Buchanan TS and Karn TS) supplying the London Area are adequate over the study period for the loss of a single 230/115 kV autotransformer.

7.1.2 230 kV Transmission Lines

Under peak load condition and with standard power factor assumption of 0.9, for (N-1) contingency of W36/W37 and breaker failure contingencies at Buchanan TS that involve loss of either W36 or W37, the companion circuit will be loaded close to its LTE rating (96% to 99%) by the end of study period. The circuit loadings improve when power factor of 0.97 as provided by London Hydro is assumed for the transformer stations connected to W36 and W37, namely Talbot TS and Clarke TS.

The remaining 230 kV circuits supplying the London Area have adequate capacity over the study period for the loss of a single 230 kV circuit in the Region.

7.1.3 115 kV Transmission Lines

The 115 kV circuits supplying the London Area have adequate capacity over the study period for the loss of a single 115 kV circuit in the Region.

7.1.4 230 kV and 115 kV Connection Facilities

A station capacity assessment was performed over the study period for the 230 kV and 115 kV TS's in the London Area using the summer station peak load forecasts (non-coincident) provided by the study team. The results are as follows:

Clarke TS
Clarke TS T3/T4 will exceed its 10-Day LTR in 2022 based on the net load forecast (approximately 101% of Summer 10-Day LTR).

Talbot TS
Talbot TS T3/T4 DESN is forecasted to exceed its 10-Day LTR rating throughout the study period based on the net load forecast (approximately 118% of Summer 10-Day LTR).

Nelson TS recently underwent refurbishment which includes converting the low-voltage supply from 13.8 kV to 27.6 kV. During the construction period, significant portion of the load that was originally supplied by this station was transferred to Clarke TS and Talbot TS. The newly refurbished Nelson TS was placed in-service in December 2018 and as more 27.6 kV distribution feeders becomes available in downtown London, London Hydro confirmed load will be transferred back to Nelson TS and additional transformation capacity is not required at this time.

All the other TSs in the London Area are forecasted to remain within their normal supply capacity during the study period. Therefore, no action is required at this time and the capacity needs will be reviewed in the next planning cycle.

7.2 System Security and Restoration Review

Based on the net coincident load forecast, the loss of one element will not result in load interruption greater than 150 MW. The maximum load interrupted by configuration due to the loss of two elements is below the load loss limit of 600 MW by the end of the 10-year study period.

Based on the net coincident load forecast at Ingersoll TS and stations connected along the 115 kV circuits K7/K12/B2, the load interrupted by configuration may reach 158 MW for the loss of double-circuit line M31W and M32W or loss of both autotransformers at Karn TS. The system is required to restore 8 MW within 4 hours and the remaining 150 MW within 8 hours. This need was first identified in the previous Regional Planning cycle and remains in this cycle. Hydro One Distribution estimated 10 MW of load at Ingersoll TS can be transferred to Highbury TS to restore some load remotely within 4 hours. To restore the remaining 148 MW of interrupted load within 8 hours, field crew from the nearest staffed centre in London area will be dispatched and install temporary fixes on the transmission system such as building emergency by-pass. Therefore, no action is required at this time and this will be reviewed in the next planning cycle.

Based on the net coincident load forecast at Clarke TS and Talbot TS, the load interrupted by configuration will reach beyond 390 MW in 2029 for the loss of double-circuit line W36 and W37. In accordance with ORTAC, the system is required to restore 140 MW within 30 minute, 100 MW within 4 hours and the remaining 150 MW within 8 hours. This need was first reported in the previous Regional Planning cycle and the impacted LDC, London Hydro, and the IESO undertook further planning as part of the Integrated Regional Resource Plan (IRRP). The recommendation was to install automated switches and extend feeders in the distribution system and London Hydro confirmed these projects are currently underway. Further, as discussed in Section 7.1.4, load will continue to be transferred from Clarke TS and Talbot TS to Nelson TS over the study period. The amount of load required to be restored within 30 minutes will continue to be reduced as these projects progress, post-completion of these projects will be a better representation of the steady state load restoration requirement. Therefore, it is recommended that London Hydro and Hydro One Transmission to further examine this need in form of Local Planning to determine the restoration target once all the ongoing projects are completed, identify the restoration capability from the existing transmission and distribution systems and devise an action plan.

The simultaneous loss of double-circuit line W44LC and W45LS will interrupt approximately 165 MW of load at Edgeware TS and Duart TS[2] by configuration and 15 MW of interrupted load needs to be restored within 4 hours. All remaining load must be restored within 8 hours. Hydro One Distribution estimated 10 MW of load at Edgeware TS can be transferred to Aylmer TS. Another 11 MW could be transferred from Duart TS to Kent TS on the feeder level. These measures can be deployed remotely to manage and mitigate the impact of the [N – 2] contingency within the 4 hours timeframe. The remaining 144 MW of interrupted load can be within 8 hours by dispatching field crew from the nearest staffed centre in London area to install

[2] Coincident forecasted load for Duart TS not available as it is part of the Chatham-Kent/Lambton/Sarnia Area Region which is scheduled to begin at a later time. For the purpose of this report, 2019 summer station peak of approximately 50 MW is assumed.

temporary fixes on the transmission system. Therefore, no action is required at this time and this will be reviewed in the next planning cycle.

7.3 Aging Infrastructure and Replacement Plan of Major Equipment

Hydro One reviewed the sustainment initiatives that are currently planned for the replacement of any autotransformers, power transformers and high-voltage lines. During the study period:

- The existing 115 kV switchyard in Buchanan TS will be replaced on a like-for-like basis and is scheduled to be completed in 2025. Project scope will be finalized upon asset condition verification.
- The existing Clarke TS DESN transformers will be replaced on a like-for-like basis and is scheduled to be completed in 2025.
- The existing Wonderland TS 27.6 kV switchyard will be replaced on a like-for-like basis and is scheduled to be completed in 2023.
- Protection equipment replacement projects will take place at Edgeware TS, Longwood TS, and Tillsonburg TS and will not have material impact to this Needs Assessment study.
- There is no significant lines sustainment plan that will affect the results of this Needs Assessment study.

To conclude, equipment replacement plans do not affect the needs identified during the study period.

8 Conclusion and Recommendations

Based on the findings and discussion in Section 7 of the Needs Assessment report, the study team recommends that load restoration need following the loss of W36 and W37 should be further assessed as part of Local Planning by Hydro One and relevant LDC and that no further regional coordination is required to address needs in the London area.

9 References

[1] RIP Report – London Area Region – August 2017

[2] IRRP Report – Greater London Area

[3] Planning Process Working Group Report to the Ontario Energy Board - May 2013

[4] Ontario Resource and Transmission Assessment Criteria (ORTAC) – Issue 5.0 -August 2007

Appendix A: London Area Region non-coincident and coincident summer load forecast

Table A.1: London Area Region Summer Non-Coincident Load Forecast

Transformer Station	Quantities	Reference	Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Aylmer TS	Gross	26.67	27.03	27.40	27.77	28.15	28.54	28.93	29.32	29.72	30.12	30.54
	DG		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	CDM		0.22	0.25	0.31	0.39	0.45	0.52	0.57	0.66	0.71	0.73
	Net		26.79	27.14	27.45	27.75	28.07	28.39	28.73	29.05	29.40	29.79
Buchanan TS	Gross	145.86	148.04	150.24	152.48	154.76	157.07	159.41	161.79	164.20	166.65	169.13
	DG		11.23	11.23	11.23	11.23	11.23	11.23	11.23	11.23	11.23	11.23
	CDM		1.22	1.35	1.68	2.14	2.48	2.88	3.16	3.64	3.93	4.04
	Net		135.59	137.66	139.57	141.38	143.36	145.30	147.39	149.33	151.49	153.87
Clarke TS	Gross	104.14	105.76	107.40	109.07	110.77	112.49	114.23	116.01	117.81	119.64	121.50
	DG		2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61
	CDM		0.87	0.97	1.21	1.53	1.77	2.06	2.27	2.61	2.82	2.90
	Net		102.28	103.82	105.25	106.62	108.10	109.56	111.13	112.58	114.21	115.98
Commerce Way TS	Gross	38.39	38.70	39.00	39.32	39.63	39.95	40.27	40.59	40.91	41.24	41.57
	DG		2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95
	CDM		0.32	0.35	0.43	0.55	0.63	0.73	0.79	0.91	0.97	0.99
	Net		35.43	35.71	35.94	36.14	36.37	36.59	36.85	37.06	37.32	37.63
Edgeware TS	Gross	106.29	107.83	109.39	110.97	112.57	114.20	115.85	117.53	119.23	120.95	122.70
	DG		3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16
	CDM		0.89	0.99	1.23	1.56	1.80	2.09	2.30	2.64	2.85	2.93
	Net		103.78	105.24	106.58	107.85	109.24	110.60	112.07	113.42	114.94	116.61
Highbury TS	Gross	72.46	73.36	74.28	75.20	76.14	77.09	78.05	79.02	80.01	81.01	82.01
	DG		3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89
	CDM		0.60	0.67	0.83	1.05	1.22	1.41	1.54	1.77	1.91	1.96
	Net		68.87	69.71	70.48	71.19	71.98	72.75	73.59	74.34	75.20	76.16
Ingersoll TS	Gross	77.78	78.60	79.43	80.27	81.12	81.97	82.84	83.71	84.60	85.49	86.40
	DG		9.36	9.36	9.36	9.36	9.36	9.36	9.36	9.36	9.36	9.36
	CDM		0.65	0.72	0.89	1.12	1.29	1.50	1.64	1.88	2.01	2.06
	Net		68.60	69.36	70.02	70.64	71.32	71.99	72.72	73.37	74.12	74.98
Longwood TS	Gross	38.37	38.77	39.18	39.58	40.00	40.41	40.83	41.26	41.69	42.12	42.56
	DG		0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
	CDM		0.32	0.35	0.44	0.55	0.64	0.74	0.81	0.92	0.99	1.02
	Net		37.64	38.00	38.33	38.62	38.96	39.28	39.63	39.94	40.31	40.72
Nelson TS	Gross	40.56	42.23	43.97	45.78	47.67	49.64	51.69	53.82	56.04	58.35	60.75
	DG		17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55
	CDM		0.35	0.40	0.51	0.66	0.78	0.93	1.05	1.24	1.37	1.45
	Net		24.34	26.03	27.73	29.47	31.31	33.21	35.22	37.25	39.43	41.76
Strathroy TS	Gross	38.37	38.56	38.75	38.95	39.14	39.34	39.54	39.74	39.94	40.14	40.34
	DG		6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29
	CDM		0.32	0.35	0.43	0.54	0.62	0.71	0.78	0.89	0.95	0.96
	Net		31.95	32.11	32.23	32.31	32.43	32.53	32.67	32.76	32.90	33.09
Talbot T1/T2	Gross	112.38	112.34	112.29	112.25	112.21	112.16	112.12	112.08	112.04	111.99	111.95
	DG		-	-	-	-	-	-	-	-	-	-
	CDM		0.92	1.01	1.24	1.55	1.77	2.03	2.19	2.48	2.64	2.67
	Net		111.41	111.28	111.01	110.65	110.40	110.10	109.89	109.55	109.35	109.28
Talbot T3/T4	Gross	204.95	204.05	203.15	202.25	201.36	200.47	199.59	198.71	197.83	196.96	196.09
	DG		12.13	12.13	12.13	12.13	12.13	12.13	12.13	12.13	12.13	0.37
	CDM		1.68	1.83	2.23	2.79	3.16	3.61	3.88	4.39	4.64	4.68
	Net		190.24	189.19	187.89	186.44	185.18	183.85	182.69	181.31	180.19	191.04
Tillsonburg TS	Gross	89.14	90.52	91.92	93.34	94.78	96.25	97.74	99.25	100.78	102.34	103.92
	DG		3.46	3.46	3.46	3.46	3.46	3.46	3.46	3.46	0.68	0.68
	CDM		0.74	0.83	1.03	1.31	1.52	1.77	1.94	2.23	2.41	2.48
	Net		86.32	87.64	88.85	90.01	91.27	92.51	93.85	95.09	99.24	100.76
Wonderland TS	Gross	90.70	91.82	92.95	94.09	95.25	96.42	97.61	98.81	100.03	101.26	102.50
	DG		1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
	CDM		0.75	0.84	1.04	1.32	1.52	1.76	1.93	2.22	2.39	2.45
	Net		89.65	90.70	91.64	92.52	93.49	94.43	95.47	96.40	97.46	98.65
Woodstock TS	Gross	65.39	65.95	66.51	67.08	67.66	68.24	68.82	69.41	70.00	70.60	71.21
	DG		1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
	CDM		0.54	0.60	0.74	0.94	1.08	1.24	1.36	1.55	1.66	1.70
	Net		63.79	64.29	64.72	65.10	65.54	65.96	66.43	66.83	67.32	67.89
Industrial Customer #1		12	12	12	12	12	12	12	12	12	12	12
Industrial Customer #2		19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9
Industrial Customer #3		2	2	2	2	2	2	2	2	2	2	2
London Area Total			1211	1222	1232	1241	1251	1261	1272	1282	1297	1322

Note (1) – Edgeware TS 15MW load increase (CAA 2019-658) is included in gross load forecast that increases load in an even annual stream over the next ten to 15 years, as opposed to a sudden step change at a particular point in time.

Note (2) – Buchanan TS 15MW load increase (CAA 2019-670) is included in gross load forecast with the assumption that some existing load will be transferred to nearby stations; hence there is no step change.

Table A.2: London Area Region Summer Coincident Load Forecast

Transformer Station	Quantities	Reference	Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Aylmer TS	Gross	20.64	20.92	21.21	21.50	21.79	22.09	22.39	22.69	23.00	23.32	23.64
	DG		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	CDM		0.17	0.19	0.24	0.30	0.35	0.40	0.44	0.51	0.55	0.56
	Net		20.74	21.00	21.25	21.47	21.72	21.97	22.24	22.48	22.75	23.06
Buchanan TS	Gross	139.77	141.86	143.97	146.12	148.30	150.51	152.76	155.04	157.35	159.69	162.08
	DG		11.23	11.23	11.23	11.23	11.23	11.23	11.23	11.23	11.23	11.23
	CDM		1.17	1.30	1.61	2.05	2.37	2.76	3.03	3.49	3.76	3.87
	Net		129.46	131.45	133.28	135.02	136.91	138.77	140.78	142.63	144.70	146.98
Clarke TS	Gross	114.79	116.57	118.38	120.22	122.09	123.98	125.91	127.86	129.85	131.87	133.92
	DG		2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61	2.61
	CDM		0.96	1.07	1.33	1.69	1.96	2.27	2.50	2.88	3.11	3.20
	Net		113.00	114.70	116.28	117.78	119.41	121.02	122.75	124.36	126.15	128.11
Commerce Way TS	Gross	27.27	27.49	27.71	27.93	28.15	28.38	28.61	28.83	29.06	29.30	29.53
	DG		2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95	2.95
	CDM		0.23	0.25	0.31	0.39	0.45	0.52	0.56	0.64	0.69	0.70
	Net		24.32	24.51	24.68	24.82	24.99	25.14	25.33	25.47	25.66	25.88
Edgeware TS	Gross	104.38	105.89	107.42	108.98	110.55	112.15	113.77	115.42	117.08	118.78	120.49
	DG		3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16
	CDM		0.87	0.97	1.20	1.53	1.77	2.06	2.25	2.60	2.80	2.88
	Net		101.86	103.30	104.61	105.86	107.22	108.56	110.00	111.33	112.82	114.46
Highbury TS	Gross	58.42	59.15	59.89	60.63	61.39	62.15	62.93	63.71	64.51	65.31	66.12
	DG		3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89	3.89
	CDM		0.49	0.54	0.67	0.85	0.98	1.14	1.24	1.43	1.54	1.58
	Net		54.77	55.45	56.07	56.64	57.28	57.90	58.57	59.18	59.88	60.65
Ingersoll TS	Gross	50.59	51.12	51.66	52.21	52.76	53.31	53.88	54.45	55.02	55.60	56.19
	DG		9.36	9.36	9.36	9.36	9.36	9.36	9.36	9.36	9.36	9.36
	CDM		0.42	0.47	0.58	0.73	0.84	0.97	1.06	1.22	1.31	1.34
	Net		41.34	41.84	42.27	42.67	43.12	43.55	44.03	44.44	44.94	45.49
Longwood TS	Gross	35.60	35.97	36.34	36.72	37.10	37.49	37.88	38.27	38.67	39.07	39.48
	DG		0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
	CDM		0.30	0.33	0.41	0.51	0.59	0.68	0.75	0.86	0.92	0.94
	Net		34.85	35.19	35.49	35.77	36.08	36.37	36.70	36.99	37.33	37.72
Nelson TS	Gross	30.98	32.26	33.59	34.97	36.41	37.92	39.48	41.11	42.80	44.57	46.41
	DG		17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55
	CDM		0.26	0.30	0.39	0.50	0.60	0.71	0.80	0.95	1.05	1.11
	Net		14.45	15.74	17.04	18.36	19.77	21.22	22.76	24.31	25.97	27.75
Strathroy TS	Gross	35.05	35.23	35.40	35.58	35.76	35.94	36.12	36.30	36.48	36.67	36.85
	DG		6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29
	CDM		0.29	0.32	0.39	0.50	0.57	0.65	0.71	0.81	0.86	0.88
	Net		28.65	28.80	28.90	28.98	29.08	29.18	29.30	29.39	29.51	29.68
Talbot T1/T2	Gross	112.00	111.96	111.91	111.87	111.83	111.78	111.74	111.70	111.66	111.61	111.57
	DG		-	-	-	-	-	-	-	-	-	-
	CDM		0.92	1.01	1.24	1.55	1.76	2.02	2.18	2.48	2.63	2.66
	Net		111.04	110.90	110.63	110.28	110.02	109.72	109.52	109.18	108.98	108.91
Talbot T3/T4	Gross	172.58	171.82	171.06	170.31	169.56	168.81	168.06	167.32	166.58	165.85	165.12
	DG		12.13	12.13	12.13	12.13	12.13	12.13	12.13	12.13	12.13	0.37
	CDM		1.41	1.54	1.88	2.35	2.66	3.04	3.27	3.69	3.91	3.94
	Net		158.28	157.39	156.30	155.08	154.02	152.90	151.92	150.76	149.81	160.80
Tillsonburg TS	Gross	80.84	82.09	83.36	84.65	85.96	87.29	88.64	90.01	91.40	92.81	94.25
	DG		3.46	3.46	3.46	3.46	3.46	3.46	3.46	3.46	0.68	0.68
	CDM		0.67	0.75	0.94	1.19	1.38	1.60	1.76	2.03	2.19	2.25
	Net		77.96	79.16	80.26	81.31	82.46	83.58	84.79	85.92	89.94	91.31
Wonderland TS	Gross	97.34	98.53	99.75	100.97	102.22	103.48	104.75	106.04	107.34	108.66	110.00
	DG		1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
	CDM		0.81	0.90	1.12	1.42	1.63	1.89	2.07	2.38	2.56	2.63
	Net		96.31	97.44	98.45	99.39	100.43	101.44	102.55	103.55	104.69	105.96
Woodstock TS	Gross	64.65	65.20	65.76	66.32	66.89	67.46	68.04	68.62	69.21	69.80	70.40
	DG		1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62
	CDM		0.54	0.59	0.73	0.93	1.06	1.23	1.34	1.53	1.64	1.68
	Net		63.04	63.55	63.97	64.34	64.78	65.19	65.66	66.05	66.53	67.10
Industrial Customer #1		12	12	12	12	12	12	12	12	12	12	12
Industrial Customer #2		19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9
Industrial Customer #3		2	2	2	2	2	2	2	2	2	2	2
London Area Total			1104	1114	1123	1132	1141	1150	1161	1170	1184	1208

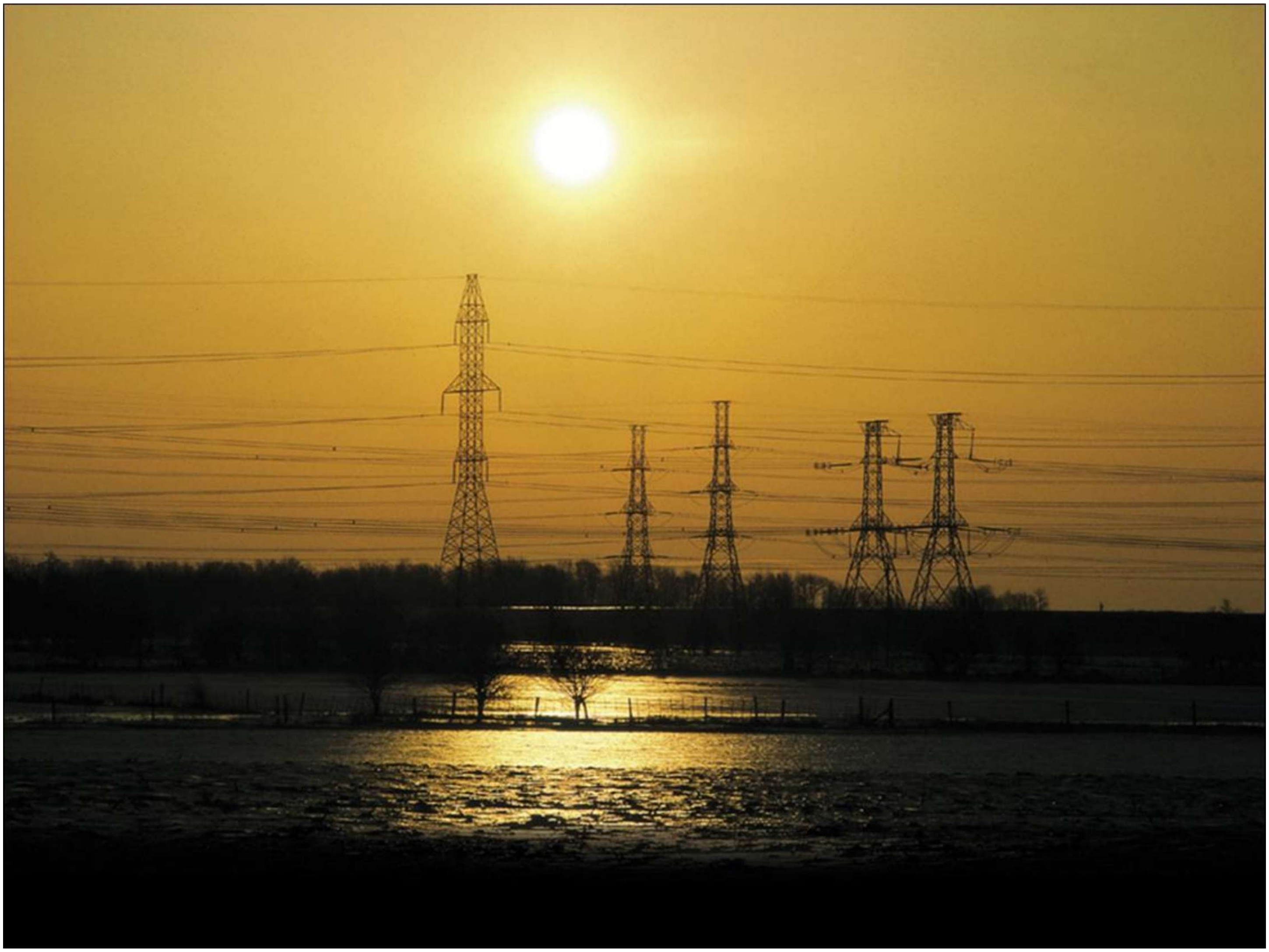
Note (1) – Edgeware TS 15MW load increase (CAA 2019-658) is included in gross load forecast that increases load in an even annual stream over the next ten to 15 years, as opposed to a sudden step change at a particular point in time.

Note (2) – Buchanan TS 15MW load increase (CAA 2019-670) is included in gross load forecast with the assumption that some existing load will be transferred to nearby stations; hence there is no step change.

Appendix B: Acronyms

Acronym	**Description**
CDM	Conservation and Demand Management
CTS	Customer Transformer Station
DESN	Dual Element Spot Network
DG	Distributed Generation
DS	Distribution Station
GS	Generating Station
HV	High Voltage
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
kV	Kilovolt
LDC	Local Distribution Company
LTE	Long Term Emergency
LTR	Limited Time Rating
LV	Low Voltage
MW	Megawatt
MVA	Mega Volt-Ampere
MVAR	Mega Volt-Ampere Reactive
OEB	Ontario Energy Board
ORTAC	Ontario Resource and Transmission Assessment Criteria
PPWG	Planning Process Working Group
RIP	Regional Infrastructure Plan
SA	Scoping Assessment
SIA	System Impact Assessment
SS	Switching Station
TS	Transformer Station

Appendix B-2 – 2022 London Area - Regional Infrastructure Plan



London Area
Regional Infrastructure Plan

August 12, 2022

hydro one

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Prepared and supported by:

Company
Entegrus Power Lines Inc.
ERTH Power Inc.
Hydro One Networks Inc. (Distribution)
London Hydro Inc.
Tillsonburg Hydro Inc.
Independent Electricity System Operator
Hydro One Networks Inc. (Lead Transmitter)

Disclaimer

This Regional Infrastructure Plan ("RIP") report was prepared for the purpose of developing an electricity infrastructure plan to address all near and mid-term needs identified in previous planning phases and any additional needs identified based on new and/or updated information provided by the RIP Study Team.

The preferred solution(s) that have been identified in this report may be reevaluated based on the findings of further analysis. The load forecast and results reported in this RIP report are based on the information provided and assumptions made by the participants of the RIP Study Team.

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Executive Summary

This Regional Infrastructure Plan ("RIP") was prepared by Hydro One with support from the RIP Study Team in accordance to the Ontario Transmission System Code requirements. It identifies investments in transmission facilities, distribution facilities, or both, that should be developed and implemented to meet the electricity infrastructure needs within the London Area.

The participants of the Regional Infrastructure Plan ("RIP") Study Team included members from the following organizations:

- Entegrus Power Lines Inc.
- ERTH Power Inc.
- Hydro One Networks Inc. (Distribution)
- London Hydro Inc
- Tillsonburg Hydro Inc.
- Independent Electricity System Operator
- Hydro One Networks Inc. (Transmission)

This RIP is the final phase of the second cycle of the London Area regional planning process, which follows the completion of the London Area Needs Assessment in May 2020 [5] and the Greater London Sub-region Restoration Local Planning Report in October 2021 [6]. Scoping Assessment and Integrated Regional Resource Plan was not carried out in this cycle. This RIP provides a consolidated summary of the needs and recommended plans for London Area Region over the planning horizon (10 years). No new need had been identified at this time.

This RIP discusses needs identified in the previous regional planning cycle, the Needs Assessment and Local Planning reports for this cycle, and wires solutions recommended to address these needs. Implementation plans to address some of these needs are already completed or are underway. Since the previous regional planning cycle, the following projects have commenced and/or completed:

- Aylmer TS transformers and low-voltage switchyard replacement project competed in 2017.
- Strathroy TS failed transformer T1 and low-voltage switchyard replacement project completed in 2019.
- Wonderland TS failed transformer T6 was replaced in 2019.
- St. Thomas TS was decommissioned and 115 kV circuit W14 re-termination work was completed in 2020.
- Sarnia Scott TS to Buchanan TS 230 kV circuits N21W/N22W tower structures refurbishment project was completed in 2021.
- Nelson TS station refurbishment project will be completed in 2022.
- Tillsonburg TS new low-voltage capacitor banks installed in 2021 and switchyard component replacement project to be completed in 2022.
- Longwood TS protection and control replacement project to be completed in 2023.
- Edgeware TS protection and control replacement project to be completed in 2024.

The major infrastructure investments planned for the London Area over the near and mid-term planning horizon are provided in the Table 1 below, along with the planned in-service dates.

Table 1 - Recommended plans for London area over the next 10 years

Need	Stations / Lines	Recommended Action Plan	In-service
Station capacity	Talbot TS	No action required	--
Greater London sub-region restoration need	W36/W37	No action required	--
End-of-life equipment replacement	Buchanan TS	Replacement of autotransformers and associated equipment	2028
	Clarke TS	Replacement of step-down transformers, associated disconnect switches, low-voltage switchyard components	2028
	Talbot TS	Replacement of step-down transformers (T3/T4), associated disconnect switches, low-voltage switchyard components	2028
	Wonderland TS	Low-voltage switchyard components replacement	2026
	M31W/ M32W (Salford Junction x Ingersoll)	London Area East Optical Ground Wire (OPGW) Infrastructure	2027
	W36/W37/W5 NL/W6NL/W2S/ N21W	London Area West Telecom Optical Ground Wire (OPGW) Infrastructure Installation	2029

The Study Team recommends Hydro One to continue with the implementation of infrastructure investments listed in Table 1 above.

In accordance with the Regional Planning process, the RIP should be reviewed and/or updated at least every five years. The London Area Region will continue to be monitored and should there be a need that emerges earlier due to a change in load forecast or any other reason, the next regional planning cycle will be triggered in advance of the five-year timeline.

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1. Introduction

THIS REPORT PRESENTS THE REGIONAL INFRASTRUCTURE PLAN ("RIP") TO ADDRESS THE ELECTRICITY NEEDS OF THE LONDON AREA REGION BETWEEN 2021 AND 2031.

The report was prepared by Hydro One Networks Inc. (Transmission) ("Hydro One") on behalf of the Study Team that consists of Entegrus Power Lines Inc., ERTH Power Inc., London Hydro Inc., Tillsonburg Hydro Inc., Hydro One Networks Inc. (Distribution), and the Independent Electricity System Operator ("IESO"), in accordance with the new Regional Planning process established by the Ontario Energy Board in 2013.

The London Area includes the municipalities of Oxford County (comprising Township of Blandford-Blenheim, Township of East Zorra-Tavistock, Town of Ingersoll, Township of Norwich, Township of South-West Oxford, Town of Tillsonburg, Township of Zorra), City of Woodstock, Middlesex County (comprising Municipality of Adelaide Metcalfe , Municipality of Lucan Biddulph, Municipality of Middlesex Centre, Municipality of North Middlesex, Municipality of Southwest Middlesex, Municipality of Strathroy-Caradoc, Municipality of Thames Centre, Village of Newbury), City of London, Elgin County (comprising Municipality of Town of Aylmer, Municipality of Bayham, Municipality of Central Elgin, Municipality of West Elgin, Municipality of Dutton/Dunwich, Township of Malahide, Township of Southwold), and the City of St. Thomas. In addition, the facilities located in the London Region supply part of Norfolk County. The boundaries of the London Area are shown below in Figure 1-1.

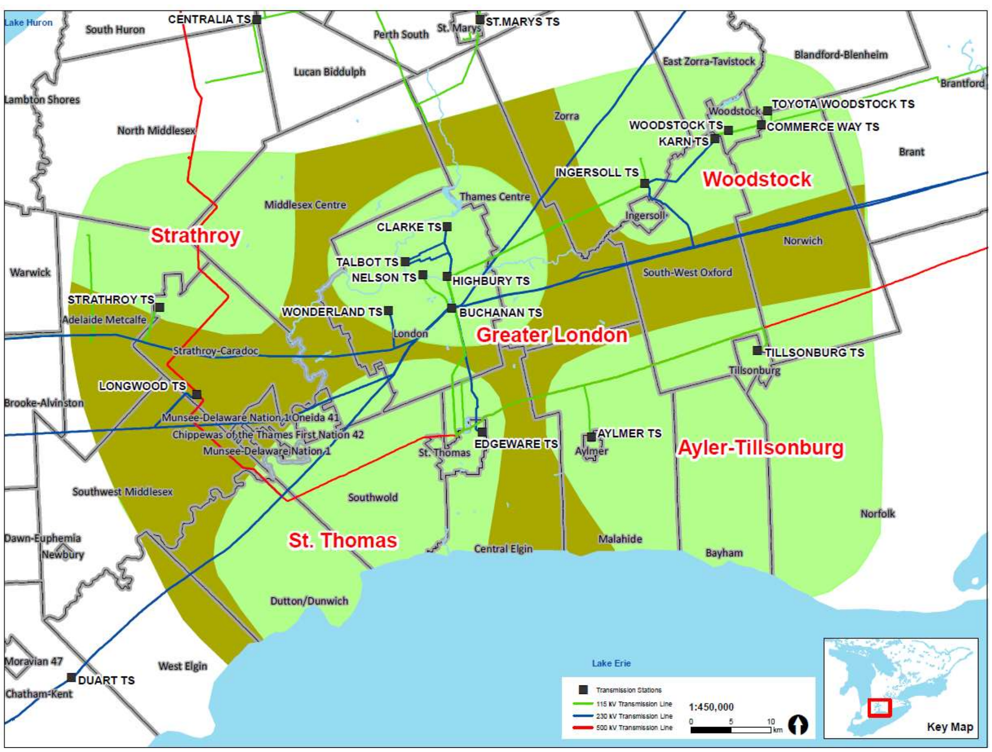

FIGURE 1-1: LONDON AREA REGION MAP

1.1. Objectives and Scope

The RIP report examines the needs in the London Area Region. Its objectives are to:

- Provide a comprehensive summary of needs and wires plans to address the needs;
- Identify any new needs that may have emerged since previous planning phases i.e., Needs Assessment and Local Planning;
- Assess and develop a wires plan to address these needs; and
- Identify investments in transmission and distribution facilities or both that should be developed and implemented on a coordinated basis to meet the electricity infrastructure needs within the region.

The RIP reviewed factors such as the load forecast, major high voltage sustainment needs emerging over the near and medium term horizon, transmission and distribution system capability along with any updates to local plans, conservation and demand management ("CDM") forecasts, renewable and non-renewable generation development, and other electricity system and local drivers that may impact the need and alternatives under consideration.

The scope of this RIP is as follows:

- A consolidated report of the relevant wires plans to address near and medium-term needs identified in previous planning phases;
- Discussion of any other major transmission infrastructure investment plans over the planning horizon;
- Identification of any new needs and a wires plan to address these needs based on new and/or updated information;
- Develop a plan to address any longer term needs identified by the Study Team.

1.2. Structure

The rest of the report is organized as follows:

- Section 2 provides an overview of the regional planning process.
- Section 3 describes the regional characteristics.
- Section 4 describes the transmission work completed over the last ten years.
- Section 5 describes the load forecast and study assumptions used in this assessment.
- Section 6 discusses the needs and provides the alternatives and preferred solutions.
- Section 7 provides the conclusion and next steps.

2. Regional Planning Process

2.1. Overview

Planning for the electricity system in Ontario takes place at three levels: bulk system planning, regional system planning, and distribution system planning. These levels differ in the facilities that are considered and the scope of impact on the electricity system. Planning at the bulk system level typically looks at issues that impact the system on a provincial level, while planning at the regional and distribution levels looks at issues on a more regional or localized level.

Regional planning focuses on assessing supply and reliability issues at a regional or local area level. Therefore, it largely considers the 115 kV and 230 kV portions of the power system that supply various parts of the province.

2.2. Regional Planning Process

A structured regional planning process was established by the Ontario Energy Board ("OEB") in 2013 through amendments to the Transmission System Code ("TSC") and Distribution System Code ("DSC"). The process consists of four phases: the Needs Assessment[1] ("NA"), the Scoping Assessment ("SA"), the Integrated Regional Resource Plan ("IRRP"), and the Regional Infrastructure Plan ("RIP").

The regional planning process begins with the NA phase, which is led by the transmitter to determine if there are regional needs. The NA phase identifies the needs and the Study Team determines whether further regional coordination is necessary to address them. If no further regional coordination is required, further planning is undertaken by the transmitter and the impacted local distribution company ("LDC") or customer and develops a Local Plan ("LP") to address them.

In situations where identified needs require coordination at the regional or sub-regional levels, the IESO initiates the SA phase. During this phase, the IESO, in collaboration with the transmitter and impacted LDCs, reviews the information collected as part of the NA phase, along with additional information on potential non-wires alternatives, and makes a decision on the most appropriate regional planning approach. The approach is either a RIP, which is led by the transmitter, or an IRRP, which is led by the IESO. If more than one sub-region was identified in the NA phase, it is possible that a different approach could be taken for different sub-regions.

The IRRP phase will generally assess infrastructure (wires) versus resource (non-wires alternatives) options at a higher or more macro level, but sufficient to permit a comparison of options. If the IRRP phase identifies that infrastructure options may be most appropriate to meet a need, the RIP phase will conduct detailed planning to identify and assess the specific wires alternatives and recommend a preferred wires solution. Similarly, resource options that the IRRP identifies as best suited to meet a need are then further planned in greater detail by the IESO.

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[1] Also referred to as Needs Screening

The IRRP phase also includes IESO led stakeholder engagement with municipalities, Indigenous communities, business sectors and other interested stakeholders in the region.

The RIP phase is the fourth and final phase of the regional planning process and involves discussion of previously identified needs and plans, identification of any new needs that may have emerged since the start of the planning cycle, and development of a wires plan to address the needs where a wires solution would be the best overall approach. This phase is led and coordinated by the transmitter and the deliverable is a comprehensive report of a wires plan for the region. Once completed, this report is also referenced in transmitter's rate filing submissions and as part of LDC rate applications with a planning status letter provided by the transmitter.

To efficiently manage the regional planning process, Hydro One has been undertaking wires planning activities in collaboration with the IESO and/or LDCs for the region as part of and/or in parallel with:

- Planning activities that were already underway in the region prior to the new regional planning process taking effect;
- The NA, SA, and LP phases of regional planning;
- Participating in and conducting wires planning as part of the IRRP for the region or sub-region;
- Working and planning for connection capacity requirements with the LDCs and transmission connected customers.

Figure 2-1 illustrates the various phases of the regional planning process (NA, SA, IRRP, and RIP) and their respective phase trigger, lead, and outcome.

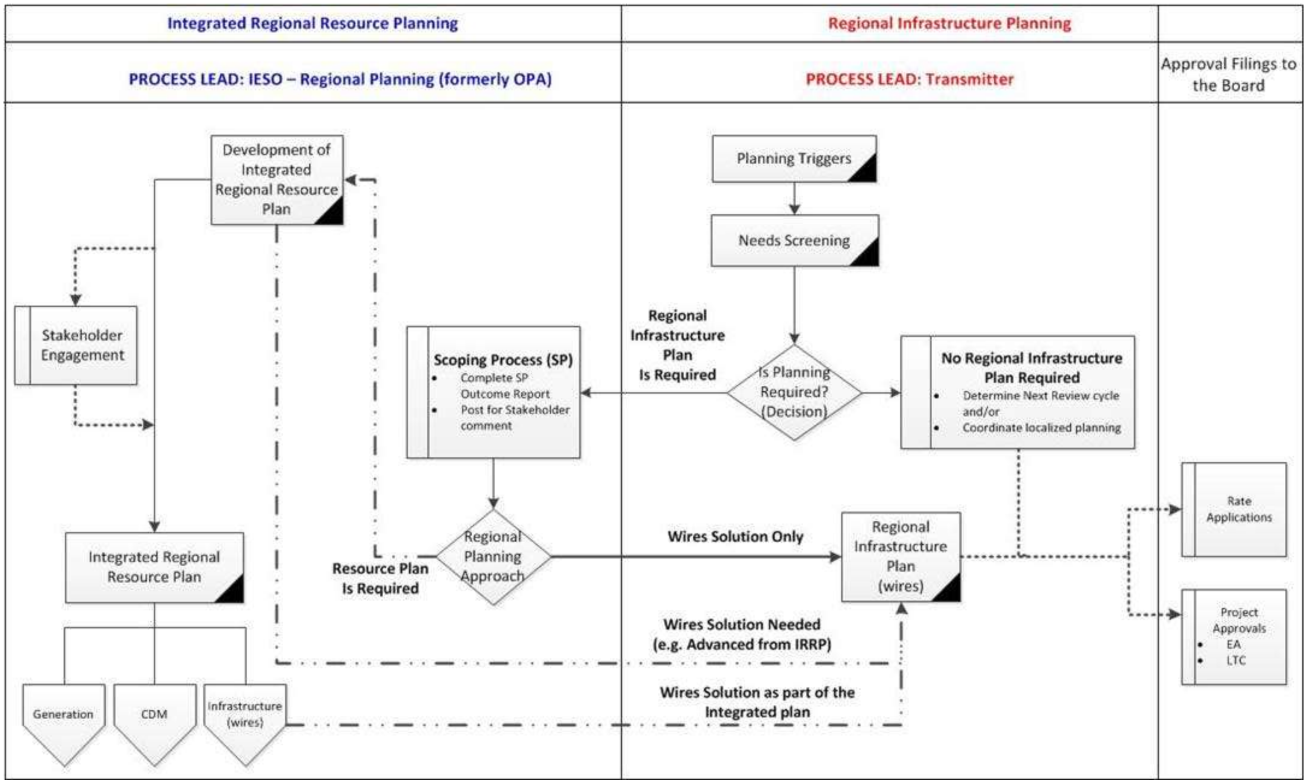


FIGURE 2-2: REGIONAL PLANNING PROCESS FLOWCHART

Upon the conclusion of Needs Assessment, the Study Team agreed that the need in the region (i.e., Greater London sub-region restoration need) was local in nature and no further regional coordination was required. Subsequently, a Local Planning report was completed to specifically address the restoration need. Therefore, Scoping Assessment and Integrated Regional Resource Plan was not carried out for London Area in this cycle.

2.3. RIP Methodology

The RIP phase consists of a four step process (see Figure 2-3) as follows:

1) Data Gathering: The first step of the process is the review of planning assessment data collected in the previous phase of the regional planning process. Hydro One collects this information and reviews it with the Study Team to reconfirm or update the information as required. The data collected includes:

    - Net peak demand forecast at the transformer station level. This includes the effect of any distributed generation or conservation and demand management programs.
    - Existing area network and capabilities including any bulk system power flow assumptions.
    - Other data and assumptions as applicable such as asset conditions; load transfer capabilities, and previously committed transmission and distribution system plans.

2) Technical Assessment: The second step is a technical assessment to review the adequacy of the regional system including any previously identified needs. Depending upon the changes to load forecast or other relevant information, regional technical assessment may or may not be required or be limited to specific issue only. Additional near and mid-term needs may be identified in this phase.
3) Alternative Development: The third step is the development of wires options to address the needs and to come up with a preferred alternative based on an assessment of technical considerations, feasibility, environmental impact and costs.
4) Implementation Plan: The fourth and last step is the development of the implementation plan for the preferred alternative.

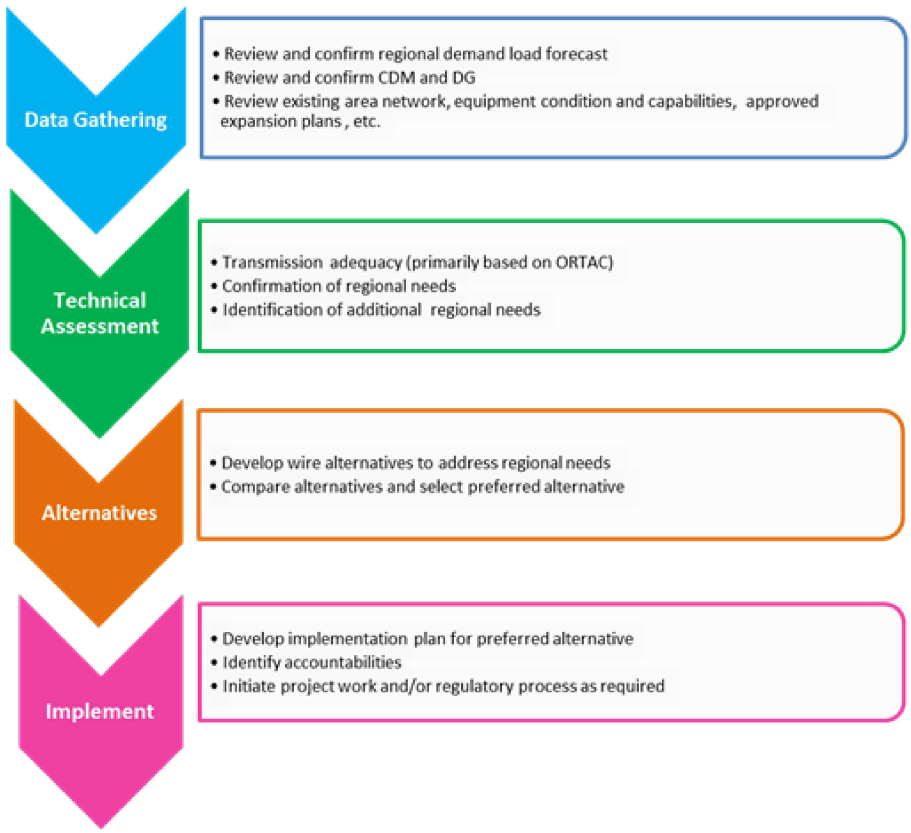


FIGURE 2-3: RIP METHODOLOGY

3. Transmission System Supplying London Area

The hub of the electrical system in London Area is Longwood Transformer Station ("TS"). Longwood TS provides the single connection to the 500 kV system in this area, through which provides majority of the resources to meet the demand in the London Area and rest of southwestern Ontario. The 500 kV system is part of the bulk power system and although it is not studied as part of this RIP, it should be noted that in 2021, the IESO identified a need to expand the 500 kV bulk system to supply the load growth in the Leamington area by 2030. The IESO recommended a new 500 kV single-circuit line connecting Longwood TS and Lakeshore TS and two 500/230 kV autotransformers to be constructed at Lakeshore TS.

London Area is supplied by a network of 230 kV and 115 kV circuits which is connected to Longwood TS through five 500/230 kV autotransformers. Autotransformers at Buchanan TS and Karn TS provide the necessary 230/115 kV autotransformation. Step-down transformer stations are connected to both 230 kV and 115 kV systems to bring the power to distribution level of 27.6 kV to serve the area. There are fourteen Hydro One step-down TS's, three transmission connected industrial load customers and three transmission connected generators in the London Area. The London Area Region summer coincident peak demand in 2021 was about 1152 MW, adjusted to extreme weather.

The existing facilities in the London Area are summarized below and depicted in the single line diagram shown in Figure 3-4:

- Fourteen step-down transformer stations supply the London Area load: Aylmer TS, Buchanan TS, Clarke TS, Commerce Way TS, Edgeware TS, Highbury TS, Ingersoll TS, Longwood TS, Nelson TS, Strathroy TS, Talbot TS (two Dual Element Spot Networks, DESN 1 and DESN 2), Tillsonburg TS, Wonderland TS, and Woodstock TS.
- Three directly connected industrial customer loads are connected in the London Area: Enbridge Keyser CTS, Lafarge Woodstock CTS and Toyota Woodstock TS.
- There are three existing transmission-connected generating stations in the London Area as follows:
    - Suncor Adelaide GS is a 40 MW wind farm connected to 115 kV circuit west of Strathroy TS
    - Port Burwell GS is a 99 MW wind farm connected to 115 kV circuit near Tillsonburg TS
    - Silver Creek GS is a 10 MW solar generator connected to 115 kV circuit near Aylmer TS

Although depicted, Duart TS is not included in the London Area study and will be studied as part of the Chatham-Kent/Lambton/Sarnia (CKLS) Area Regional Planning.

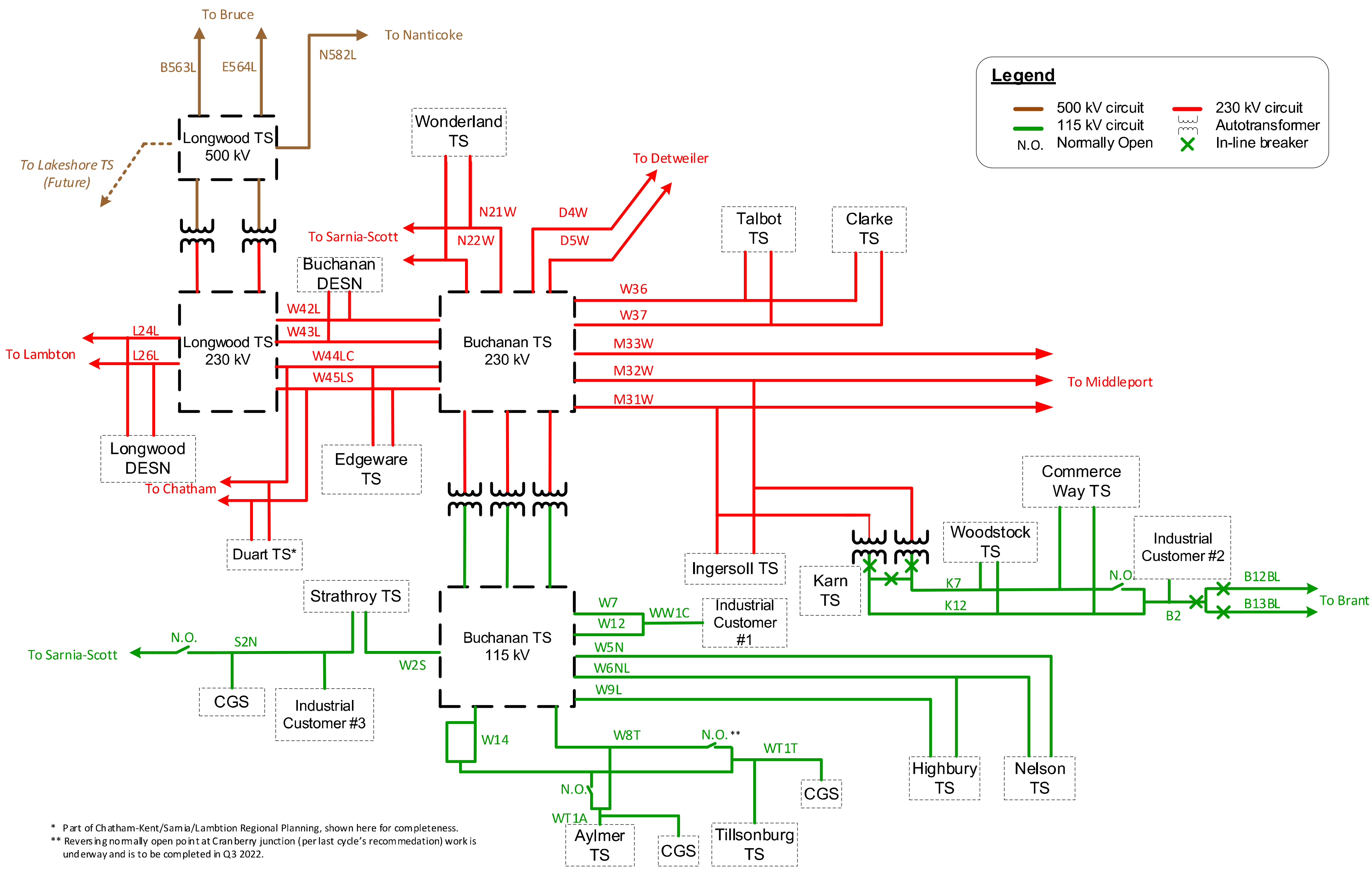


FIGURE 3-4: SIMPLIFIED SINGLE LINE DIAGRAM OF THE LONDON AREA REGION'S TRANSMISSION NETWORK

4. Transmission Projects Completed and/or Underway Over the Last Ten Years

OVER THE LAST TEN YEARS, A NUMBER OF TRANSMISSION PROJECTS HAVE BEEN PLANNED AND UNDERTAKEN BY HYDRO ONE AIMED TO MAINTAIN THE RELIABILITY AND ADEQUACY OF ELECTRICITY SUPPLY IN THE LONDON AREA REGION.

A summary and description of the major projects completed and/or currently underway over the last ten years is provided below.

- Strathroy TS like-for-like replacement of 25/42 MVA 115/27.6 kV transformer T2 due to failure completed in 2012.
- Ingersoll TS like-for-like replacement of 75/125 MVA 230/27.6 kV transformers T5 & T6 that were approximately 35 years old. The transformers were identified to have a design weakness and were replaced to mitigate the risk of failures, improve restoration time and maintain system performance completed in 2012.
- Woodstock TS 50/83 MVA 115/27.6 kV transformers T1 & T2 that were approximately 50 years old and were deemed end-of-life were replace like-for-like in 2014.
- Aylmer TS transformers and low-voltage switchyard replacement project competed in 2017.
- Strathroy TS failed transformer T1 and low-voltage switchyard replacement project completed in 2019.
- Wonderland TS failed transformer T6 was replaced in 2019.
- St. Thomas TS was decommissioned and 115 kV circuit W14 re-termination work was completed in 2020.
- Sarnia Scott TS to Buchanan TS 230 kV circuits N21W/N22W tower structures refurbishment project was completed in 2021.
- Nelson TS station refurbishment project will be completed in 2022.
- Tillsonburg TS new low-voltage capacitor banks installed in 2021 and switchyard component replacement project to be completed in 2022.
- Longwood TS protection and control replacement project to be completed in 2023.
- Edgeware TS protection and control replacement project to be completed in 2024.

5. London Area Demand

5.1. Load Forecast

The electricity demand in the London Area Region is anticipated to grow at an average rate of 1% over the next ten years. The London Area Region has been historically a summer-peaking region. Figure 5-5 shows the London Area Region's summer coincident peak load forecast for the 2022 – 2031 study period (extreme weather corrected peak) developed during the RIP phase. The load forecast prepared for the RIP phase is approximately 5% lower than the Needs Assessment load forecast due to higher forecasted contributions from CDM and DG.

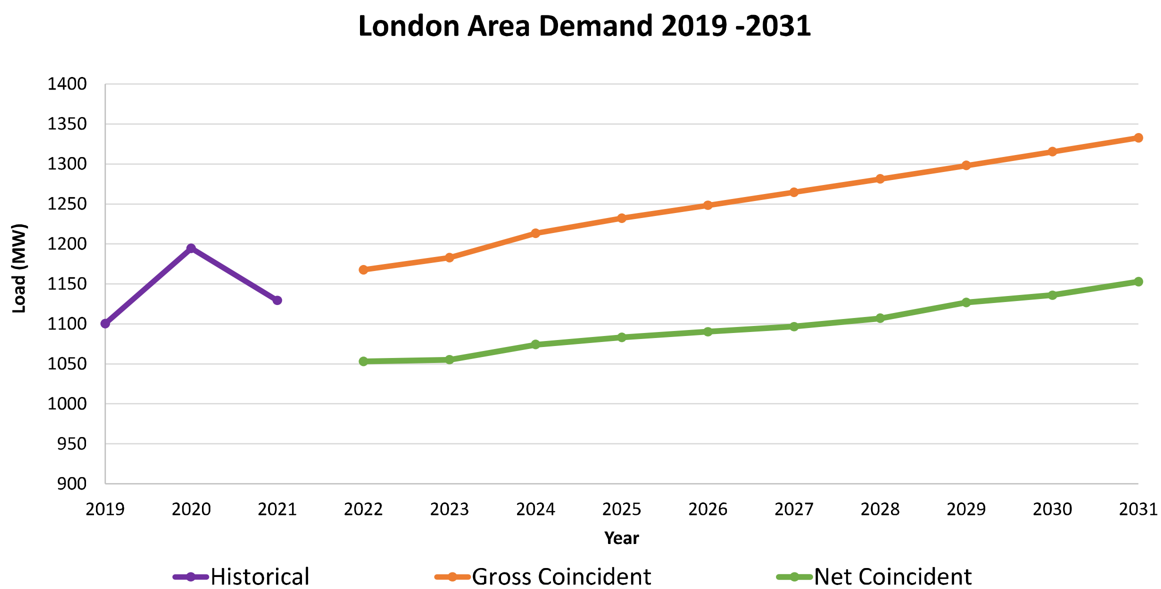


FIGURE 5-5: LONDON AREA REGION LOAD FORECAST

The load forecast shows that the region peak summer load increases from 1053 MW in 2022 to 1153 MW by 2031. The corresponding non-coincident summer peak loads increase from 1159 MW to about 1250 MW over the same period. The non-coincident and coincident net load forecasts for the individual stations in the London Area Region are given in Appendix D, Table D-1 and Table D-2.

LDCs in this region emphasized that impact of electrification have not been factored into the current RIP load forecasts. Should initiatives such as gas furnace conversion and continued electric vehicle adoption accelerate, transmission system adequacy will have to be re-assessed.

5.2. Forecast Assumptions

The following assumptions are made:

- The study period for the RIP assessment is 2022 – 2031.
- The 2021 summer station peak load is considered as a reference point and was adjusted for extreme weather impact (2.12% in 2021). Growth rates were extrapolated from LDCs' load forecasts via linear regression and are applied onto to the reference point to develop a gross load forecast.
- Distributed generation ("DG") refers to small-scale power generation connected in the distribution system which is located close to where the electricity is consumed. Both conservation & demand management ("CDM") as well as DG can reduce the amount of load that needs to be supplied and their contributions, as provided by the IESO, are directly net against the gross load forecast to develop a net load station forecast. A non-coincident version of the net load forecast was used to assess the station capacity.
- Load data for transmission-connected industrial customers in the region was assumed to be consistent with historical peak loads.
- All facilities that are identified in Section 4 and that are planned to be placed in-service within the study period are assumed to be in-service.
- Normal planning supply capacity for transformer stations is determined by the summer 10-day Limited Time Rating ("LTR"), assuming a 90% lagging power factor.

6. Regional Needs and Plans

THIS SECTION DISCUSSES ELECTRICAL INFRASTRUCTURE NEEDS IN THE LONDON AREA AND SUMMARIZES THE PLANS DEVELOPED TO ADDRESS THESE NEEDS.

This section outlines and discusses electrical infrastructure needs in the London Area and plans to address these needs for the study period of 2022 – 2031.

Based on the gross regional non-coincident load forecast, Clarke TS is forecasted to exceed its 10-Day LTR in 2023 and Highbury TS and Tillsonburg TS will also exceed station LTR in the medium term. However, these stations are expected to be adequate to meet the net load forecast for the remainder of the study period as planned CDM targets and DG contributions continue to offset the load growth. Overall, as the net load forecast prepared for the RIP phase is approximately 5% lower than the Needs Assessment load forecast, no new need was identified.

During the development of this RIP, issue about available capacity was raised at a number of stations, most notably Strathroy TS and Tillsonburg TS. Available capacity and its allocation among LDCs are governed by OEB's Transmission System Code and are separate from the regional planning process. Hydro One Transmission will continue to engage with its customers following the conclusion of this RIP.

Table 6-2 provides a summary of the needs identified in this cycle and the corresponding sub-sections where recommendations and plans are discussed. The planned in-service dates are tentative and will be finalized closer to project commencement in coordination with impacted LDCs.

TABLE 6-2: IDENTIFIED NEAR AND MID-TERM NEEDS IN LONDON AREA REGION

No.	Need	Need Date	Section
1	Talbot TS station capacity	Today	6.1
2	Greater London sub-region restoration need	Today	6.2
3	End-of-life equipment replacement	Vary	6.3

6.1. Talbot TS

6.1.1. Sustainment Need

The existing Talbot TS comprises two 230 kV/27.6 kV DESNs (T1/T2 and T3/T4) and supplies electricity to London Hydro customers. It is supplied by two 230 kV circuits W36 and W37. Step-down transformers T3 and T4 have been in-service from 1979 and are in poor condition and approaching end-of-life. A number of 27.6 kV breakers and protection equipment have also been identified for replacement.

6.1.2. Station Capacity Need

The station capacity for T1/T2 and T3/T4 are 113 MW and 161 MW respectively. The summer regional non-coincident peak load of the two DESNs in 2021 are 119 MW and 168 MW. According to the regional non-coincident net load forecast in the study period, Talbot TS T1/T2 DESN is expected to exceed its station capacity throughout the study period and Talbot TS T3/T4 DESN will exceed its capacity in 2029.

6.1.3. Recommendation

The station capacity need was first identified in the 2020 Needs Assessment and was primarily driven by temporary load transfer from neighbouring station (Nelson TS). As noted in Section 4, Nelson TS underwent refurbishment which includes converting the low-voltage supply from 13.8 kV to 27.6 kV. During the construction period, significant portion of the load that was originally supplied by this station was transferred to Clarke TS and Talbot TS. The newly refurbished Nelson TS was placed in-service in December 2018 and as more 27.6 kV distribution feeders becomes available in downtown London, London Hydro confirmed load will be transferred back to Nelson TS and additional transformation capacity is not required at this time.

The Study Team recommends Hydro One to proceed with like-for-like replacement of T3 and T4 at Talbot TS. Project is expected to be completed in 2028. In addition, Hydro One will look for opportunities to coordinate this project with London Hydro for the metalclad switchgear replacement.

6.2. Greater London Sub-region Restoration Need

6.2.1. Description

The 230 kV double-circuit line,W36 and W37, emanates from Buchanan TS and supplies Talbot TS (both DESNs) and Clarke TS. Should the simultaneous loss of W36/W37 occurs, all of the loads supplied by the Clarke TS and Talbot TS, which amounts to over 340 MW[2], would be interrupted by configuration. The potential load loss exceeds the ORTAC 30-minute restoration criteria.

6.2.2. Recommendation

This need was first reported in the first cycle of regional planning for the London Area Region in 2015. The 2017 IRRP working group recommended installing switching devices and feeder extensions on the distribution system. The IRRP working group also acknowledged while these measures will not fully address the restoration need, they will substantially improve the restoration capability in a cost-effective manner.

The restoration need persists in the current regional planning cycle and was further re-assessed with London Hydro via the Local Planning process. The Study Team noted a significant portion of the interrupted load could be restored by a neighbouring unaffected station, Highbury TS, if its station capacity limit is lifted. This option was not pursued further at this time as work required will be extensive and cost prohibitive. Hydro One undertook a detailed historical equipment performance review to assess the probability of common-mode failure that would lead to simultaneous loss of W36 and W37. It was concluded that the only common-mode failure that may result in the simultaneous loss of both W36/W37 is the failure of the steel poles that carry

[2] 2021 historical coincident peak load.

the two circuits and probability of this event is very low. Therefore, the Study Team recommends no action is required at this time.

6.3. End-of-Life Equipment Replacement

6.3.1. Buchanan TS

6.3.1.1. Description

Buchanan TS is a major 230/115 kV transformer station in the area that supplies load stations in London Area. The station houses three 230/115 kV auto-transformers, three 230 kV capacitor banks, one 115 kV capacitor bank and two 230/27.6 kV step-down transformers. There are sixteen 230 kV oil breakers and nine SF6 circuit breakers in the 230 kV switchyard; seventeen oil circuit and three SF6 circuit breakers in the 115 kV switchyard.

Two of the 3 auto-transformers T2 and T3 are 48 and 54 years old respectively, are in poor condition, and approaching the end of life.

6.3.1.2. Recommendation

To address poor equipment performance of deteriorating equipment, Hydro One plans to replace two 230kV autotransformers, spill containment pits, AC and DC station service equipment, as well as some obsolete protection, controls and telecom equipment.

6.3.2. Clarke TS

6.3.2.1. Description

Clarke TS is a DESN station located in the northern part of the London Area. The station is supplied by two 230 kV circuits W36 and W37. The station supplies electricity to London Hydro and Hydro One Distribution customers.

The two 230/27.6 kV 50/83 MVA transformers T3 and T4 are 55 years old, in poor condition, and approaching end of life. Some of the protection equipment is also found to be obsolete.

6.3.2.2. Recommendation

To address the assets in poor condition and end-of-life, Hydro One plans to replace step-down transformers like-for-like, associated disconnect switches, 27.6 kV switchyard components including breakers, station services, capacitors and protections. Replacement plan will be closely coordinated with affected LDCs and the expected completion date is 2028.

6.3.3. Wonderland TS

6.3.3.1. Description

Wonderland TS is a DESN station located in the western part of the London Area. The station is supplied by two 230 kV circuits N21W and N22W. The station supplies electricity to London Hydro and Hydro One Distribution customers.

The Wonderland T5/T6 DESN facility was originally built in the 1960s and its equipment is degrading in condition. The 50/83 MVA T6 power transformer was replaced in 2004 due to failure. The companion transformer, T5, failed in July 2019 and was subsequently replaced. The existing air insulated 27.6 kV switchgear, majority of which are original installations have reached end-of-life due to deteriorated condition and has limited availability of parts for ongoing support and maintenance. All site protection and control equipment, consisting of first generation electro-mechanical relaying are deemed end-of-life, obsolete and require replacement. During the early project development phase, London Hydro and Hydro One Distribution were consulted to assess if there is a capacity need to replace the 50/83 MVA transformers with 75/125 MVA and it was concluded there is no such need at the time.

6.3.3.2. Recommendation

To address the end-of-life need, Hydro One plans to replace the Wonderland 27.6 kV switchyard. Replacement plan will be closely coordinated with affected LDCs and the expected completion date is 2026.

6.3.4. London Area East OPGW Infrastructure

6.3.4.1. Description

M31W and M32W are 230 kV network circuits that connect Buchanan TS and Middleport Port TS. Ingersoll TS and Karn TS are tapped off M31W/M32W at Salford Junction. High voltage 230/115 kV autotransformers are located at Karn TS provide the necessary transformation from the 230 kV system to the Woodstock and Commerce Way 115 kV system.

6.3.4.2. Recommendation

To improve the reliability of power system telecom network, Hydro One plans to install 9km of OPGW fibre from Salford Junction to Ingersoll TS and remove the existing licensed microwave link connects Ingersoll TS to Buchanan TS. Project is expected to be completed in 2027.

6.3.5. London Area West OPGW Infrastructure

6.3.5.1. Description

Several transmission lines in the London area that emanate from Buchanan TS currently rely on leased legacy dedicated metallic cable infrastructure for DC remote trip protections. These include 230kV circuits W36/W37 that connect to Talbot TS and Clarke TS, 115 kV circuits W5N/W6NL that connect to Nelson TS and Highbury TS, 115 kV circuit W2S that connects to Strathroy TS and 230kV circuit N21W connecting to Sarnia Scott TS.

6.3.5.2. Recommendation

To improve the reliability of power system telecom network, Hydro One plans to establish a geographically diverse and fully redundant fibre optic network for protection and SCADA applications. A combination of Hydro One's existing and new OPGW-based fibre and two leased third-party fibre links would be utilized. The existing metallic cable will be removed and the project is expected to be completed in 2029.

7. Conclusions and Next Steps

THIS REGIONAL INFRASTRUCTURE PLAN CONCLUDES THE REGIONAL PLANNING PROCESS FOR THE LONDON AREA REGION.

The major infrastructure investments recommended by the Study Team in the near and mid-term planning horizon are provided in Table 7-3 below are all end of life needs, along with their planned in-service date. The planned in-service dates are tentative and will be finalized closer to project commencement in coordination with impacted LDCs.

TABLE 7-3: RECOMMENDED PLANS IN LONDON AREA REGION OVER THE NEXT 10 YEARS

Stations / Lines	Scope	In-service
Buchanan TS	Replacement of autotransformers and associated equipment	2028
Clarke TS	Replacement of step-down transformers, associated disconnect switches, low-voltage switchyard components	2028
Talbot TS	Replacement of step-down transformers (T3/T4), associated disconnect switches, low-voltage switchyard components	2028
Wonderland TS	Low-voltage switchyard components replacement	2026
M31W/ M32W (Salford Junction x Ingersoll)	London Area East OPGW Infrastructure	2027
W36/W37/W5 NL/W6NL/W2S/ N21W	London Area West Telecom OPGW Infrastructure Installation	2029

The Study Team recommends Hydro One to continue with the implementation of infrastructure investments listed in Table 7-3.

In accordance with the Regional Planning process, the RIP should be reviewed and/or updated at least every five years. The Region will continue to be monitored and should there be a need that emerges earlier due to a change in load forecast or any other reason, the next regional planning cycle will be triggered in advance of the five-year timeline.

References

[1] London Area Needs Assessment [2015]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Needs%20Assessment%20Report%20-%20London%20Region%20-%20April%202,%202015.pdf

[2] Strathroy TS Transformer Capacity Local Planning [2016]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Local%20Planning%20Report%20-Strathroy%20TS.pdf

[3] Woodstock Sub-region Restoration Local Planning [2017]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Woodstock%20Restoration%20Local%20Planning%20Report%20(Final)%2020170519.pdf

[4] London Area Integrated Regional Resource Plan [2017]
https://www.ieso.ca/-/media/Files/IESO/Document-Library/regional-planning/London-Area/Final-Greater-London-IRRP-20170120.ashx

[5] London Area Needs Assessment [2020]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Needs-Assessment-Report-London-2020.pdf

[6] Greater London Sub-region Restoration Local Planning [2021]
https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/london/Documents/Local_Planning_Report_Greater_London_Subregion.pdf

Appendix A. Stations in the London Area Region

Station	Voltage (kV)	Supply Circuits
Aylmer TS	115/27.6	W8T
Buchanan TS	230/27.6	W42L/W43L
Clarke TS	230/27.6	W36/W37
Commerce Way TS	115/27.6	K7/K12
Edgeware TS	230/27.6	W44LC/W45LC
Highbury TS	115/27.6	W6NL/W9L
Ingersoll TS	230/27.6	M31W/M32W
Longwood TS	230/27.6	L24L/L26L
Nelson TS	115/27.6	W5N/W6NL
Strathroy TS	115/27.6	W2S
Talbot TS (T1/T2 and T3/T4)	230/27.6	W36/W37
Tillsonburg TS	115/27.6	W14
Wonderland TS	230/27.6	N21W/N22W
Woodstock TS	115/27.6	K7/K12

Appendix B. Transmission Lines in the London Area Region

Circuit Designations	Location	Voltage (kV)
N21W, N22W	Scott TS to Buchanan TS	230
W42L, W43L	Longwood TS to Buchanan TS	230
W44LC	Longwood TS to Chatham TS to Buchanan TS	230
W45LS	Longwood TS to Spence SS to Buchanan TS	230
W36, W37	Buchanan TS to Talbot TS and Clarke TS	230
D4W, D5W	Buchanan TS to Detweiler TS	230
M31W, M32W, M33W	Buchanan TS to Middleport TS	230
W2S	Buchanan TS to Strathroy TS	115
W5N	Buchanan TS to Nelson TS	115
W6NL	Buchanan TS to Highbury TS to Nelson TS	115
W9L	Buchanan TS to Highbury TS	115
W7, W12	Buchanan TS to CTS	115
WW1C	Buchanan TS to CTS	115
W8T	Buchanan TS to ESWF JCT	115
WT1T	Cranberry Junction to Tillsonburg TS	115
W14	Buchanan TS to Cranberry Junction	115
WT1A	Aylmer TS to Lyons JCT	115
K7, K12	Karn TS to Commerce Way TS	115

Appendix C. Distributors in London Area Region

Distributor Names	Station Name	Connection Type
Entegrus Power Lines Inc. [Middlesex]	Edgeware TS	Tx
	Longwood TS	Dx
	Strathroy TS	Dx
		Tx
ERTH Power Corporation	Aylmer TS	Tx
	Buchanan TS	Dx
	Edgeware TS	Dx
	Ingersoll TS	Dx
	Tillsonburg TS	Dx
Hydro One Networks Inc.	Aylmer TS	Tx
	Buchanan TS	Tx
	Clarke TS	Tx
	Edgeware TS	Tx
	Highbury TS	Tx
	Ingersoll TS	Tx
	Longwood TS	Tx
	Strathroy TS	Tx
	Tillsonburg TS	Tx
	Wonderland TS	Tx
	Woodstock TS	Tx
London Hydro Inc.	Buchanan TS	Dx
		Tx
	Clarke TS	Tx
	Edgeware TS	Dx
	Highbury TS	Dx
		Tx
	Nelson TS	Tx
	Talbot TS	Tx
	Wonderland TS	Dx
		Tx
Tillsonburg Hydro Inc.	Tillsonburg TS	Tx

Appendix D. London Area Region Load Forecast

TABLE D1: LONDON AREA REGIONAL NON-COINCIDENT NET LOAD FORECAST

Transformer Station	LTR* (MW)	Quantities	Reference	Near Term Forecast (MW)					Medium Term Forecast (MW)				
			2021**	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Aylmer TS		Gross	32.46	32.98	33.51	34.05	34.61	35.16	35.73	36.31	36.90	37.49	38.10
		DG		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
		CDM		0.67	1.06	1.38	1.66	1.93	2.22	2.49	2.75	2.99	3.04
	40	Net		32.29	32.44	32.65	32.92	33.22	33.49	33.80	34.13	34.48	35.03
Buchanan TS		Gross	131.49	133.22	134.96	136.73	138.52	140.34	142.17	144.04	145.92	147.84	149.77
		DG		14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74
		CDM		2.70	4.26	5.54	6.65	7.69	8.85	9.86	10.87	11.81	11.96
	173	Net		115.77	115.96	116.45	117.12	117.90	118.58	119.44	120.31	121.29	123.07
Clarke TS		Gross	102.45	103.58	104.72	105.88	107.05	108.23	109.43	110.64	111.86	113.10	114.35
		DG		3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
		CDM		2.10	3.30	4.29	5.14	5.93	6.81	7.57	8.33	9.03	9.13
	103	Net		98.08	98.03	98.20	98.51	98.91	99.22	99.67	100.13	100.67	101.82
Commerce Way TS		Gross	34.55	35.12	35.69	36.27	36.87	37.47	38.08	38.70	39.33	39.97	40.63
		DG		2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
		CDM		0.71	1.13	1.47	1.77	2.05	2.37	2.65	2.93	3.19	3.25
	106	Net		31.46	31.62	31.86	32.15	32.47	32.77	33.11	33.46	33.84	34.44
Edgeware TS		Gross	102.45	103.93	105.43	121.83	126.36	127.92	129.52	131.13	132.77	134.43	136.12
		DG		4.47	4.47	4.47	4.47	4.47	4.47	4.47	4.47	4.47	4.44
		CDM		2.11	3.33	4.93	6.07	7.01	8.06	8.98	9.89	10.74	10.87
	180	Net		97.35	97.64	112.43	115.81	116.44	116.98	117.68	118.40	119.22	120.81
Highbury TS		Gross	74.76	75.72	76.70	77.69	78.69	79.70	80.72	81.76	82.81	83.88	84.96
		DG		5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51
		CDM		1.53	2.42	3.15	3.78	4.37	5.02	5.60	6.17	6.70	6.79
	80	Net		68.68	68.77	69.02	69.39	69.82	70.18	70.65	71.13	71.66	72.67
Ingersoll TS		Gross	69.40	71.92	74.53	77.24	80.05	82.96	85.98	89.10	92.34	95.70	99.17
		DG		12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.93
		CDM		1.46	2.35	3.13	3.85	4.55	5.35	6.10	6.88	7.64	7.92
	158	Net		57.51	59.24	61.17	63.26	65.47	67.68	70.05	72.51	75.11	78.33
Longwood TS		Gross	40.27	41.14	42.04	42.95	43.88	44.83	45.80	46.80	47.81	48.85	49.91
		DG		1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.12
		CDM		0.83	1.33	1.74	2.11	2.46	2.85	3.20	3.56	3.90	3.99
	121	Net		39.15	39.55	40.05	40.61	41.21	41.79	42.43	43.09	43.79	44.80
Nelson TS		Gross	53.39	53.78	54.17	54.56	54.95	55.34	55.74	56.14	56.55	56.96	57.37
		DG		17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55
		CDM		1.09	1.71	2.21	2.64	3.03	3.47	3.84	4.21	4.55	4.58
	107	Net		35.14	34.91	34.80	34.76	34.77	34.73	34.75	34.79	34.86	35.24
Strathroy TS		Gross	39.63	40.19	40.77	41.35	41.94	42.54	43.15	43.77	44.39	45.03	45.67
		DG		8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63
		CDM		0.81	1.29	1.67	2.01	2.33	2.69	3.00	3.31	3.60	3.65
	56	Net		30.75	30.86	31.05	31.30	31.58	31.84	32.14	32.46	32.80	33.40
Talbot T1/T2		Gross	121.81	122.79	123.77	124.77	125.78	126.79	127.81	128.84	129.87	130.92	131.97
		DG		-	-	-	-	-	-	-	-	-	-
		CDM		2.49	3.90	5.05	6.04	6.95	7.95	8.82	9.68	10.46	10.54
	113	Net		120.30	119.87	119.72	119.73	119.84	119.85	120.02	120.20	120.46	121.43
Talbot T3/T4		Gross	172.17	173.87	175.59	177.33	179.08	180.85	182.64	184.45	186.27	188.11	189.97
		DG		12.28	12.28	12.28	12.28	12.28	12.28	12.28	0.52	0.52	0.45
		CDM		3.52	5.54	7.18	8.60	9.91	11.37	12.63	13.88	15.03	15.18
	161	Net		158.06	157.77	157.86	158.20	158.66	158.99	159.54	171.87	172.56	174.35
Tillsonburg TS		Gross	94.95	96.18	97.42	98.68	99.95	101.25	102.56	103.88	105.23	106.59	107.96
		DG		3.54	3.54	3.54	3.54	3.54	3.54	0.97	0.97	0.97	0.91
		CDM		1.95	3.07	4.00	4.80	5.55	6.38	7.11	7.84	8.51	8.62
	103	Net		90.68	90.80	91.14	91.61	92.16	92.63	95.80	96.42	97.10	98.43
Wonderland TS		Gross	91.36	92.76	94.17	95.61	97.08	98.56	100.07	101.60	103.15	104.73	106.33
		DG		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.87
		CDM		1.88	2.97	3.87	4.66	5.40	6.23	6.95	7.68	8.37	8.49
	115	Net		88.87	89.20	89.74	90.41	91.16	91.84	92.64	93.47	94.36	95.96
Woodstock TS		Gross	64.10	64.68	65.27	65.87	66.47	67.07	67.69	68.30	68.92	69.55	70.19
		DG		2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.23	1.60
		CDM		1.31	2.06	2.67	3.19	3.68	4.21	4.68	5.13	5.56	5.61
	81	Net		61.08	60.92	60.91	60.99	61.11	61.18	61.34	61.50	61.77	62.98
Industrial Customer #1			12	12	12	12	12	12	12	12	12	12	12
Industrial Customer #2			19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9
Industrial Customer #3			2	2	2	2	2	2	2	2	2	2	2
London Area Total				1159	1161	1181	1191	1199	1206	1217	1238	1248	1267

*Station LTR is based on 90% power factor

** Adjusted to extreme weather

Note (1) Edgeware TS step increases in 2024 & 2025 reflects a new connection request of 20MW.

TABLE D2: LONDON AREA REGIONAL COINCIDENT NET LOAD FORECAST

Transformer Station	Quantities	Reference	Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2021^	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Aylmer TS	Gross	25.99	26.41	26.83	27.27	27.71	28.16	28.61	29.07	29.54	30.02	30.51
	DG		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	CDM		0.54	0.85	1.10	1.33	1.54	1.78	1.99	2.20	2.40	2.44
	Net		25.85	25.97	26.14	26.36	26.59	26.81	27.06	27.32	27.60	28.05
Buchanan TS	Gross	129.03	130.72	132.43	134.17	135.92	137.70	139.51	141.34	143.19	145.06	146.96
	DG		14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74	14.74
	CDM		2.65	4.18	5.43	6.53	7.55	8.68	9.68	10.67	11.59	11.74
	Net		113.33	113.51	113.99	114.65	115.42	116.08	116.92	117.78	118.73	120.48
Clarke TS	Gross	86.32	87.27	88.24	89.21	90.20	91.20	92.20	93.22	94.25	95.29	96.35
	DG		3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40	3.40
	CDM		1.77	2.78	3.61	4.33	5.00	5.74	6.38	7.02	7.61	7.70
	Net		82.11	82.06	82.21	82.47	82.80	83.07	83.45	83.84	84.29	85.26
Commerce Way TS	Gross	32.18	32.71	33.24	33.78	34.34	34.90	35.47	36.05	36.63	37.23	37.84
	DG		2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94
	CDM		0.66	1.05	1.37	1.65	1.91	2.21	2.47	2.73	2.97	3.02
	Net		29.10	29.25	29.47	29.74	30.04	30.32	30.64	30.96	31.32	31.87
Edgeware TS	Gross	102.45	103.93	105.43	121.83	126.36	127.92	129.52	131.13	132.77	134.43	136.12
	DG		4.47	4.47	4.47	4.47	4.47	4.47	4.47	4.47	4.47	4.44
	CDM		2.11	3.33	4.93	6.07	7.01	8.06	8.98	9.89	10.74	10.87
	Net		97.35	97.64	112.43	115.81	116.44	116.98	117.68	118.40	119.22	120.81
Highbury TS	Gross	74.61	75.57	76.54	77.53	78.52	79.53	80.56	81.59	82.64	83.71	84.78
	DG		5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51	5.51
	CDM		1.53	2.41	3.14	3.77	4.36	5.01	5.59	6.16	6.69	6.77
	Net		68.52	68.61	68.87	69.24	69.66	70.03	70.49	70.97	71.50	72.50
Ingersoll TS	Gross	54.92	56.92	58.99	61.13	63.35	65.65	68.04	70.51	73.08	75.73	78.49
	DG		12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.93
	CDM		1.15	1.86	2.48	3.04	3.60	4.23	4.83	5.44	6.05	6.27
	Net		42.82	44.18	45.71	47.36	49.11	50.86	52.74	54.69	56.74	59.29
Longwood TS	Gross	37.74	38.56	39.39	40.25	41.12	42.01	42.93	43.86	44.81	45.78	46.77
	DG		1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.12
	CDM		0.78	1.24	1.63	1.98	2.30	2.67	3.00	3.34	3.66	3.74
	Net		36.62	36.99	37.46	37.99	38.55	39.09	39.69	40.31	40.96	41.92
Nelson TS	Gross	37.94	38.22	38.49	38.77	39.05	39.33	39.61	39.90	40.19	40.48	40.77
	DG		17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55	17.55
	CDM		0.77	1.21	1.57	1.88	2.16	2.47	2.73	2.99	3.23	3.26
	Net		19.90	19.73	19.65	19.63	19.63	19.60	19.62	19.65	19.70	19.96
Strathroy TS	Gross	30.42	30.86	31.30	31.74	32.20	32.66	33.13	33.60	34.08	34.57	35.06
	DG		8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63
	CDM		0.63	0.99	1.29	1.55	1.79	2.06	2.30	2.54	2.76	2.80
	Net		21.60	21.68	21.83	22.02	22.24	22.44	22.67	22.91	23.18	23.63
Talbot T1/T2	Gross	109.09	109.96	110.85	111.74	112.64	113.55	114.46	115.38	116.31	117.25	118.19
	DG		-	-	-	-	-	-	-	-	-	-
	CDM		2.23	3.50	4.53	5.41	6.22	7.12	7.90	8.67	9.37	9.44
	Net		107.74	107.35	107.22	107.23	107.33	107.34	107.49	107.65	107.88	108.75
Talbot T3/T4	Gross	152.03	153.53	155.05	156.58	158.13	159.69	161.27	162.87	164.48	166.10	167.75
	DG		12.28	12.28	12.28	12.28	12.28	12.28	12.28	0.52	0.52	0.45
	CDM		3.11	4.89	6.34	7.60	8.75	10.04	11.15	12.25	13.27	13.40
	Net		138.13	137.87	137.96	138.25	138.66	138.95	139.43	151.70	152.31	153.89
Tillsonburg TS	Gross	94.21	95.43	96.66	97.91	99.18	100.46	101.76	103.07	104.41	105.76	107.12
	DG		3.54	3.54	3.54	3.54	3.54	3.54	0.97	0.97	0.97	0.91
	CDM		1.93	3.05	3.97	4.76	5.50	6.33	7.06	7.78	8.45	8.56
	Net		89.95	90.07	90.40	90.87	91.41	91.88	95.05	95.66	96.34	97.66
Wonderland TS	Gross	87.66	89.00	90.36	91.74	93.14	94.57	96.01	97.48	98.97	100.49	102.02
	DG		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.87
	CDM		1.80	2.85	3.72	4.47	5.18	5.98	6.67	7.37	8.03	8.15
	Net		85.19	85.51	86.02	86.67	87.38	88.04	88.81	89.60	90.46	92.00
Woodstock TS	Gross	64.10	64.68	65.27	65.87	66.47	67.07	67.69	68.30	68.92	69.55	70.19
	DG		2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.29	2.23	1.60
	CDM		1.31	2.06	2.67	3.19	3.68	4.21	4.68	5.13	5.56	5.61
	Net		61.08	60.92	60.91	60.99	61.11	61.18	61.34	61.50	61.77	62.98
Industrial Customer #1		12	12	12	12	12	12	12	12	12	12	12
Industrial Customer #2		19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9
Industrial Customer #3		2	2	2	2	2	2	2	2	2	2	2
London Area Total			1053	1055	1074	1083	1090	1097	1107	1127	1136	1153

^ Adjusted to extreme weather
Note (1) Edgeware TS step increases in 2024 & 2025 reflects a new connection request of 20MW.

TABLE D3: CONSERVATION AND DEMAND FORECAST (SOURCE: IESO)

2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
2.0%	3.2%	4.1%	4.8%	5.5%	6.2%	6.8%	7.4%	8.0%	8.0%

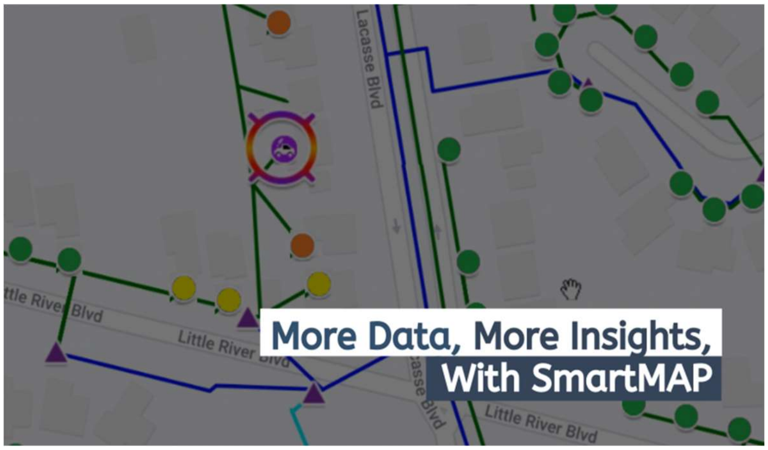
Appendix F. List of Acronyms

Acronym	**Description**
A	Ampere
BES	Bulk Electric System
BPS	Bulk Power System
CDM	Conservation and Demand Management
CIA	Customer Impact Assessment
CGS	Customer Generating Station
CSS	Customer Switching Station
CTS	Customer Transformer Station
DESN	Dual Element Spot Network
DG	Distributed Generation
DSC	Distribution System Code
GATR	Guelph Area Transmission Reinforcement
GS	Generating Station
HV	High Voltage
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Plan
kV	Kilovolt
LDC	Local Distribution Company
LP	Local Plan
LTE	Long Term Emergency
LTR	Limited Time Rating
LV	Low Voltage
MTS	Municipal Transformer Station
MW	Megawatt
MVA	Mega Volt-Ampere
MVAR	Mega Volt-Ampere Reactive
NA	Needs Assessment
NERC	North American Electric Reliability Corporation
NGS	Nuclear Generating Station
NPCC	Northeast Power Coordinating Council Inc.
OEB	Ontario Energy Board
ORTAC	Ontario Resource and Transmission Assessment Criteria
PF	Power Factor
PPWG	Planning Process Working Group
RIP	Regional Infrastructure Plan
SA	Scoping Assessment
SIA	System Impact Assessment
SPS	Special Protection Scheme
SS	Switching Station
TS	Transformer Station
TSC	Transmission System Code

Appendix C – Utilismart "Smartmap"

Appendix C

Utilismart's Outage Management System, aka **SmartMAP,** creates value from utility data in near real time to improve business processes related to grid visibility, engineering & performance analysis, maintenance, outage management, and network planning.



Wholesale meter points, smart meters, and other sensors provide the supporting data SmartMAP needs to create a **sophisticated, realistic, and reliable simulation** of your distribution system – from the transmission substation down to the individual meters.

SmartMAP provides your utility's engineering & operational groups with a **geographic analysis tool** of their medium voltage distribution system. Using the data provided by **Utility Data Manager**, SmartMAP runs real, measured voltage and load meter data through engineering and connectivity models to eliminate the guesswork. **It acts as a data scientist, converting vast amounts of complex data into actionable information.**

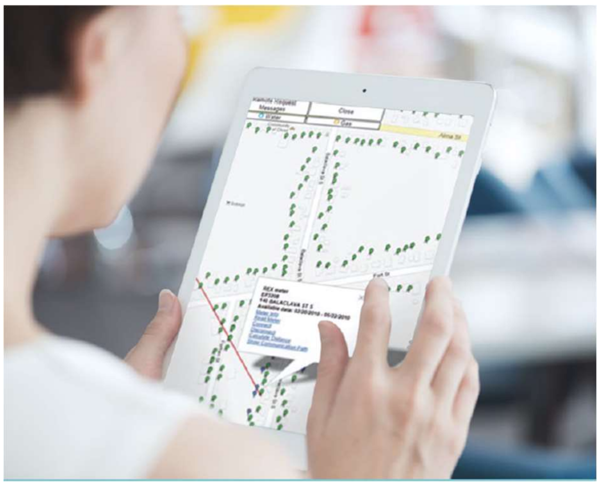
SYSTEM BENEFITS

- Cross-platform accessibility to real-time data.
- Improved overall system reliability and customer satisfaction.
- "What-if" scenario simulation to analyze system-based outcomes.
- Proactive, rather than reactive, asset management.
- Improved network availability.

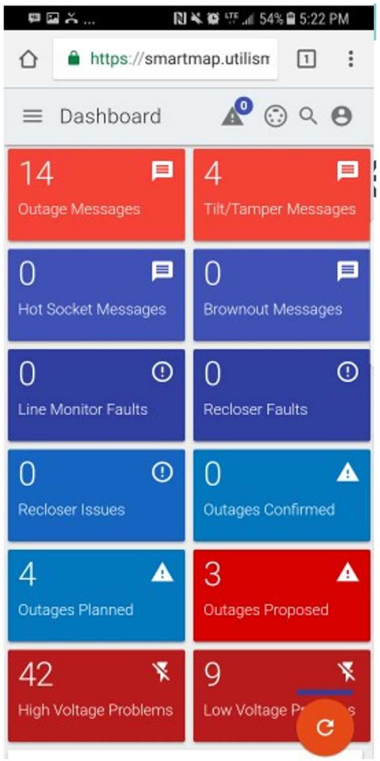
Utilismart helps reduce the challenges associated with aging infrastructure and makes distribution grid modernization a breeze.

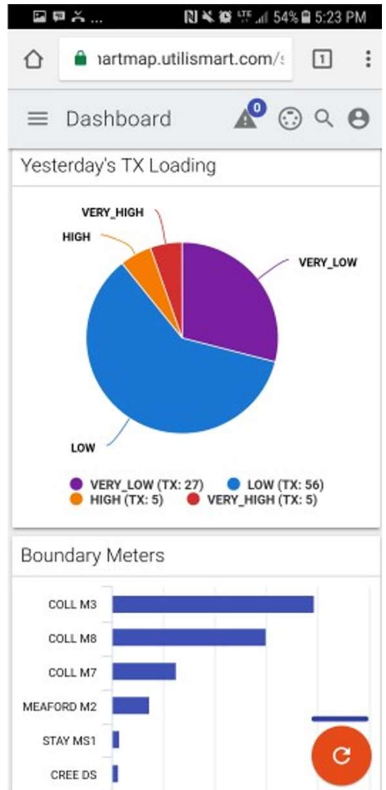
Utilismart's HealthMAP is an offshoot of SmartMAP that grants you near real-time visibility of your network. Take control over common issues like network overloading, under/over voltage, power outages, and network losses. This solution is offered under a hosting model designed to be affordable to utilities of any size.

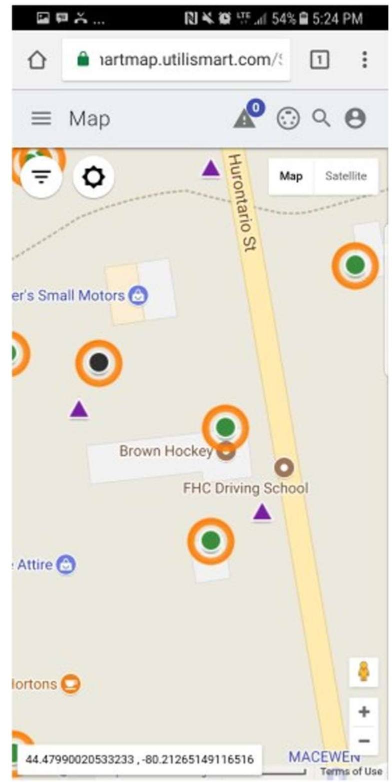
Utilities use HealthMAP to gain operational efficiencies using their existing meter data. By uncovering patterns and learning from the past, they're able to conserve voltage, improve reliability, pinpoint theft of power, and more.



Features:







Receive email alerts when thresholds are exceeded, and view displays of your utility’s assets for easy status checks.
Substantiate your decisions with historical evidence. See network losses due to emergency load transfers.

Pinpoint customers without power during an outage, or isolate events on a map for ease of communication with stakeholders.

Utilismart strives to help utilities unlock the potential of their AMI data.

Appendix D – Asset Management Plan

TILLSONBURG HYDRO INC.:

2023 Asset Management Plan:

Prepared For:

Tillsonburg Hydro Inc.
10 Lisgar Avenue
Tillsonburg, Ontario
N4G 5A5

Prepared By:

Anthony Tomlin

Contents

Executive Summary

This Asset Management Plan (AMP) is a formal document outlining how Tillsonburg Hydro Inc. (THI) manages the assets of the local distribution company (LDC). The majority of the work that THI has done on the distribution system over the last 5 years has been capital expansion and focusing on the conversion of 4 kV assets to 27.6 kV, based on the results and recommendations of the Due Diligence Report created by Elecsar Engineering Ltd in 2000. THI has now converted almost all of the Town of Tillsonburg to 27.7 kV, with only a small pocket of 4 kV distribution. During the conversion process, many of the aging assets (poles, insulators, transformers) were replaced and system reliability had been acceptable. However, during the past five years, system reliability has started to degrade and the main cause of system outages is foreign interference and defective equipment.

Since 2013, THI has obtained updated asset information (demographics) and incorporated it into a geographic information system (GIS). In 2018, THI migrated to a full server-based GIS system to provide better accessibility and reliability to its end users. The data obtained from GIS has revealed significant numbers of assets that are beyond their useful, maximum lives and are primarily responsible for the increasing frequency and duration of outages. This analysis has been used in conjunction with local knowledge to create this AMP, which provides THI with a recommended average level of asset replacements that should take place over the next five to ten years to address the trend of degrading system reliability.

It is recommended that this AMP be enhanced in the future to include a formal prioritization / rating system that ties back to corporate goals and objectives, which should be shaped by input from customers. A more formal method of prioritizing investments will improve the asset management process and result in a system that clearly meets the expectations of customers. Until this formal prioritization method has been adopted, it will be necessary to continue to rely on the knowledge and experience of THI employees when setting up the annual budgets.

To assist with the investment prioritization, THI has enhanced the inspection and maintenance policies and practices to ensure data is captured in the GIS and available for review and analysis. The inspection process captures more information about the asset condition and has been filling in existing data gaps where practical to obtain the missing information. Additional data is captured when recording outages with the adoption of Utilismart's SmartMap application – which feeder, whether the problem was on the overhead system or underground system, voltage level of the fault, and specific details of the device that failed (eg. padmount transformer or overhead switch).

For completeness, computer and communication assets (hardware and software) should be added to the AMP once the Shareholder (Town of Tillsonburg) has completed their long term strategic plan (which will influence future IT purchase / lease decisions). Software needed for, customer service, billing, and regulatory compliance can require significant capital investments (or maintenance contracts) that may impact the overall annual spending envelop at THI.

Recommendations

The level of investment in the THI distribution system needs to increase somewhat over the next five to ten years to address the current trend of worsening reliability caused by aging infrastructure. The table below outlines the priority areas that will replace the portions of the system that are most likely contributing to the degradation in reliability. The volume of investments has been averaged over a ten year period to smooth capital spending. THI may need to ramp up capital spending over the next five years depending on the physical condition of the assets and risks to safety and reliability. An assumption has been made that the existing asset demographic mix is providing an acceptable level of service to THI customers[1], however, letting the assets age and deteriorate further could result in unacceptable service levels.

It is expected that THI will be able to address the proposed volume of asset replacements through a variety of projects that may include voltage conversions, complete rebuilds, line relocations, and like-for-like replacements. The maps included in Appendix B should be used to identify areas where asset replacements can be done in conjunction with other projects, and where like-for-like replacement is appropriate. The volume of replacements can vary from year to year to accommodate other priorities, but caution should be exercised if the volume is consistently below the recommended average as this can lead to a backlog of replacements that will eventually need to be addressed.

Recommended Average Quantity of Assets to be Replaced Annually			
Asset Type	**Average Quantity per Year**	**Average Budget per Year**	**Comments**
Wood Poles[2]	19	$190,000	Quantity per year is an average over 10 years based on projected pole ages and assuming 33% of poles 50 years old will fail a sound and bore test[3]
Pole Mount Transformers	6	$78,000	Quantity per year is an average over 10 years based on projected age demographics to replace 50% of units older than the expected MUL[4].
Padmount Transformers	6	$90,000	Quantity per year is an average over 10 years based on projected age demographics to replace 50% of units older than the expected MUL.
PoleTrans Transformers	6	$120,000	Quantity per year is an average over 5 years based on eliminating all 31 units within 5 years through voltage conversions.
Padmount Switches	1	$100,000	Quantity per year will gradually replace air insulated units with solid dielectric units

[1] A customer survey conducted in 2021 found 95% of respondents agreed or strongly agreed that THI has a standard of reliability that meets expectations.

[2] The replacement of a wood pole will typically include the replacement of wood crossarms, insulators, brackets and other hardware. The costing assumes the replacement of a fully dressed pole.

[3] THI started a selective sound and bore test program and this percentage is adjusted with actual results.

[4] MUL = maximum useful life as reported by Kinetrics in their report "Asset Depreciation Study for the Ontario Energy Board" July 2010

Recommended Average Quantity of Assets to be Replaced Annually			
Asset Type	**Average Quantity per Year**	**Average Budget per Year**	**Comments**
Primary Underground Cable	1625m (650m via 4 kV conversions)	$255,000	Quantity per year is an average over 10 years based on projected age demographics and eliminating 50% of cable that is 10 years beyond the maximum useful life expectancy. Silicone injection to be used for 50% of older 27.6 kV cables. All other cable to be replaced.
Secondary Underground Cable	940m	$148,000	Quantity per year is an average over 10 years based on projected age demographics and eliminating direct buried, backyard secondary underground cable that is at or beyond the maximum useful life expectancy.
Meters	146	$25,000	Quantity per year is based on average failure rate of 1.8% that THI typically sees in smart meters
Total		**$1,006,000**	Average Budget per year for Asset Replacements (System Renewal) based on the AMP.

Note: Buildings have been excluded as they are leased and are the responsibility of the Town. Vehicles are not owned by THI and have been excluded from this analysis.

The budget numbers in table above are based on typical costs per unit from historical records of similar projects completed by THI. The total amount is an average amount per year over a ten-year period.

Depending on the actual physical condition of assets (and the risk to safety and reliability), it may be necessary to spend above average during the first five years, with the latter five-year spending less than average.

To address the high frequency of foreign interference outages, THI should review tree trimming practices to ensure tree branches are kept away from powerlines (which discourages squirrels from using powerlines) and review the actual damage caused by animals to see if some of these problems could be averted with better animal guarding techniques (this may be a capital program in addition to the above).

There are several opportunities where the AMP should be enhanced in the coming years.

AMP Enhancement Opportunities		
Opportunity	**Recommendation**	**Comments**
Formalize Project Ranking / Prioritization	List key metrics (safety, reliability, failure risk, capacity, customer preference, financial, company image, etc.), identify how metrics are assessed, assign weighting based on corporate goals and objectives	Corporate Goals and Objectives need to be developed – this should take place after the Shareholder and Board of THI have completed a Strategic Plan
Enhance inspection and maintenance policies and practices	Policies and practices should be enhanced to include process for entering all inspection results into GIS for further review and analysis. Obtain missing data when practical.	This may be impacted by the Strategic Plan which may include formal alliances / partnerships / shared services where these may already be in place.
Add other Assets to Plan	Add computers and communication equipment to the AMP with evaluation criteria.	Will need to wait for Strategic Plan to be completed as it may impact lease / buy decisions.

Corporate Goals

As a municipally owned utility, THI works very closely with the Town of Tillsonburg and shares in their vision "*Tillsonburg is a family-friendly community known for its historic charm, thriving businesses and modern lifestyle amenities. It is a regional hub for employment, recreation and culture*." This close working relationship with the municipality has resulted in a culture at THI that is very focused on customers. While THI has not adopted a formal customer engagement strategy, all THI employees interact with customers on a daily basis and are able to understand their needs and expectations based on these informal interactions. The effectiveness of this informal approach was validated by a customer satisfaction survey conducted in 2021 by a third party which confirmed an overall customer satisfaction of 80%[5]. This is 1% greater than in 2019 and 1% higher than the average of all LDC's.

The Vision of the Town of Tillsonburg, and the interactions with customers have led to the use of the following Objectives that are used to guide staff in the management of the distribution system assets: Public Safety, Employee Safety, Reliability, Operational Efficiency, Capacity (to connect new load and generation), Customer Expectations, Competitive Rates, and Shareholder Value. These Objectives are closely aligned with the OEB Performance Outcomes, summarized in the table below.

[5] See Appendix C for results of 2021 Customer Satisfaction Survey by RedHead Media Solutions Inc, page 4

OEB Performance Outcomes	THI AMP Objectives[6]
Customer Focus	Public Safety, Reliability, Customer Expectations, Competitive Rates
Operational Effectiveness	Employee Safety, Reliability, Operational Efficiency, Capacity
Public Policy Responsiveness	Safety, Reliability, Capacity
Financial Performance	Operational Efficiency, Competitive Rates, Shareholder Value

Strategy

The table below shows how each asset class is inspected and maintained, and the sustainment strategy. Details for each asset type are available later in this report.

Asset Type	Inspection Cycle[7]	Maintenance Plan[8]	Sustainment Strategy
Wood Poles[9]	Visual inspection once every 3 years	Sound and bore test as needed, 3 to 5 year cycle[10]	Keep in service as long as physical condition and testing results (residual strength) permits
Pole Mount Transformers	Visual inspection once every 3 years	Infrared scan every year	Repair or replace if hot spots[11] or other damage or deterioration (oil leaks, excessive rust) is noted, otherwise run to failure
Padmount Transformers	Visual inspection once every 3 years	Infrared scan when opened for switching or other work (about every 3 to 5 years)	Repair or replace if hot spots or other damage or deterioration (oil leaks, excessive rust) is noted, otherwise run to failure
PoleTrans Transformers	Visual inspection once every 3 years	Infrared scan when opened for switching or other work (about every 3 to 5 years)	Repair or replace if hot spots or other damage or deterioration (oil leaks, excessive rust) is noted, otherwise run to failure; long term plan to eliminate via voltage conversions
Overhead Switches	Visual inspection once every 3 years	Infrared scan every year	Repair or replace if hot spots noted, otherwise run to failure

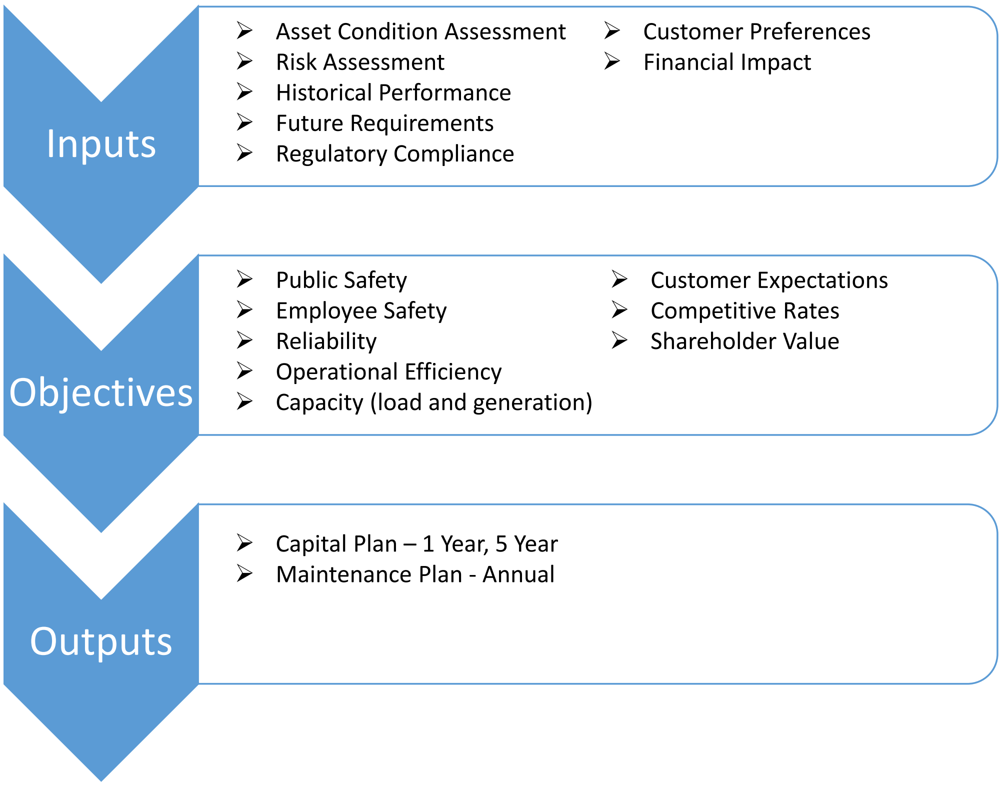
[6] These Objectives are typical to other Ontario LDCs and will be reviewed in the near future to ensure alignment with the results of the THI Strategic Review and Customer Engagement.
[7] Inspection cycles meet or exceed minimums required by the Distribution System Code.
[8] THI does not have a standalone maintenance policy. The information provided is based on past practice.
[9] THI has limited quantities of steel and concrete poles which are inspected on the same cycle as wood poles, but are expected to last much longer than wood so no sustainment strategy has been developed for these assets.
[10] THI started a pole testing program in 2016.
[11] Infrared hotspots – temperature above ambient >75C requires immediate attention, >36C and <75C requires attention within three months, >10C and <36C to be monitored and re-scanned within 12 months

Asset Type	Inspection Cycle[12]	Maintenance Plan[13]	Sustainment Strategy
Padmount Switches	Visual inspection once every 3 years	Infrared scan when opened for switching or other work (about every 3 to 5 years)	Repair or replace if hot spots noted, otherwise run to failure
Primary Underground Cable	Visual inspection once every 3 years[14]	Infrared scan when transformer, switchgear or vault is opened, other work (about every 3 to 5 years)	Repair or replace if hot spots noted, otherwise run to failure
Primary Overhead Conductor[15]	Visual inspection once every 3 years	Infrared scan every year, tree trimming every 3 years	Run to failure or replace due to capacity restrictions.
Poleline Hardware (crossarms, pins, insulators, brackets, etc.)	Visual inspection once every 3 years	None	Run to failure or replace as part of line upgrade or rebuild.
Substations	Visual inspection once every month	Preventative maintenance every 4 years	Repair or replace if hot spots or other damage or deterioration (oil leaks, excessive rust) is noted, otherwise run to failure; long term plan to eliminate all substations via voltage conversions
Small Vehicles[16] (cars, vans, pickup trucks, trailers)	Visual inspection once every month	Follow manufacturer's recommended schedule	Repair and maintain until maintenance/repair cost, reliability, and/or functionality become an issue.
Large Vehicles[17]	Visual inspection daily	Follow manufacturer's recommended schedule, dielectric testing every year	Repair and maintain until maintenance/repair cost, reliability, and/or functionality become an issue.
Meters	Visual inspection during disconnect /reconnect, troubleshooting, or other work nearby.	Testing and compliance sampling as per Measurement Canada requirements.	Keep in service until no longer able due to failure of unit or sample test of batch.

[12] Inspection cycles meet or exceed minimums required by the Distribution System Code.
[13] THI does not have a standalone maintenance policy. The information provided is based on past practice.
[14] Visual inspection of underground cables is limited to terminations and portions of cable visible in transformers, switchgear and vaults.
[15] Secondary conductors (overhead and underground) are not separately inspected or maintained, and are run to failure (replaced upon third fault – ie max of two repairs).
[16]THI Vehicles are owned by the Town and provided to THI through a service agreement and THI pays an hourly rate for vehicles. THI employees are responsible for advising the Town of any issues with vehicles and recommending replacements when necessary.
[17] THI Vehicles are owned by the Town.

The Table above notes that most assets are run to failure or repaired/replaced when problems are identified through inspection and testing. It has been the experience at THI that few assets fail during normal use and cause a safety or reliability concern[18]. The scheduled inspections are augmented by patrols following an outage, and observations by staff while they conduct their daily tasks. Each year a portion of the system is replaced or upgraded due to reasons other than the condition of the assets – municipal projects (road widenings, deep service installation / replacement), customer / developer projects (new developments, subdivisions, upgrades), and capacity upgrades (re-conductoring, upgrade single phase to three phase).

The diagram below shows the inputs, objectives, and outputs of the Asset Management process.



Inputs:

Asset Condition Assessment:

THI uses a combination of internal staff and external contracts to inspect and where practical test the assets to determine physical condition. For most of the distribution system, the regular inspections and patrols are sufficient for staff to identify deficiencies and make an immediate determination if action is needed (eg. obvious damage to a transformer requiring repair or replacement). THI records the results of these assessments and generate a list of deficiencies that need to be addressed in the near future. However, as a small LDC, the experience and knowledge of the staff is able to provide the engineering and operations team with an overall assessment of different asset categories and highlight areas that require further study.

[18] See Appendix A for Reliability Analysis that identifies some assets that are more prone to failure.

One third of wood poles are visually inspected yearly by internal staff and the entire wood pole population is tested by a third party on a three to five year cycle, and these results are used to identify immediate deficiencies and the overall condition of the wood pole population.

Substations were inspected and maintained by a third party on a 4 year cycle, and the results were used to identify immediate deficiencies and overall condition. The last THI owned substation was taken out of service in 2020

Risk Assessment:

Most of the risk assessment is done at the same time as condition assessment, with THI staff identifying areas or specific assets that pose a risk to safety, reliability, or capacity. High risk items requiring immediate attention are addressed by staff as soon as practical. Other risk areas are brought to the attention of the engineering and operations team who incorporate these identified risks into the five year capital plan. As an example, the increase in the number of broken poles resulted in the introduction of a formal pole testing program in 2016 to identify at risk poles.

Historical Performance:

System reliability is the primary measure of how well the system performs. In general, reliability is fair but with a worsening trend that needs to be addressed. A brief report on reliability is included in Appendix A.

Future Requirements:

THI staff consult with municipal planners, developers and larger customers to gain an understanding of how fast load might increase in the Town, and where future development will occur.

Regulatory Compliance:

THI is a member of USF (Utilities Standards Forum) which is a group of LDCs that are focused on construction standards and compliance with ESA Regulation 22/04. Also, THI is a member of the EDA (Electricity Distributors Association) who provide their members with advocacy and analysis, frequently alerting LDCs of regulatory changes that could impact their system planning, design, operation, and budgeting. THI uses these groups to identify the potential impacts of proposed regulatory changes and allow for them in the budgeting process.

Customer Preference:

The main influence that customer preference has on the asset management process is their feedback on the overall acceptance of system reliability. THI uses this to gauge whether the current value proposition (level of reliability and service for cost) is appropriate, if they should be spending more to improve reliability (or customer service), or if they could spend less (potentially decreasing reliability or customer service). In general, THI customers find the current level of reliability is acceptable[19] so there are no plans to make investments specifically targeted at reliability improvements. Also, THI customers are not very

[19] A customer survey conducted in 2021 found 95% of respondents agreed or strongly agreed that THI has a standard of reliability that meets expectations.

supportive of increasing the level of spending on capital or operating unless there are demonstrated benefits (such as more tree trimming to reduce the frequency of outages)[20].

Financial Impact:

THI is aware that customers are concerned about the overall cost to them for the delivery of electricity, and THI seeks ways to provide maximum value to customers. The pacing of projects is adjusted to smooth spending and avoid fluctuations in rates year over year. When it is necessary to make a large purchase, the capital budget is adjusted to advance or defer projects so that annual spending is similar to previous years.

Objectives:

Public Safety:

Ensuring public safety is the top priority for THI. When a safety concern or risk is identified, THI staff take immediate action to address the concern by taking appropriate steps which could include an immediate change or a mitigation plan to address the safety concern but allow for planned work to eliminate the problem. Proactively inspecting and testing system assets ensure they are in safe operating condition, and plans are in place to address potential safety risks before they become a problem. One example of this is pole testing, which was introduced after a number of poles failed under normal operating conditions. The physical condition of wood poles can change in a few years and the problem may not always be visible. After an initial assessment of "at risk poles[21]", the third party contractor and in house staff will inspect the pole population every 3 years and test any that they suspect may have internal decay (sound test and if needed, bore test). The results from the contractor and in house staff will be reviewed each year and adjustments made in the forecast of future pole replacements, and any immediate concerns will be addressed by THI staff.

Employee Safety:

THI is equally concerned about the safety of their staff who work on and around the distribution assets. Providing employees with the appropriate tools (including vehicles such as line trucks) that are safe and reliable is one way that employees are kept safe. Identifying assets such as porcelain insulators, poletrans transformers, and open secondary conductors that are higher risk to workers allows the engineering and operations team to give the replacement of these assets priority when planning annual budgets.

Reliability:

The main objective for THI after addressing safety is to ensure the system provides an acceptable level of reliability to customers. THI's reliability objective is to keep the system performing at or better than the average of past five years. Customers have indicated the current level of reliability is acceptable. To achieve this objective, THI understands that a more proactive approach to asset replacement is necessary. Thus THI plans to gradually increase the number of assets that are repaired or replaced before they fail (if

[20] 2021 Customer Survey Results page 10 – 95% of respondents are satisfied with the reliability of the electrical service provided by THI.
[21] THI has identified poles installed before 1982 or poles with no known install date as "at risk".

possible), keeping in mind financial constraints. Regular inspection and testing by staff allows THI to monitor the assets and prioritize those that need to be replaced before others.

Operational Efficiency:

When changes to the system are contemplated, consideration is given to ensuring the result will be the most efficient as possible. For example, 4 kV distribution assets that are approaching end of life are replaced with 27.6 kV assets that provide the same service with fewer line losses. When transformers are replaced, the actual loading is checked so that the correct transformer size is selected rather than simply replace like for like. Where possible, industry standard components and designs are used to ensure replacement parts are readily available from multiple vendors. Main feeder tie switches are designed to accommodate future automation installations.

Capacity (Load and Generation):

The system is designed to accommodate reasonably foreseeable connections of load and generation within all of Tillsonburg. The main 27.6 kV feeder ties use conductors and devices sized to allow for load growth and multiple contingencies. When older areas are rebuilt, poles are framed to accommodate immediate or future conversion to three phase and/or voltage conversion to 27.6 kV.

Customer Expectations:

In addition to maintaining reliability, THI customers expect their LDC to respond to specific requests (such as new or upgraded services) promptly. Delivering on this expectation requires the annual capital budget be flexible, with some projects identified that can be deferred if customer driven work exceeds original estimates.

Competitive Rates:

THI seeks to have rates comparable to peers and fair to customers, while addressing needed infrastructure upgrades and improving customer service. This objective is challenging to meet as pace of infrastructure upgrades needs to increase to accommodate the aging assets, and customers are expecting more enhanced customer services such as self-serve options on the website and outage notification.

Shareholder Value:

THI seeks to provide value to the Town of Tillsonburg (Shareholder) not only through dividends but also being an active partner in the community. The assets of THI provide the residents, businesses, and visitors to Tillsonburg with safe and reliable electricity. Thus maintaining a safe, reliable, and efficient distribution system satisfies the Shareholder and customers who are essentially the same group.

Outputs

Capital Plan – 1 Year, 5 Year:

The main output of the Asset Management Plan is a forecast of capital investment by asset category. This forecast is an average amount of investment needed over the coming five years. It is used as a guideline for creating a 1 Year Capital Plan and a 5 Year Capital Investment forecast. The engineering and operations team uses the forecast to create an annual capital budget, taking into consideration other drivers such as the forecast of new customer connections and other initiatives. The actual projects selected will typically encompass the expected quantity of assets that need to be replaced, although there may be shifts from year to year as it can be more efficient to replace all assets in a specific area than single assets across the system.

Maintenance Plan:

The AMP will also highlight any changes that need to be made in how the assets are maintained. This will typically be in recommended changes in the frequency and/scope of maintenance activities which may be influenced by the selection of and overall volume of capital projects. For example, the 2016 AMP recommended that THI start a comprehensive pole testing program immediately to address the increasing number of pole failures and prevent future outages. This has proved to be a successful implementation

Assessment Methodology

The table below shows how the condition and performance of each asset class is evaluated.

Asset Type	Inspection Criteria	Maintenance Criteria	Evaluation
Wood Poles (including hardware)	Check for visible decay (pole top, at connections, at groundline), visible damage (large cracks, impact damage), loose or damaged hardware	Sound test to assess wood condition, bore test (measure shell thickness at groundline) if rot suspected[22].	Immediate replacement if pole broken, shell rot at groundline, excessive damage or decay at other locations, or less than 60% strength. Additional risk factors include location (quantity and voltage of circuits, on path to critical customers). Rated as fail (immediate replacement), poor (replace or re-test in 3 years), or good (inspect in 5 years).
Pole Mount Transformers	Check for oil leaks, cracked or damaged bushings, missing grounds, excessive rusting, and other damage.	Except for loose connections (noted as hotspots) and missing ground leads, these units will not be maintained in the field.	Replacement scheduled if rated as poor - bushings are cracked or damaged, oil is visibly leaking, tank rust is excessive, or large section of unit is hot under normal load (infrared). Units removed from service to be further evaluated to determine if they can be repaired or refurbished before scrapping.
Padmount Transformers	External check for oil leaks, excessive rusting, other damage, obstructions (vegetation), missing warning labels and locks.	Internal check for hot spots, oil leaks, excessive rusting, missing grounds. Field maintenance to be limited to minor paint touch ups, replacement of labels and locks, removal of obstructions, replacement of missing grounds.	Replacement scheduled if rated as poor - bushings are cracked or damaged, oil is visibly leaking, tank rust is excessive, large section of unit is hot under normal load (infrared). Units removed from service to be further evaluated to determine if they can be repaired or refurbished before scrapping.

[22] From sound and bore tests that started in 2016.

Asset Type	Inspection Criteria	Maintenance Criteria	Evaluation
PoleTrans Transformers	External check for oil leaks, excessive rusting, other damage, obstructions (vegetation), missing warning labels and locks.	Internal checks only done if opening unit is necessary for other reasons – check for oil leaks, excessive rusting, overheated wires and connections. Field maintenance to be limited to replacement of labels and locks, removal of obstructions, repair or replacement of wires and connectors, replacement of missing grounds.	Unless unit fails or is expected to fail, keep in service until area is converted to 27.6 kV. Units with minor issues (small oil leaks, rusting, etc.) should be ranked as poor to give area priority in 4 kV conversion schedule.
Overhead Switches	Check for cracked or broken insulators, oil leaks, damaged connectors, loose hardware, rusting.	Field maintenance limited to three phase units expected to remain in service at least another 5 years. Hotspots to be assessed for repair / replacement.	Most single phase units identified with deficiencies will be replaced or eliminated. Three phase units to be field maintained if possible or replaced. Consideration given for units on circuits supplying critical customers, or if switch expected to be operated frequently. Three phase units removed from service to be further assessed to determine if they can be repaired, refurbished, or scrapped.
Padmount Switches (includes air-insulated switchgear, oil-insulated switchgear, vaults with junction bars)	External check for oil leaks, excessive rusting, other damage, obstructions (vegetation), missing warning labels and locks.	Internal check for hot spots, oil leaks, excessive rusting, missing grounds. Field maintenance to be limited to minor paint touch ups, replacement of labels and locks, removal of obstructions, replacement of missing grounds.	Replacement scheduled if rated as poor - bushings are cracked or damaged, oil is visibly leaking, tank rust is excessive, large section of unit is hot under normal load (infrared). Units removed from service to be further evaluated to determine if they can be repaired or refurbished before scrapping.

Asset Type	Inspection Criteria	Maintenance Criteria	Evaluation
Primary Underground Cable	Visual check of elbows and terminators – look for cracks, tracking, contamination, signs of overheating, missing grounds.	Infrared check to look for hotspots.	Elbows and terminators to be replaced if hotspots identified. After second cable fault, cable section to be given priority for replacement.
Primary Overhead Conductor	Visual check to look for broken strands, excessive sag, proximity to trees, signs, buildings.	Tree trimming as per guidelines (every 3 years), infrared to check for hotspots.	Tree trimming and hot spot repairs to be completed ASAP. Broken strands to be monitored and repaired if several appear at same location. Proximity to signs and buildings will require further evaluation. Conductor sag may need to be verified.
Secondary Underground Cable	Visual check of terminations – look for cracks, tracking, contamination, signs of overheating.	Infrared check to look for hotspots.	Terminations to be replaced if hotspots identified. Splicing to occur if cable were to fail
Secondary Overhead Conductor	Visual check to look for broken strands, excessive sag, proximity to trees, signs, buildings.	Tree trimming as per guidelines (every 3 years), infrared to check for hotspots.	Tree trimming and hot spot repairs to be completed ASAP. Broken strands to be monitored and repaired if several appear at same location. Proximity to signs and buildings will require further evaluation.
Small Vehicles	Visual check for damage, tire wear, functioning lights, fluid levels, etc. by staff at least monthly.	Routine maintenance at local garage (oil and filter change, tire rotation, brake replacements, tire replacements).	Monitor maintenance costs and review any major repairs to determine if replacement is better option than repair.
Large Vehicles	Daily checks as part of CVOR requirements.	Routine maintenance at local garage (oil and filter change, tire rotation, brake replacements, tire replacements). Dielectric testing by qualified firm every year.	Monitor maintenance costs and review any major repairs to determine if replacement is better option than repair. Review utilization trends and feedback from users to determine if vehicle type is still required or if an alternate vehicle type is needed.

Meters	Check for obvious damage, internal condensation, LCD screen failure.	Testing and maintenance as required by Measurement Canada and conducted by third party.	Monitor failure rates and types of failures (measurement vs communication), discuss with other LDCs using same vendor. Trends indicate failure rate of smart meters is higher than expected, which may lead to a complete replacement in future.

Record Keeping

The results of inspections, testing, and planned maintenance of the distribution system is typically recorded within the server based GIS system acquired in 2018. Where there are known data gaps (such as the age of some poles) this information will be gathered during a planned inspection or maintenance cycle and the GIS will be updated with the missing data. When assets are replaced or new assets installed, map change requests are submitted electronically to a GIS technician to update the database. Paper records are also tracked and archived. Any updates or changes are reviewed and addressed on a daily basis.

THI has moved towards a more automated process by which the data is captured electronically and then tied to the asset in the GIS. The first asset class to have this done is wood poles, which are inspected and tested in house and by a third party. The results from the third party are captured in an Excel database which is then linked to the GIS.

The records for non-distribution assets are also primarily paper based with only costing information tracked

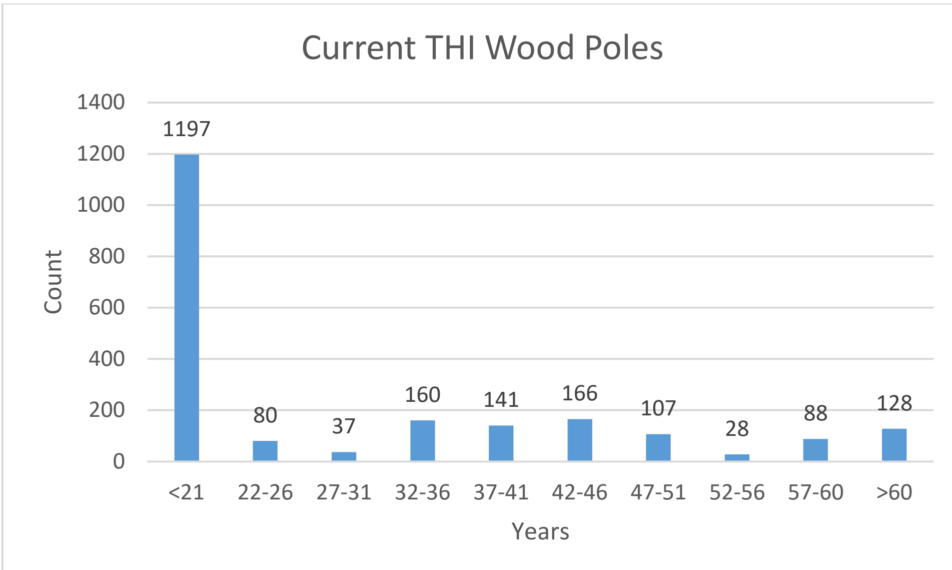
Asset Details

Poles

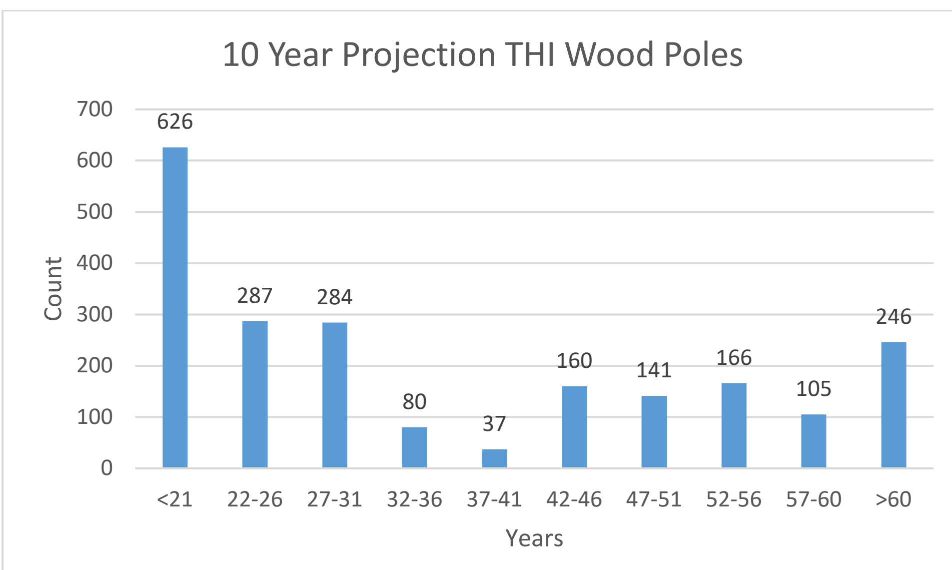
<u>Demographics:</u>

THI has a total of 2475 poles, of which 150 are concrete, 193 are metal, and 2132 are wood. The concrete and metal poles have a lifespan much greater than wood and are replaced when a visual inspection reveals defects. Since they make up a relative small percentage of the population, the concrete and metal poles have been excluded from the forecast of replacements during the next 10 years.

The existing age distribution of wood poles is noted below.



Assuming no changes take place during the next 10 years, the wood pole population will have an age distribution noted below.



In 10 years THI can expect to have just over 561 wood poles over 50 years old. Assuming that around 33% of wood poles over 50 years old will fail a sound and bore test, this means an average of 19 poles will need to be changed per year over the next 10 years. Once THI starts getting results from sound and bore testing, the assumed failure rate of 33% should be adjusted.

Inspection and Testing Results:

Prior to 2016, poles were inspected during the regular system inspections and only deficiencies were noted and addressed. Starting in 2016, pole testing will start and the information collected will be added to the GIS for further analysis. In 2018, THI adopted a server based GIS installation that allows the regular inspections to be performed electronically and tied directly to the core GIS pole data

Life Expectancy:

The Kinetrics Study has the following life expectancy values for poles.

Pole Type	**Minimum Useful Life (Years)**	**Typical Useful Life (Years)**	**Maximum Useful Life (Years)**
Wood	35	45	75
Concrete	50	60	80
Steel	60	60	80

There are no unique circumstances or actual failure rate experience to suggest these values are not valid for THI[23].

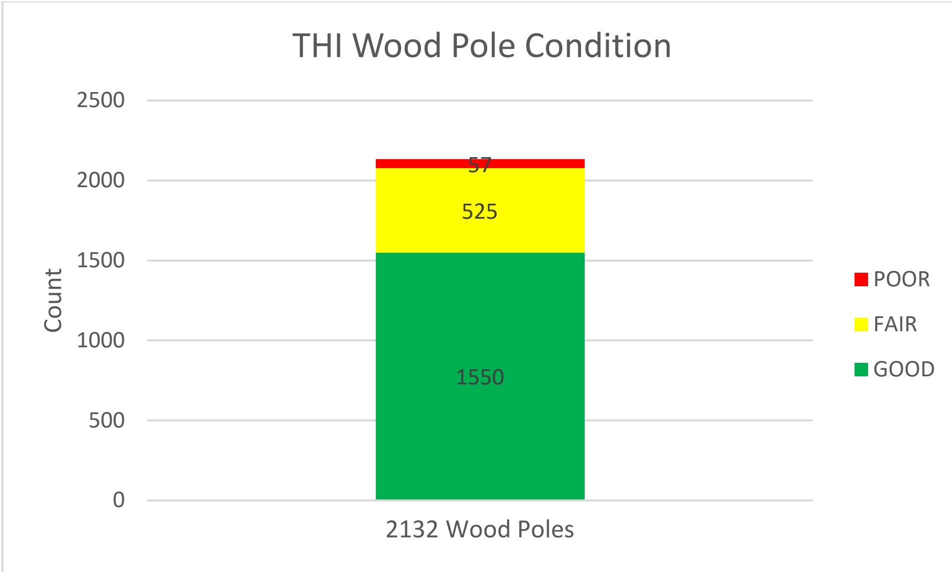
Performance Review:

In the past 5 years (up to May 31, 2021), there has only been 1 wood pole that failed, and that failure resulted in an outage. The introduction of a pole testing program in 2018 has allowed the utility to identify and replace end of life poles before failure. This has resulted in little to no outages or hazards caused by pole failures.

Condition Assessment:

The condition of the poles is directly related to the inspection results from the third party contractors, inspections done by staff and age. Wood poles over 50 years old (assumed to be in poor condition) currently make up 12% of the wood pole population. Wood poles between 35 and 50 years old (assumed to be in fair condition) make up 21% of the wood pole population. Wood poles 34 years old and newer (assumed to be in good condition) make up 67% of the wood pole population. These assumptions match the inspections records of the poles done by staff with over two thirds appearing to be in good condition, and only a few appearing to be in poor condition.

[23] THI pole failures have typically been with poles between TUL and MUL.



<u>Inspection and Maintenance Plan:</u>

Poles are inspected on a 3 year cycle (along with the rest of the overhead distribution system). Poles are checked in greater detail if they have been involved in a motor vehicle accident. No maintenance is done on poles at this time. If defects that may affected safety and pole strength are noticed during an inspection, the pole is replaced.

<u>Sustainment Plan:</u>

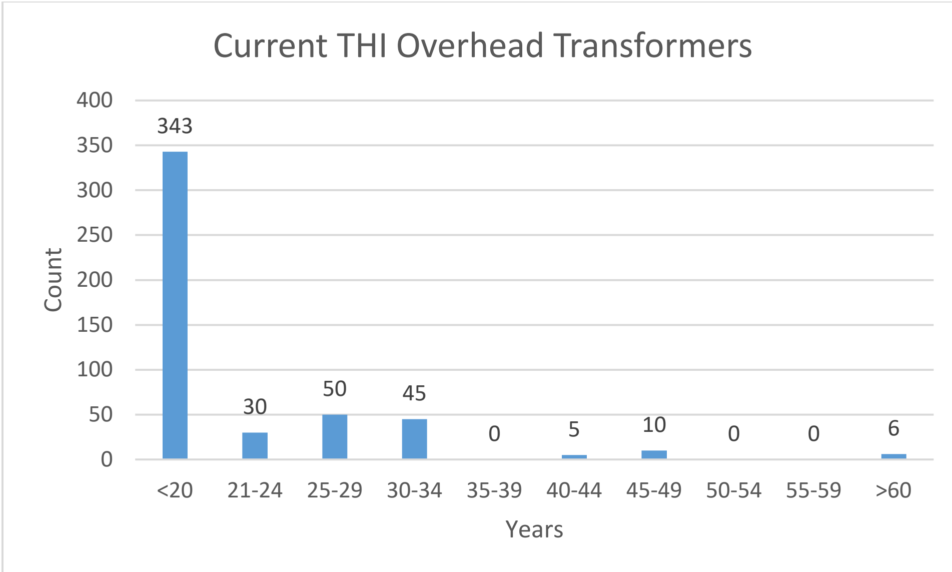
Concrete and steel poles will remain in service until inspections reveal significant defects that warrant replacement. In most cases, concrete poles will be replaced with concrete poles (to maintain visual aesthetics of pole line) while steel poles will likely be replaced with wood poles. Wood poles will be selectively tested

Overhead Transformers

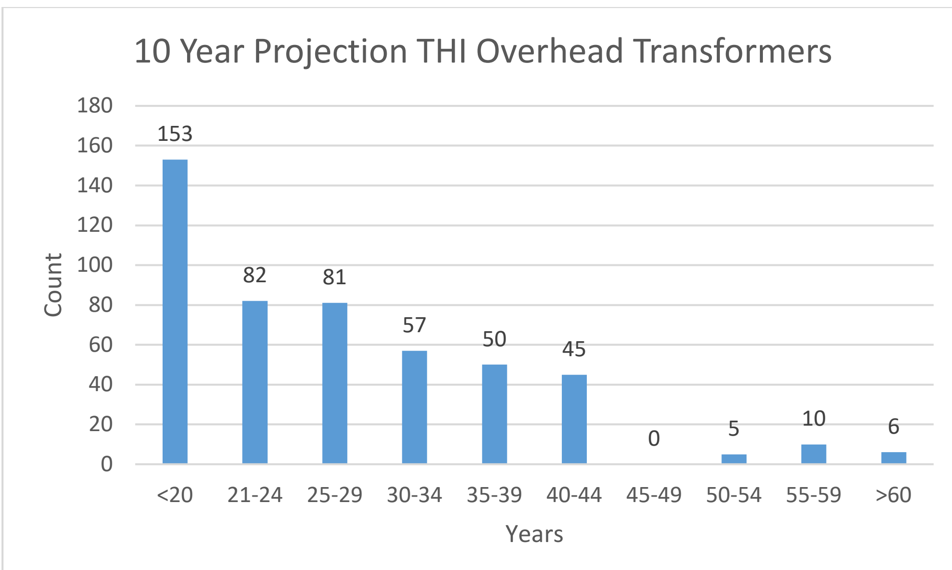
<u>Demographics:</u>

THI has 489 pole mounted transformers in service. Of these, only 6 remain on the 4 kV system. For initial analysis purposes, transformers without an identified age have been assigned an age based on the age distribution of the wood pole population (assuming transformers were installed in a similar pattern as poles).

The existing age distribution of overhead transformers is noted below.



Assuming no changes take place during the next 10 years, the overhead transformer population will have an age distribution noted below.



In 10 years THI can expect to have approximately 6 overhead transformers or about 1% that are 60 years old or older. Since the vast majority of overhead transformers are below the typical useful life, THI will expand the scope to include the monitoring of overhead transformers at their current TUL and beyond. In 10 years, the amount increases to 66 overhead transformers that are at or beyond their typical useful life of 40 years. Therefore, THI should budget to replace an average of 6-7 overhead transformers per year

Inspection and Testing Results:

Overhead transformers are inspected by a third party from the ground using infrared technology. The inspection and associated deficiencies (if applicable) are noted in the report and addressed. Inspection results[24] are collected and added to the GIS for storage.

Life Expectancy:

The Kinetrics Study has the following life expectancy values for overhead transformers.

Transformer Type	Minimum Useful Life (Years)	Typical Useful Life (Years)	Maximum Useful Life (Years)
Overhead	30	40	60

There are no unique circumstances or actual failure rate experience to suggest these values are not valid for THI. Transformer failures are rare and replacements are typically driven by other factors such as capacity upgrades, line rebuilds, or poor tank condition (rusting).

Performance Review:

In the past 5 years, there have been 10 overhead transformer problems (typically broken drop leads) that were not attributed to external factors such as lightning, severe weather, or motor vehicle accidents. This suggests the units are not failing prematurely or due to overload.

Condition Assessment:

Through in house testing and inspection, the condition of the overhead transformers is a combination of results from visual inspections done by staff, third party infrared patrols and directly related to age. Units that are identified of having critical deficiencies are addressed immediately. Age of unit then becomes the next metric. Units over 60 years old (assumed to be in poor condition) currently make up 1% of the overhead transformer population. Units between 37 and 60 years old (assumed to be in fair condition) make up 3% of the population. Units 36 years old and newer (assumed to be in good condition) make up 96% of the population. These assumptions match random visual inspections of the units with over half appearing to be in good condition, and only a few appearing to be in poor condition.

Inspection and Maintenance Plan:

Overhead transformers are inspected on yearly cycle (along with the rest of the overhead distribution system) by a third party company that utilizes infrared technology. Units are also visually inspected by staff in house on a 3 year cycle with the results being stored in the GIS. Units are also checked in greater detail (visual check using a bucket truck) if they were in the proximity of a lightning strike or flashover (due to tree contact for example). No maintenance is done on overhead transformers at this time. If defects that may affect safety and reliability are noticed during an inspection, the unit is replaced and then further assessed to see if it can be repaired, refurbished, or scrapped.

[24] Inspection results will be limited to an overall assessment – good, fair, poor – and obvious deficiencies that do not require immediate attention (such as tank rust) but should be tracked.

Sustainment Plan:

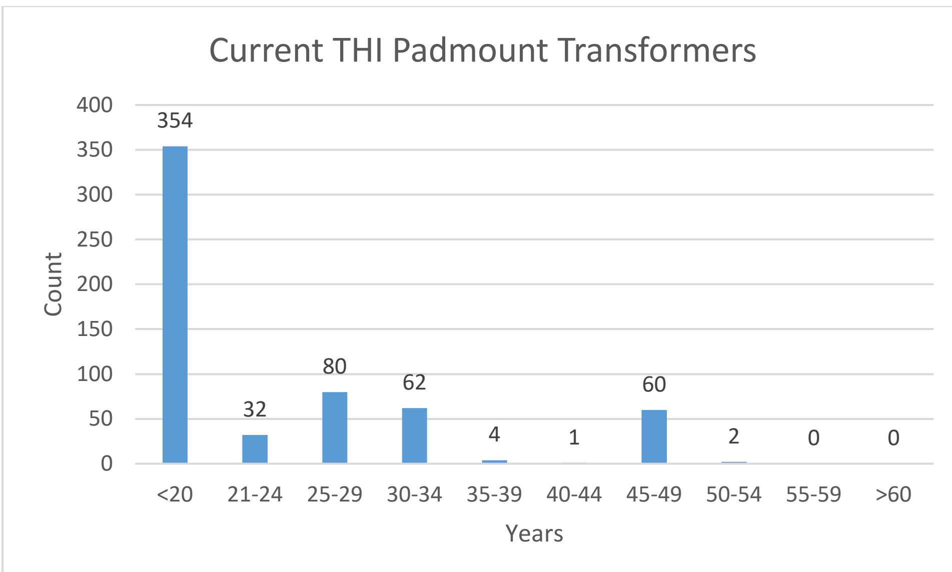
Overhead transformers will essentially be run to failure (or until a visual inspection reveals a major defect or other deficiency affecting safety or reliability). Older units will tend to be replaced during voltage conversions and line rebuilds.

Padmount Transformers

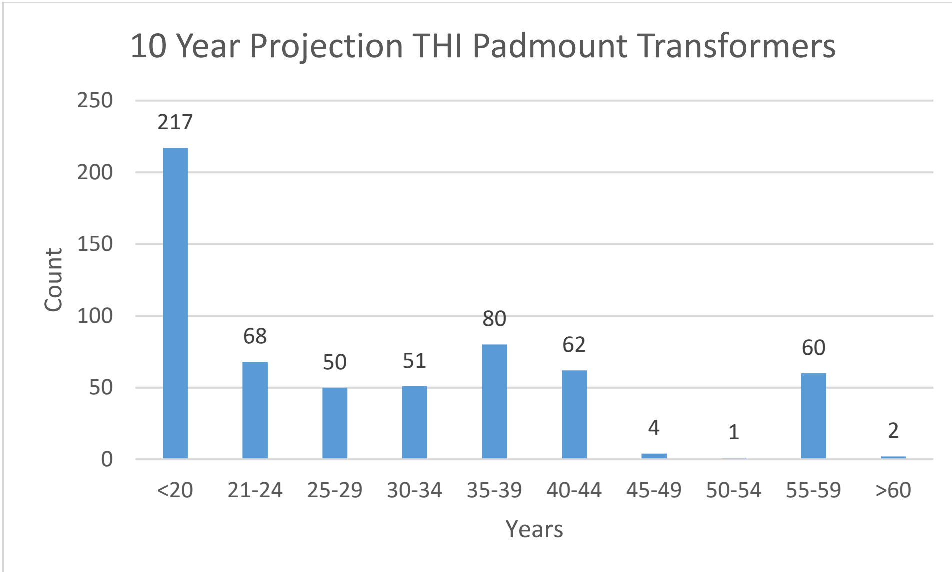
Demographics:

THI has 595 padmount transformers in service. Of these, only 49 remain on the 4 kV system. For analysis purposes, ages have been assigned to each transformer without a known age by using the age of the primary cable connected to it (if known), or the age of adjacent transformers where applicable.

The existing age distribution of overhead transformers is noted below.



Assuming no changes take place during the next 10 years, the padmount transformer population will have an age distribution noted below.



In 10 years THI can expect to have 63 padmount transformers or about 10% that are 50 years old or older. Approximately 46% of these are on the 4 kV system, and will be replaced during voltage conversions. Some (about 50%) of the remaining 30 can be expected to need replacing sometime during the next 10 years. Therefore, THI should budget to replace an average of 6 padmount transformers per year (4 through voltage conversion). Once a more accurate assignment of ages and condition for the transformers takes place, this analysis will need to be updated.

Inspection and Testing Results:

Padmount transformers are inspected yearly during the regular system inspections and the inspection and associated results or deficiencies are link to the GIS data and stored within the GIS database for further analysis

Life Expectancy:

The Kinetrics Study has the following life expectancy values for padmount transformers.

Transformer Type	Minimum Useful Life (Years)	Typical Useful Life (Years)	Maximum Useful Life (Years)
Padmount	25	40	45

There are no unique circumstances or actual failure rate experience to suggest these values are not valid for THI. Transformer failures are rare and replacements are typically driven by other factors such as capacity upgrades, voltage conversions, or poor tank condition (rusting).

Performance Review:

In the past 5 years, there have been 3 padmount transformer failures (elbows or bushing inserts) that were not attributed to external factors such as lightning, severe weather, or motor vehicle accidents. This suggests the units are not failing prematurely or due to overload.

Condition Assessment:

Through in house testing and inspection, the condition of the padmount transformers is a combination of results from visual inspections done by staff, infrared inspections done by staff and directly related to age. Units that are identified of having critical deficiencies are addressed immediately. Age of unit then becomes the next metric. Units over 45 years old (assumed to be in poor condition) currently make up 10% of the population. Units between 25 and 45 years old (assumed to be in fair condition) make up 25% of the population. Units 24 years old and newer (assumed to be in good condition) make up 65% of the population. These assumptions match random visual inspections of the units with over half appearing to be in good condition, and only a few appearing to be in poor condition.

Inspection and Maintenance Plan:

Padmount transformers are inspected on a yearly cycle (along with the rest of the underground distribution system). Units are checked in greater detail (visual check with lid open and temperature of connectors measured) if they were bumped by a vehicle, or in the proximity of a lightning strike or flashover (due to tree contact for example). No maintenance is done on padmount transformers at this time although THI is investigating re-painting options for units showing surface rust. If defects that may affected safety and reliability are noticed during an inspection, the unit is replaced and then further assessed to see if it can be repaired, refurbished, or scrapped.

Sustainment Plan:

Padmount transformers will essentially be run to failure (or until a visual inspection reveals a major defect or other deficiency affecting safety or reliability). Older units will tend to be replaced during voltage conversions and line rebuilds.

PoleTrans Transformers

THI has 31 poletrans transformers in service. These units are a combination street light pole with a built in transformer and connectors used for distribution in residential areas. Due to tight clearances, these units are considered to be a high safety risk to work on while energized, and most Ontario LDCs have been eliminating these types of units from their system. All 31 units are part of the 4 kV distribution system and are between 30 to 40 years old. THI is in the final stages of eliminating 4 kV from their system, thus further analysis of these units has not been conducted under the assumption they will be removed from the system in the next five years.

Overhead Switches

Demographics:

THI has numerous switches installed on the overhead system, some of which are 3 phase load break units. There are no motorized or automated units currently installed on the THI system. Not all switch ages are known therefore it is reasonable to assume the age demographics are similar to the wood poles. These switches are essentially run to failure or proactively replaced as part of larger projects (line rebuilds, pole replacements, and transformer replacements).

Inspection and Testing Results:

Overhead switches are inspected as part of the regular inspection cycles of the overhead system, and deficiencies noted during these inspections are logged and addressed as found.

Life Expectancy:

The Kinetrics Study has the following life expectancy values for overhead switches.

Switch Type	**Minimum Useful Life (Years)**	**Typical Useful Life (Years)**	**Maximum Useful Life (Years)**
Overhead	30	45	55

There are no unique circumstances or actual failure rate experience to suggest these values are not valid for THI.

Performance Review:

During the past 5 years, there have been 3 failures of overhead switches on the THI system. In addition, approximately 1 switch per year is proactively replaced due to deficiencies noted during inspections.

Condition Assessment:

Based on feedback from staff conducting the regular inspections, the overhead switches are generally in good condition.

Inspection and Maintenance Plan:

Overhead switches will continue to be inspected on a 3 year cycle and only 3 phase switches will be worked on in the field.

Sustainment Plan:

THI will continue to replace switches that fail or have identified deficiencies. THI is investigating the use of automated switches to improve reliability which may replace some of the 3 phase switches on main feeders.

Padmount Switches

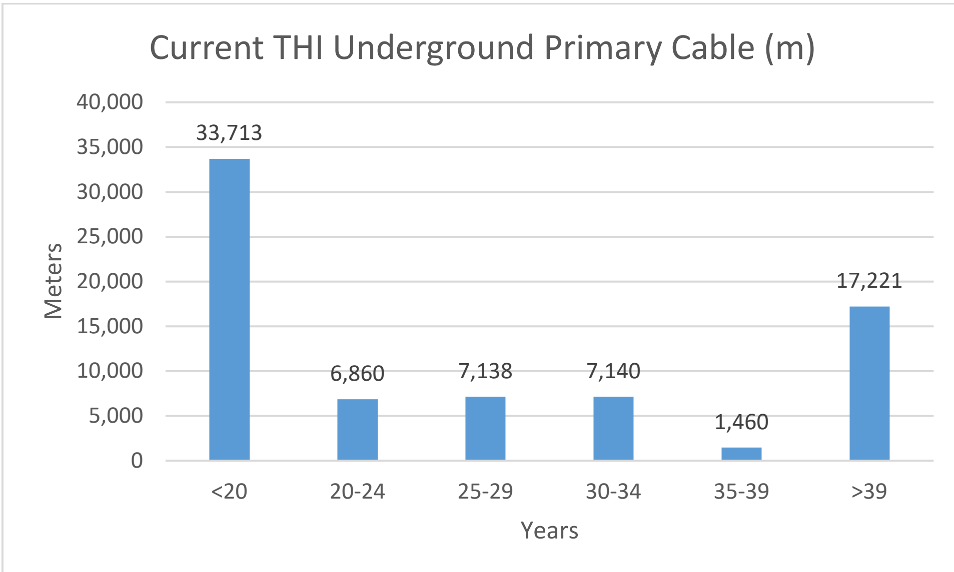
THI has 3 air insulated padmount switches. 2 out of the 3 are being phased out and replaced with solid dielectric switches through voltage conversions. The last air insulated switch is in relatively good condition. This switch will be monitored and inspected on an ongoing 3 year cycle. The rest of the population of switches are relatively new and further analysis is not needed at this time.

Primary Underground Cable

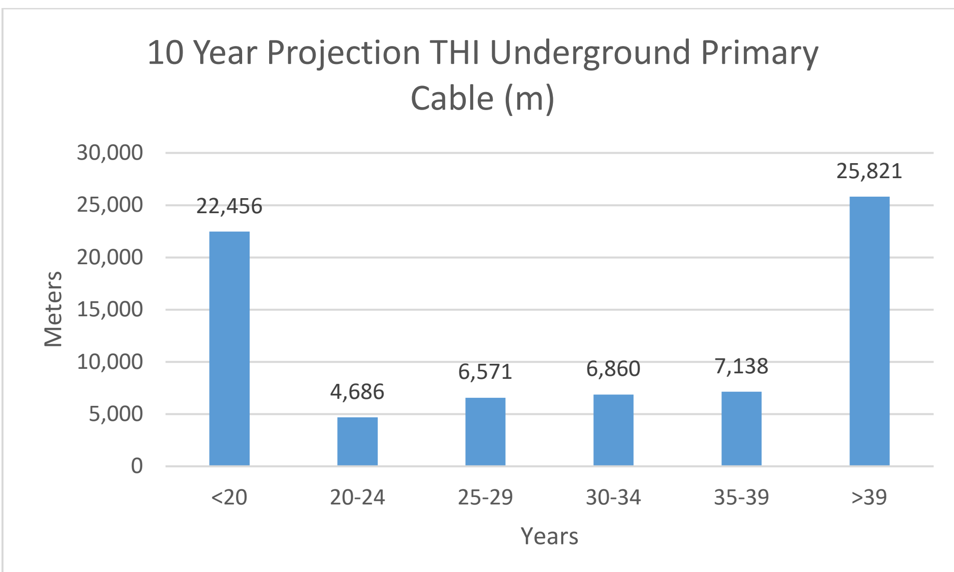
<u>Demographics:</u>

THI has a total of 73,532m of primary underground cable in service. Of this, 8,865m is on the 4 kV system and expected to be removed from service through voltage conversions in the near future. The data does not identify when tree-retardant (TR) cable became standard at THI, so it has been assumed that all cable installed prior to 1990 is non-TR with 1990 and newer as TR.

The existing age distribution of primary underground cable is noted below.



Assuming no changes take place during the next 10 years, the primary underground cable population will have an age distribution noted below.



In 10 years THI can expect to have around 26,000m or about 35% that are 40 years old or older (this is assumed to be all non-TR cable with a maximum useful life expectancy of 30 years). Approximately 25%

or 6,500m of this is on the 4 kV system, and will be replaced during voltage conversions. Some (about 50% - 9,750m) of the remaining 19,500m can be expected to need replacing sometime during the next 10 years as it would be over 10 years past the maximum useful life expectancy. Therefore, THI should budget to replace an average of 1625m of primary cable per year (650m through 4kV voltage conversion). Since this is a significant increase from historical replacements, it is further recommended that THI prioritize replacement areas based on cable age, history of faults, number of customers, and condition of other assets in the area. The use of silicone injection should be investigated for older 27.6 kV cable as an alternative to replacement.

Inspection and Testing Results:

THI only inspects the visible portions of underground cable (terminations) while inspecting other components (riser poles, transformers, switchgear, vaults). An infrared tester checks for hotspots during the inspection. Few hotspots have been noted in the past.

Life Expectancy:

The Kinetrics Study has the following life expectancy values for primary underground cable.

Cable Type (TR=tree retardant)	Minimum Useful Life (Years)	Typical Useful Life (Years)	Maximum Useful Life (Years)
XLPE Non-TR	20	25	30
XLPE TR in Duct	35	40	55
XLPE TR Direct Buried.	25	30	35

Tree Retardant cable was introduced in the 1990's. Cables installed prior to 1990 have been assumed to be non-TR, cables installed in 1990 and later have been assumed to be TR. There are no unique circumstances or actual failure rate experience to suggest these values are not valid for THI.

Performance Review:

In the past 5 years, there have only been 11 cable faults that resulted in outages. Of the 11, 2 were caused by primary cable failure. This is lower than expected due to the relatively high population of older cables.

Condition Assessment:

Since the actual condition of primary cables is difficult to determine, the condition of the cables has been assumed to be directly related to age. Cables over 40 years old (assumed to be in poor condition) currently make up 23% of the population. Cables between 25 and 40 years old (assumed to be in fair condition) make up 22% of the population. Cables 24 years old and newer (assumed to be in good condition) make up 55% of the population.

Inspection and Maintenance Plan:

THI will continue to inspect cables during regular inspections of other system components (every 3 years). THI will investigate the use of silicone injection on older 27.6 kV to extend the life of the cable (instead of replacing it).

Sustainment Plan:

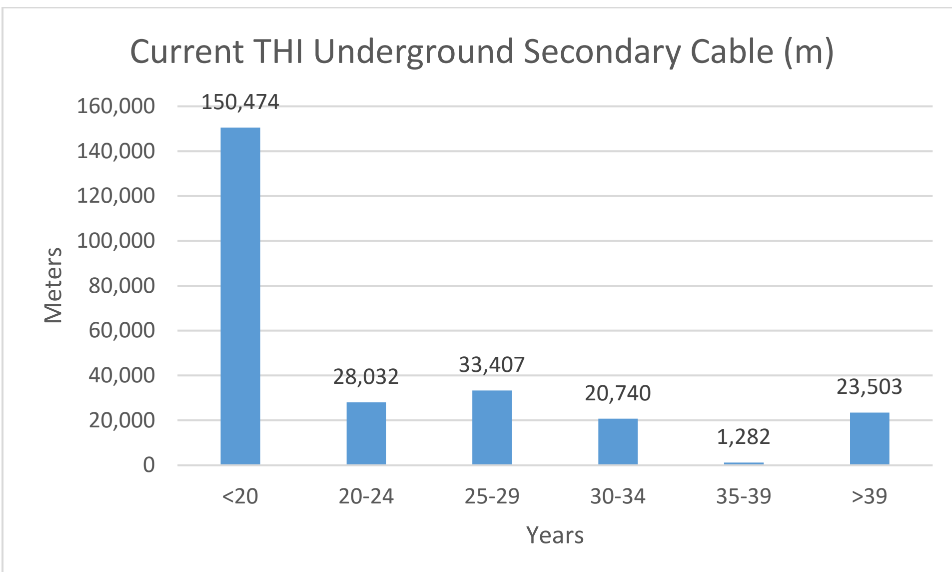
All 4 kV cable will be removed from service with the conversion of 4 kV to 27.6 kV in the near future. Older 27.6 kV cable, and cables experiencing more than two faults in a section will be replaced or injected with silicone.

Secondary Underground Cable

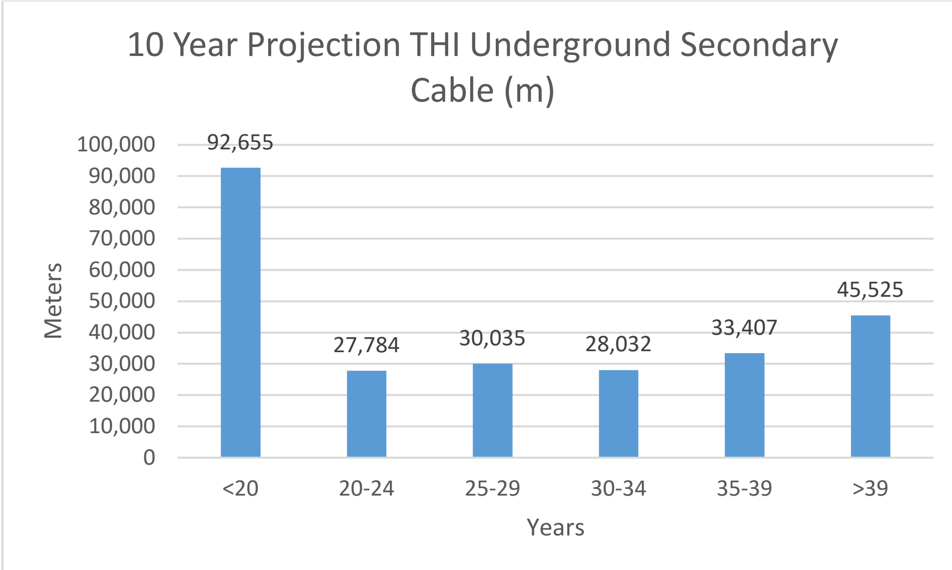
Demographics:

THI has a total of 257,438m of secondary underground cable in service. The data does not identify when installing secondary cable in ducts became the standard at THI, so it has been assumed that all cable installed prior to 2015 is direct buried and any cable installed after 2015 is within ducts. Typically, THI runs secondary underground cable to failure as THI rarely sees premature failure in this asset category. When failures do occur, the cable can typically be spot repaired immediately as it is not economical or practical to replace the entire cable. The only situation where a full replacement is practical is when the cable has experienced numerous faults (>3), relocating secondary cables from backyard to front-yard or converting from an overhead service to underground.

The existing age distribution of secondary underground cable is noted below.



Assuming no changes take place during the next 10 years, the secondary underground cable population will have an age distribution noted below.



In 10 years THI can expect to have approximately 45,500m or about 18% that are 40 years old or older (this is assumed to be all direct buried cable with a maximum useful life expectancy of 40 years). Some (about 21% - 9,400m) of the 45,500m are backyard underground services that can be expected to need replacing sometime during the next 10 years as they would be at or past the maximum useful life expectancy. Therefore, THI should budget to replace an average of 940m of backyard secondary cable per year. However, since THI rarely sees failures in secondary cables, this budget is more of a suggestion if THI starts to see significant trends in secondary cable failures. Since this is a significant increase from historical replacements, it is further recommended that THI prioritize replacement areas based on 4kV conversions, cable age and history of faults.

Inspection and Testing Results:

THI only inspects the visible portions of underground cable (terminations) while inspecting other components (IE: pad mount transformers). An infrared tester checks for hotspots during the inspection. Few hotspots have been noted in the past.

Life Expectancy:

The Kinetrics Study has the following life expectancy values for secondary underground cable.

Cable Type	Minimum Useful Life (Years)	Typical Useful Life (Years)	Maximum Useful Life (Years)
Direct Buried	25	35	40
In Duct	35	40	60

THI standardized installing secondary underground cable in ducts in 2015. Cables installed prior to 2015 have been assumed to be direct buried, cables installed in 2015 and later have been assumed to be in ducts.

There are no unique circumstances or actual failure rate experience to suggest these values are not valid for THI.

Performance Review:

In the past 5 years, there have only been 11 cable faults that resulted in outages. Of the 11, 9 were caused by secondary underground cables. This is much lower than expected due to the relatively high population of older, direct buried secondary underground cables.

Condition Assessment:

Since the actual condition of secondary cables is difficult to determine, the condition of the cables has been assumed to be directly related to age. Cables over 40 years old (assumed to be in poor condition) currently make up 9% of the population. Cables between 25 and 40 years old (assumed to be in fair condition) make up 22% of the population. Cables 24 years old and newer (assumed to be in good condition) make up 69% of the population.

Inspection and Maintenance Plan:

THI will continue to inspect underground secondary cables during regular inspections of pad mount transformers (every 3 years). Infrared technology is used to identify hotspots. THI typically allows secondary cables to run to failure as there are no suitable remediation practices.

Sustainment Plan:

THI will continue to repair secondary underground cable that fail or have identified deficiencies through routine inspections of other components (IE: pad mount transformers). THI will also focus on re-locating the backyard underground secondary services in conjunction with other capital projects as most, if not all are direct buried and are nearing their maximum useful life expectancy.

Substations

THI has only one remaining substation in service, however it is only on potential and is not in service. It is scheduled to be removed in the next 5 years when the 4 kV distribution is fully converted to 27.6 kV. Therefore, no additional analysis has been done on the substation assets.

Buildings

THI does not own any buildings but leases space from the Town of Tillsonburg at 10 Lisgar Street (for operations). The cost of maintenance going forward is expected to be minimal (between $15,000 to $20,000 per year) to address on-going upgrades to furniture, HVAC units, energy efficiency improvements, and accessibility improvements.

Meters

Demographics:

Meter Type	Quantity
Single Phase Residential (Smart Meters)	7372
General Service < 50 kW	695
General Service > 50 kW	81
Large Use > 5000 kW	0
Wholesale Meter Points	4

THI has approximately 8,152 meter points within its service territory. Over the past 5 years, meter failure rates have fluctuated but on average is around 1.8% (~147 meters) per year. Failures can occur for numerous reasons but not limited to: mechanical failures (broken jaws, broken display or broken housing). Measurement failures (metrology has been corrupted) and communication failures (special option board is corrupted). THI will continue to monitor failure rates and types of failures (measurement vs communication vs mechanical), if trends indicate failure rate of smart meters is higher than expected, it may lead to a complete replacement in future.

Inspection and Testing Results:

Meters are tested (compliance sampling) in accordance with Measurement Canada requirements – seal extensions are available for 6 to 8 years. THI has historically had success getting seal extensions through compliance sampling. This may not be the case with the newer smart meters.

Life Expectancy:

The life expectancy of revenue meters was not assessed by Kinetrics, but meters are expected to last at least one seal extension period. This means meters have a life expectancy of 12 to 18 years depending on type. However, a high failure rate of smart meters may shorten this value considerably.

Performance Review:

As with many Ontario LDCs, THI has experienced a failure rate of smart meters higher than expected. While the primary failure mode is within the LCD display and communication portion of the meter, the failure typically requires the meter to be replaced and the failed unit sent back to the manufacturer. THI typically has 1.8% of smart meters fail each year.

Condition Assessment:

Due to the stringent testing requirements of Measurement Canada, all revenue meters are in good condition.

Inspection and Maintenance Plan:

Aside from the compliance sampling, THI does not have a formal inspection program for revenue meters. Essentially all electronic meters have self-diagnostics and report errors to the collection system. The remaining meters are manually read every month and the meter readers will report any signs of damage or concern (signs of overheating, condensation, cracks in cover, missing seals, etc).

Sustainment Plan:

THI will continue to apply for seal extensions via compliance sampling and replace meters as they fail. The long term strategy for smart meters may need to be reviewed due to the high failure rate (this may be led by larger LDCs with significant meter failures).

Computers and Communication Equipment

The computers and communication equipment assets have been excluded from this AMP as they are generally below the materiality threshold and the Shareholder is presently conducting a Strategic Planning Review which may result in changes regarding ownership of computers and communication assets in the future (through shared services, fee for service, etc.). Once the future direction has been determined, an appropriate AMP for computers and communication equipment will be created and added to this document.

Asset Utilization

The total loading on the THI system is around 37.5MW, with the most recent peak at 39MW in 2016. This is well below the capacity allocated to THI at the Tillsonburg TS. The load is divided among 4 – 27.6 kV feeders, each with the capacity to supply up to 20MW under normal conditions and up to 30MW under emergency conditions. The capacity of the *feeders* is sufficient to supply reasonably foreseeable load growth for the next 25 years. The Regional Planning conducted by the IESO, Hydro One, and area LDCs has identified the *Tillsonburg TS* will exceed capacity in the near future. However, the station is expected to be adequate to meet the net load forecast for the remainder of the study period (2022-2031) as planned CDM targets and DG contributions continue to offset the load growth. Overall, as the net load forecast prepared for the Regional Infrastructure Plan phase is approximately 5% lower than the Needs Assessment load forecast, therefore no new need was identified.

Risk Analysis

THI considers three main types of risk – safety, reliability, and capacity. Safety and reliability risks are assessed primarily by THI staff as they conduct their routine inspections of the system. Where possible, these risks are eliminated or mitigated immediately through corrective action. When an immediate solution is not possible or practical, the risk is brought to the attention of the engineering and operations team for further review. In some cases, plans are put on place to eliminate the risk in future years through rebuild projects and staff are made aware of the risk and any special procedures they should follow.

Capacity risks are reviewed on an annual basis with Hydro One. Based on the review conducted in 2022, there are no capacity risks within the THI system due to the planned CDM targets and DG contributions forcasted. The Regional Planning conducted by the IESO, Hydro One, and area LDCs has identified the 115 kV circuit (W8T) that supplies the Tillsonburg TS will reach its thermal limit in the near future, and the Tillsonburg TS may have capacity issues during this time period. Hydro One is leading the assessment of options and a report is expected in the near future.

Opportunities

Many of the assets that have been identified as being at or beyond end of life are on the underground system. In 2018, THI conducted a pilot project which tested silicone injection on older 27.6 kV cable as an alternative to replacement. Other LDCs are using this to defer cable replacements. The 2018 pilot project was deemed successful and is now a considered a proper alternative to replacement where applicable. It was noted in the pilot project that cables containing t-splices or straight splices cannot be injected. This has led THI to remove all splices from underground distribution system to ensure this technology can be applied in the future. The relocation of direct buried, backyard underground secondary services will provide customers and THI better accessibility and reliability of the underground system.

Supporting Documents

To support this AMP, the following documents were used.

Appendix A – Reliability Analysis

Appendix B – Selected Maps of Aging Assets

Appendix C – Customer Satisfaction Survey Results

Appendix A – Reliability Analysis

The outage data from 2017 to 2021 was reviewed and analyzed to determine if there were noticeable trends developing that could provide input to the AMP. Outages due to Loss of Supply have been excluded from the analysis as they are beyond the control of THI and do not reflect the condition or performance of THI assets. The results are noted below.

Quantity of Outages by Cause

Outage Cause	2017	2018	2019	2020	2021	Total	%
Unknown/Other	1	3	3	6	6	**19**	**5%**
Scheduled Outage	23	28	66	47	32	**196**	**50%**
Tree Contacts	3	0	6	1	4	**14**	**3.5%**
Lightning	1	1	1	1	0	**4**	**1%**
Defective Equipment	17	18	15	9	8	**67**	**17%**
Adverse Weather	1	4	0	6	1	**12**	**3%**
Adverse Environment	0	0	0	0	0	**0**	**0%**
Human Element	0	1	1	1	0	**3**	**0.5%**
Foreign Interference	11	30	14	12	11	**78**	**20%**
Total	**57**	**85**	**106**	**83**	**62**	**393**	**100%**

The two leading causes of unplanned outages are Defective Equipment at 17% and Foreign Interference at 20%. The outages with an Unknown Cause represent 5% of outages, and it is reasonable to assume that these were due to either Foreign Interference or Defective Equipment and the underlying contributor (animal contact, intermittent equipment failure) was not located.

The impact of these outages to customers depends on their location and how quickly the problem is identified and power is restored. The table below summarizes the customer impact by looking at the customer hours (# customers x outage duration) by cause.

Customer Hours of Outage per Year by Cause

Cause	2017	2018	2019	2020	2021	avg	Total	%
Unknown/Other	0.5	493	114	147	222	195.3	**976.5**	**2%**
Scheduled Outage	1182	1759	5719	1604	1541	2361	**11805**	**20%**
Tree Contacts	63	0	281	14	1900	451.6	**2258**	**4%**
Lightning	110	19	95	2250	0	494.8	**2474**	**4%**
Defective Equipment	6654	8014	350	3335	261	3722.8	**18614**	**32%**
Adverse Weather	3	2409	0	5366	3	1556.2	**7781**	**13%**
Adverse Environment	0	0	0	0	0	0	**0**	**0%**
Human Element	0	1	379	0.75	0	76.15	**380.75**	**1%**
Foreign Interference	12976	593	148	187	212	2823.2	**14116**	**24%**
Total	**20988.5**	**13288**	**7086**	**12903.75**	**4139**	**11681.05**	**58405.25**	**100%**

Looking at the actual impact to customers, Defective Equipment is the leading contributor at 32% over the past five years while Foreign Interference is 24%. This suggests that foreign interference (primarily animal contacts) will impact only a few customers (often just 10 to 15 supplied by one transformer) while equipment failure can impact an entire feeder or large section of a feeder.

If we look at the numbers of customer affected by Defective Equipment over the past five years, this has been a consistent cause of unplanned outages.

To further understand what is causing this trend, the information captured for the Defective Equipment outages was reviewed in greater detail.

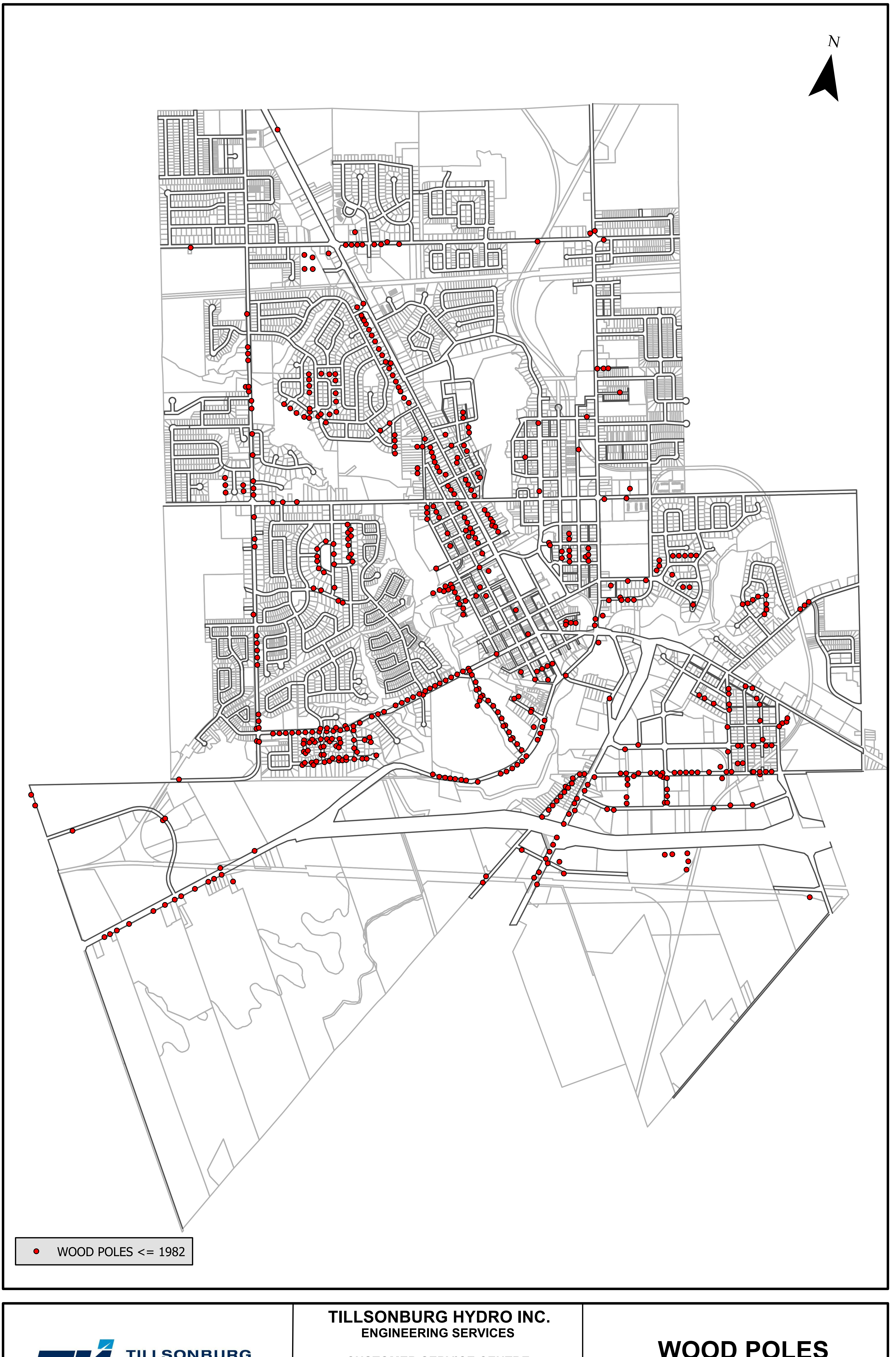
Defective Equipment Outage Details

Specific Cause	2017	2018	2019	2020	2021	Total	%
Cable Fault	3	3	2	2	1	**11**	**17%**
Transformer Fault	2	2	1	2	3	**10**	**16%**
Defective Insulator	3	0	0	0	0	**3**	**5%**
Defective Switch	3	7	3	1	0	**14**	**22%**
Broken Pole	0	0	0	0	1	**1**	**2%**
Broken OH Conductor	1	2	1	1	1	**6**	**9%**
Failed Arrestor	0	1	0	0	2	**3**	**5%**
Failed Elbow / Cable Terminator	2	0	1	0	0	**3**	**5%**
Other	1	2	7	2	1	**13**	**20%**
Total	**15**	**17**	**15**	**8**	**9**	**64**	**100%**

Conclusions:

THI should focus more capital resources on replacing aging equipment before it fails, while some additional maintenance work on the overhead system (better tree trimming, animal guards) to address foreign interference.

Appendix B – Selected Maps of Aging Assets

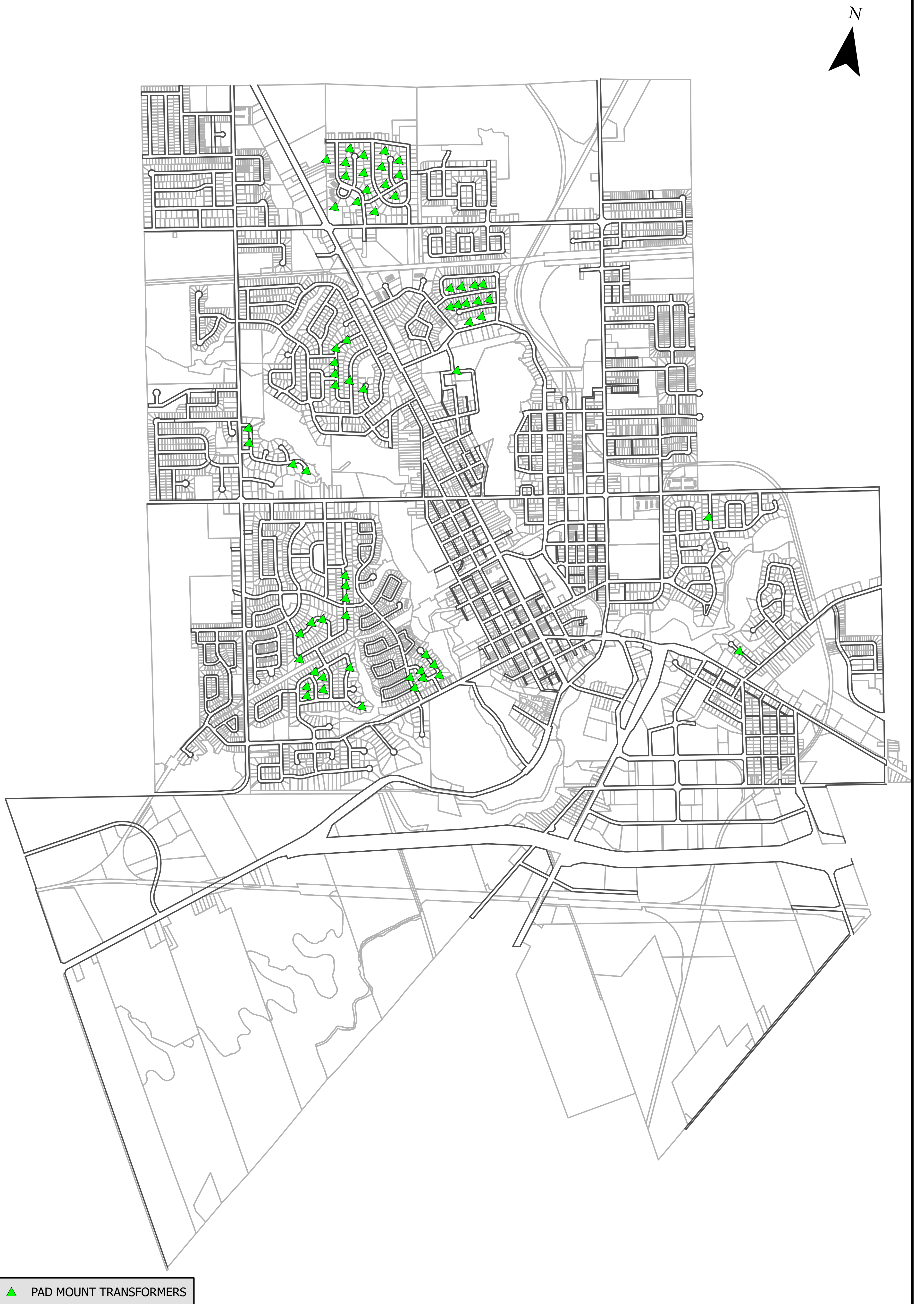


TILLSONBURG HYDRO INC.

TILLSONBURG HYDRO INC.
ENGINEERING SERVICES

CUSTOMER SERVICE CENTRE
10 LISGAR AVE, TILLSONBURG, ON, N4G 5A5

WOOD POLES <= 1982



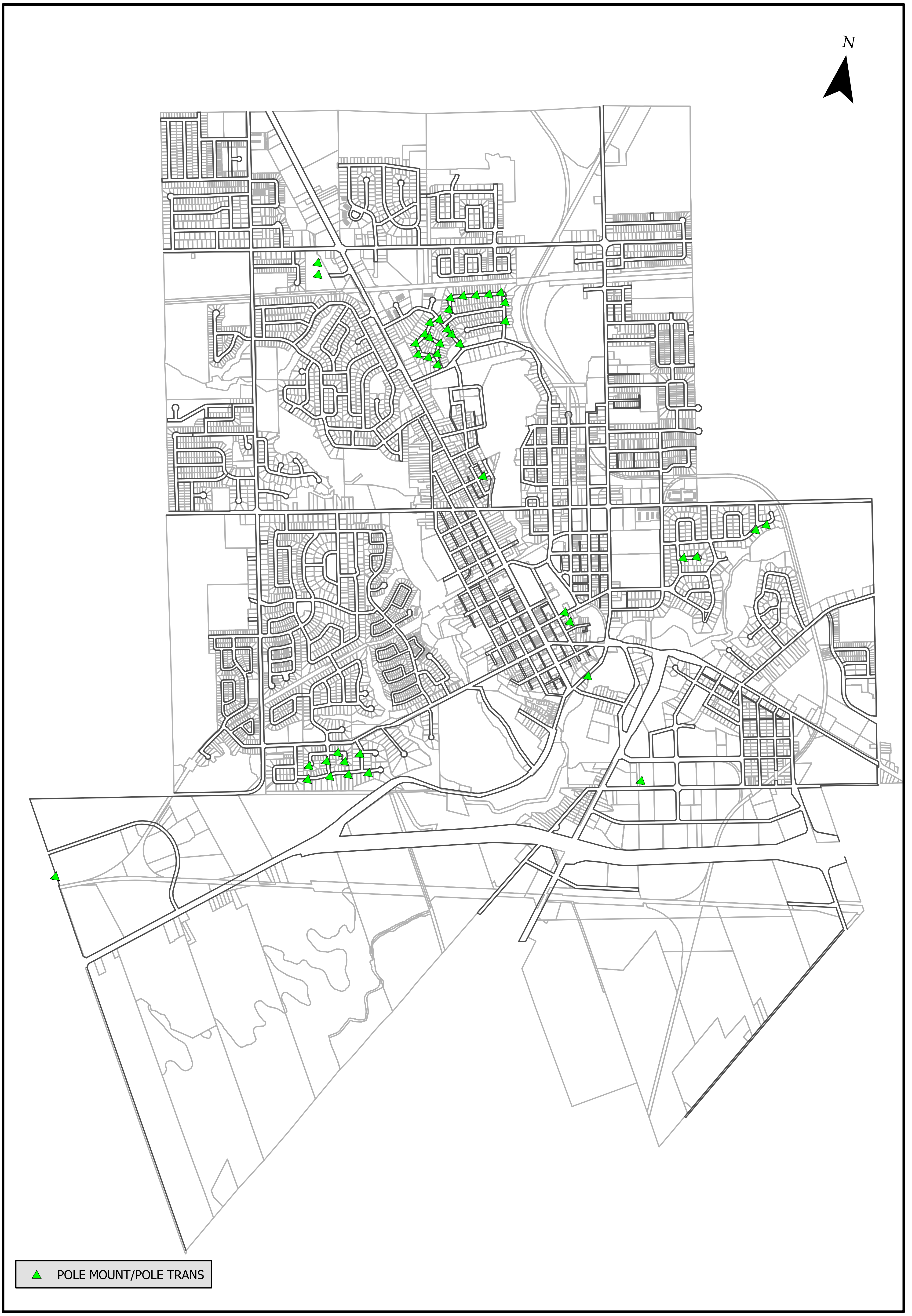
TILLSONBURG HYDRO INC.

TILLSONBURG HYDRO INC.
ENGINEERING SERVICES

CUSTOMER SERVICE CENTRE
10 LISGAR AVE, TILLSONBURG, ON, N4G 5A5

0 100 200 400 600 800 1,000
Meters

PAD MOUNT TRANSFORMERS <= 1982



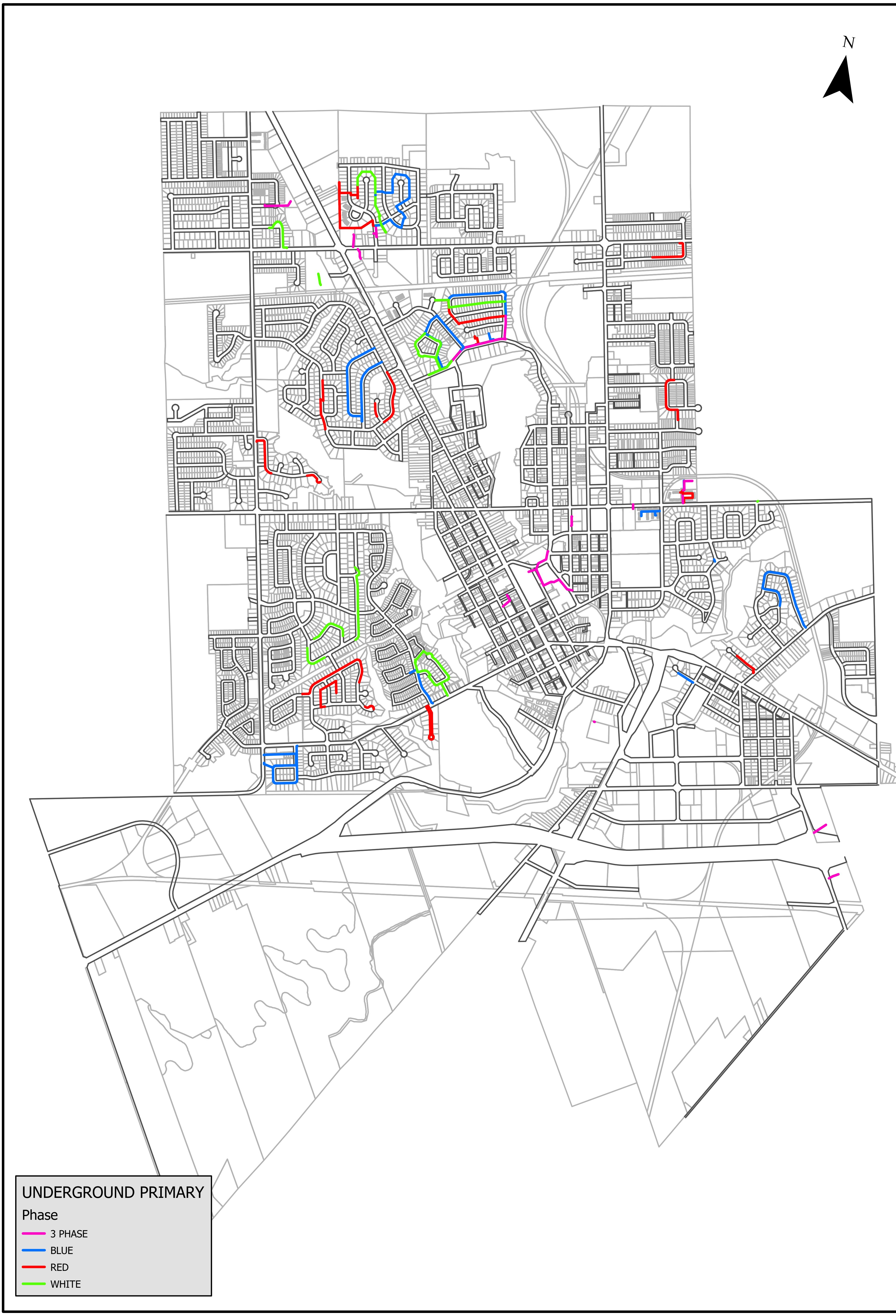
TILLSONBURG HYDRO INC.

TILLSONBURG HYDRO INC.
ENGINEERING SERVICES

CUSTOMER SERVICE CENTRE
10 LISGAR AVE, TILLSONBURG, ON, N4G 5A5

0 100 200 400 600 800 1,000
Meters

POLE MOUNT/ POLE TRANS <= 1982



TILLSONBURG HYDRO INC.

TILLSONBURG HYDRO INC.
ENGINEERING SERVICES

CUSTOMER SERVICE CENTRE
10 LISGAR AVE, TILLSONBURG, ON, N4G 5A5

0 100 200 400 600 800 1,000
Meters

UNDERGROUND PRIMARY <= 1982

Appendix C – Customer Satisfaction Survey Results

2021 Tillsonburg Hydro Customer Satisfaction Survey

Introduction and Summary

Thank you for selecting Redhead Media Solutions Inc. for this important project for Tillsonburg Hydro. We appreciate your confidence in us to provide you with data on Customer Satisfaction that provides both a current snapshot and can be used to compare with previous surveys in 2019 and among other LDCs that we work with.

It is our goal to always be improving our deliverables and provide value to our clients. To supplement this report, we have also included a stand-alone section on comparable data and verbatims for question G15 (open comments) in spreadsheet format. The methodology guide, as well as residential and general service questionnaires are also included as appendices B, C and D for your reference.

Should there be any specific data or breakouts that you require we would be happy to provide them. Please contact us to discuss how we can assist you and ensure you are getting the most from this project.

Sincerely,

Graydon Smith
President

TILLSONBURG HYDRO INC.

REDHEAD MEDIA SOLUTIONS INC

Introduction and Summary

Redhead Media Solutions Inc. (Redhead), partnering with ADVANIS for data collection and reporting, has been retained (via an RFP process by Cornerstone Hydro Electric Concepts Inc. - CHEC) to conduct a 2021 Customer Satisfaction Survey for Tillsonburg Hydro. This survey is a required part of an LDC's Balanced Scorecard and other reporting and regulatory requirements for the Ontario Energy Board (OEB).

The complete group of participating CHEC LDCs are as follows:

- Centre Wellington Hydro
- EPCOR
- ERTH Power
- Grimsby Power
- Lakefront Utilities
- Lakeland Power Distribution
- Niagara-on-the-Lake Hydro
- Orangeville Hydro
- Ottawa River Power Corp
- Renfrew Hydro
- Rideau St. Lawrence Distribution
- Tillsonburg Hydro
- Wasaga Distribution
- Wellington North Power

Introduction and Summary

This final report contains data specifically for Tillsonburg Hydro.

The survey is comprised of 401 randomly selected interviews of Tillsonburg Hydro customers among the low volume customer base (residential customers and general service under 50kW customers; GS<50kW). Residential customers were asked to confirm that they receive an electricity or hydro bill from Tillsonburg Hydro and that they are the primary payer of that bill or share the responsibility.

GS<50kW customers were also asked to confirm they receive an electricity or hydro bill from Tillsonburg Hydro, and additionally to confirm that the person who manages the organization's electricity bill was the one to complete the interview. The sample frame is stratified on region (where applicable) and consumption quartiles by rate class in accordance with the "Survey Implementation Requirements" on page 4 of the "EDA/Innovative Customer Satisfaction Scorecard: Methodology & Survey Implementation Guide" which is contained in Appendix B of this report.

The objective of the survey is to provide an Overall Customer Satisfaction index score for Tillsonburg Hydro. This is a calculated aggregate value based on responses of to 9 core measures in the survey instrument. In some cases, additional questions were asked but not included in the calculation of the Customer Satisfaction Index Score.

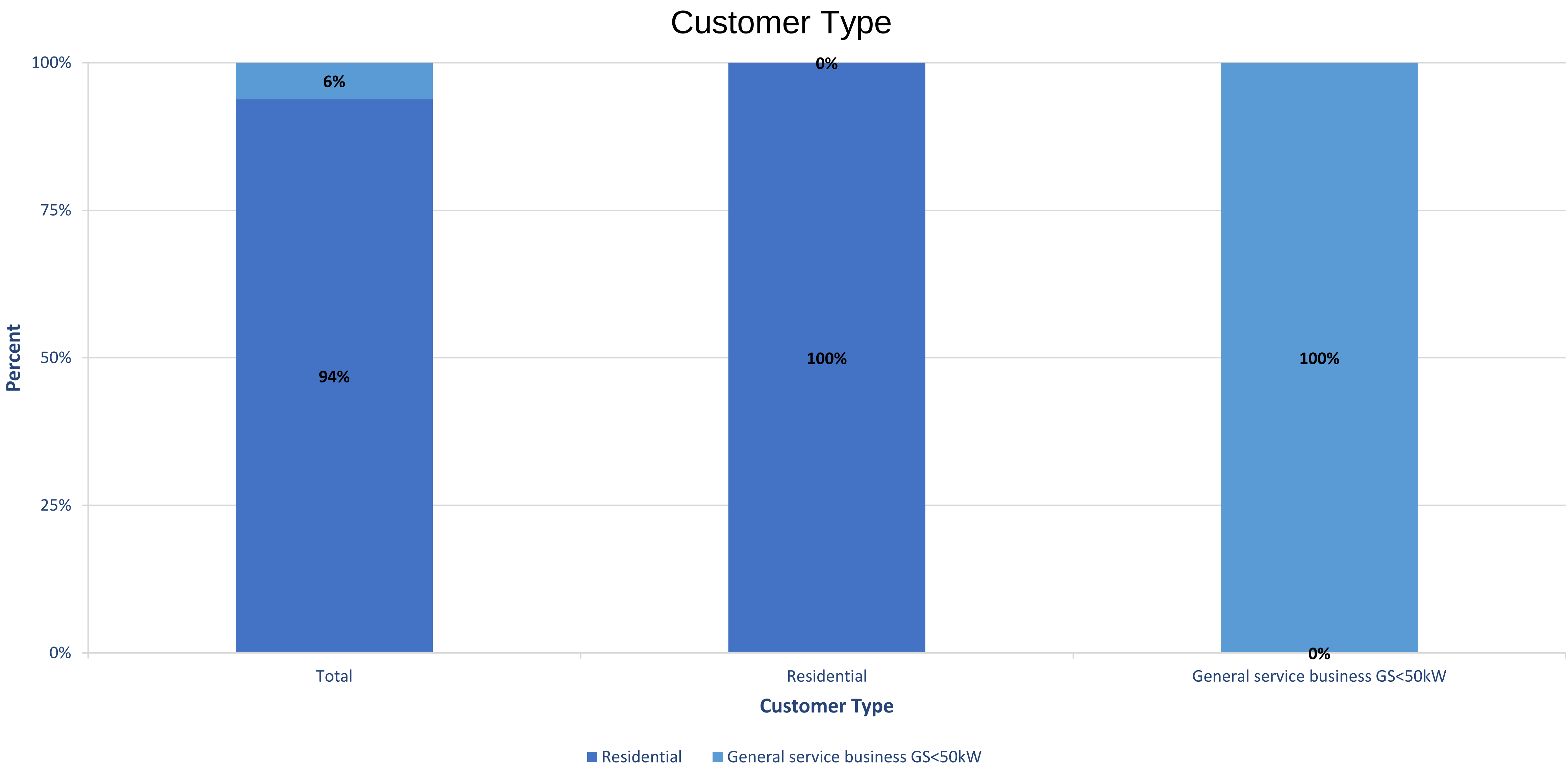
Tillsonburg Hydro's 2021 Customer Satisfaction Index Score is 80%, This is 1% greater than the 2019 score (79%) and 1% higher than the average of all LDCs (79%).

This falls within a very tight spectrum of index scores we processed for all LDCs that participated in the 2019 survey via Redhead. When the confidence interval is applied to all index scores, there is significant overlap between LDCs which underlines the statistical similarity of performance and satisfaction among participants. Statistically, Tillsonburg Hydro is similar to all other LDCs surveyed.

The following report contains graphic data and tables for all core questions as well as any additional questions supplied by the LDC, which were asked after the core questions were completed.

Question scoring and index methodologies were prescribed by the EDA/Innovative. As such, there has been limited additional analysis provided beyond the direction provided to meet the reporting guidelines. Should you wish further analysis of the data please contact our office to discuss.

PARTICIPANT INFORMATION



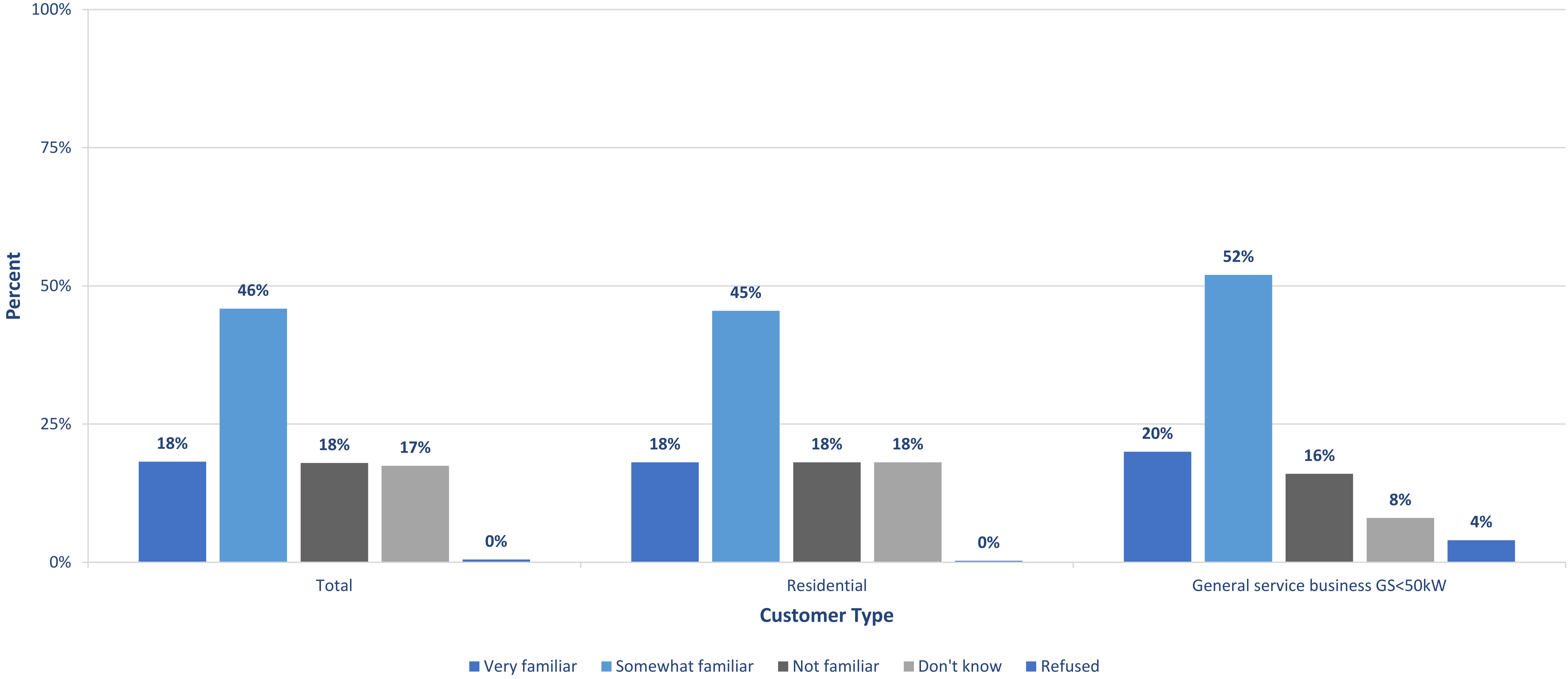
Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

QUESTIONS/DATA

REDHEAD MEDIA SOLUTIONS INC

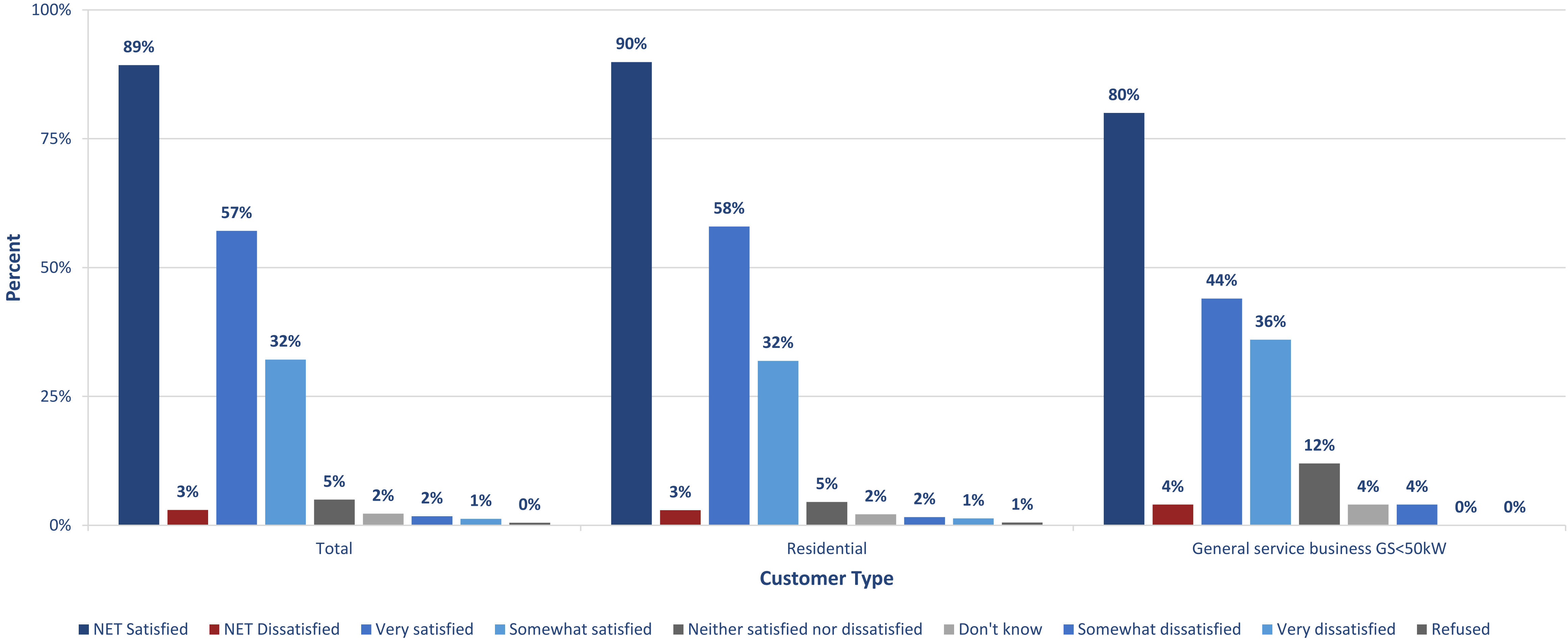
How familiar are you with Tillsonburg Hydro, which operates the electricity distribution system in your community?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

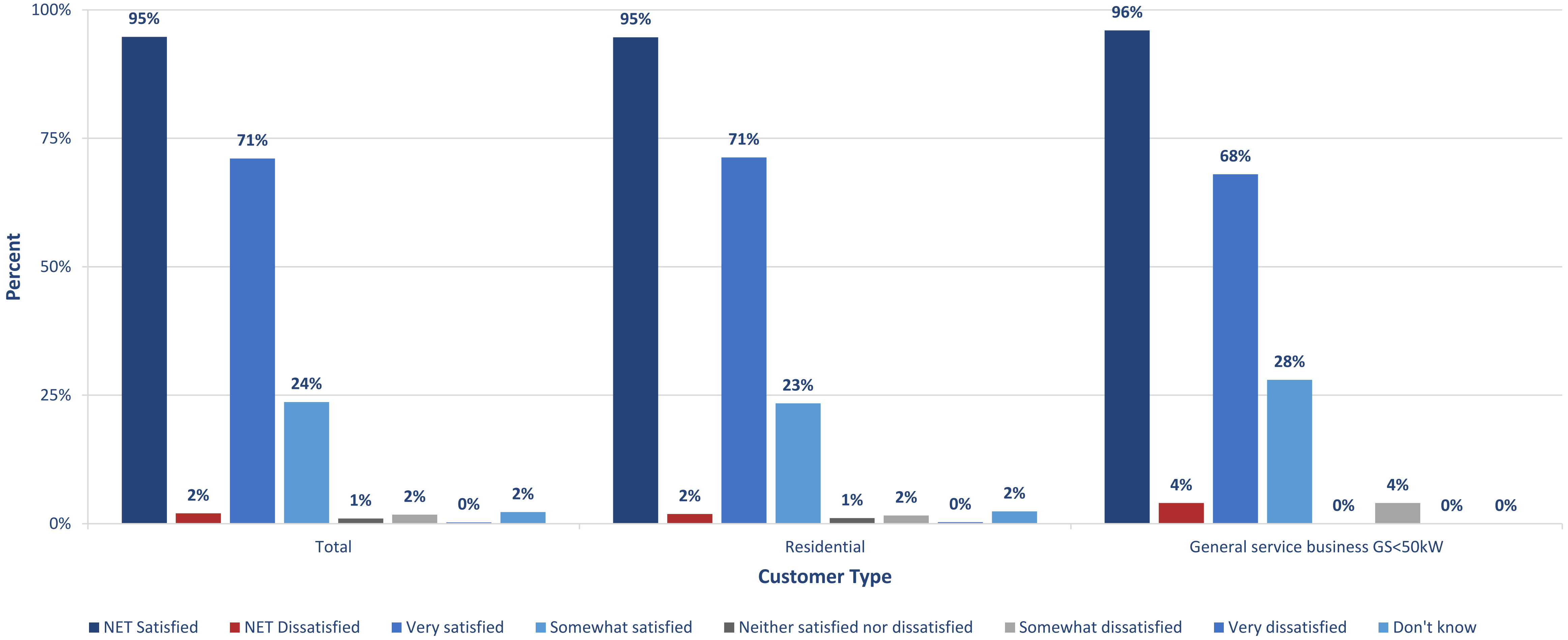
Thinking specifically about the services provided to you and your community by Tillsonburg Hydro, overall, how satisfied are you with the services that you receive from Tillsonburg Hydro?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

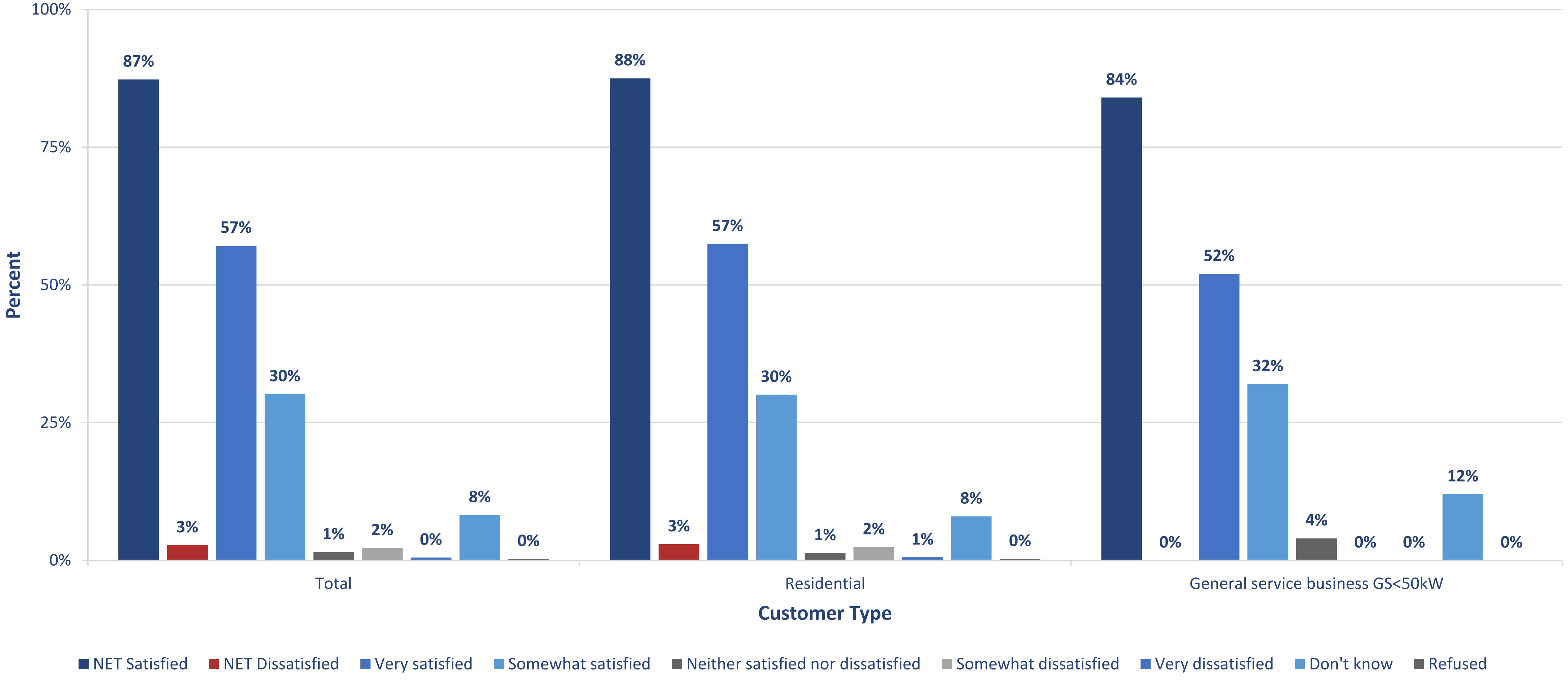
The reliability of your electricity service – as judged by the number of power outages you experience: How satisfied are you with the electrical service that you receive from Tillsonburg Hydro based on...?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

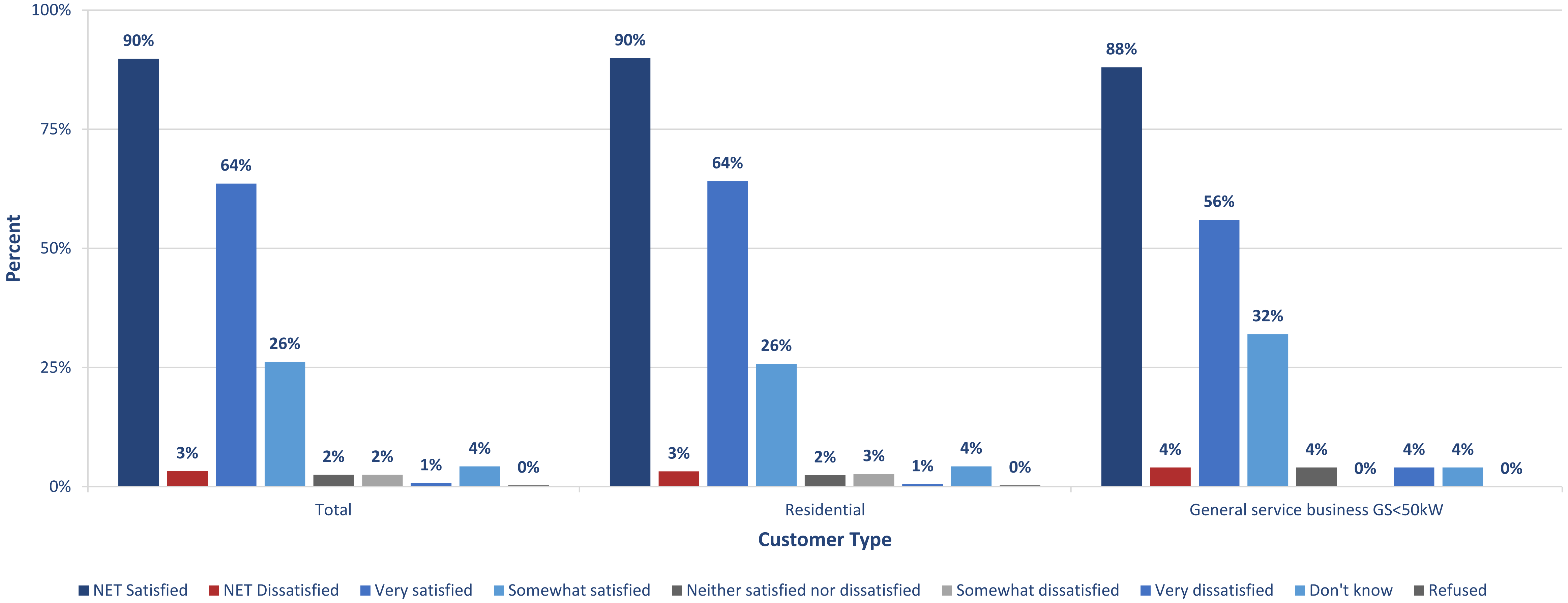
The amount of time it takes to restore power when power outages occur: How satisfied are you with the electrical service that you receive from Tillsonburg Hydro based on...?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

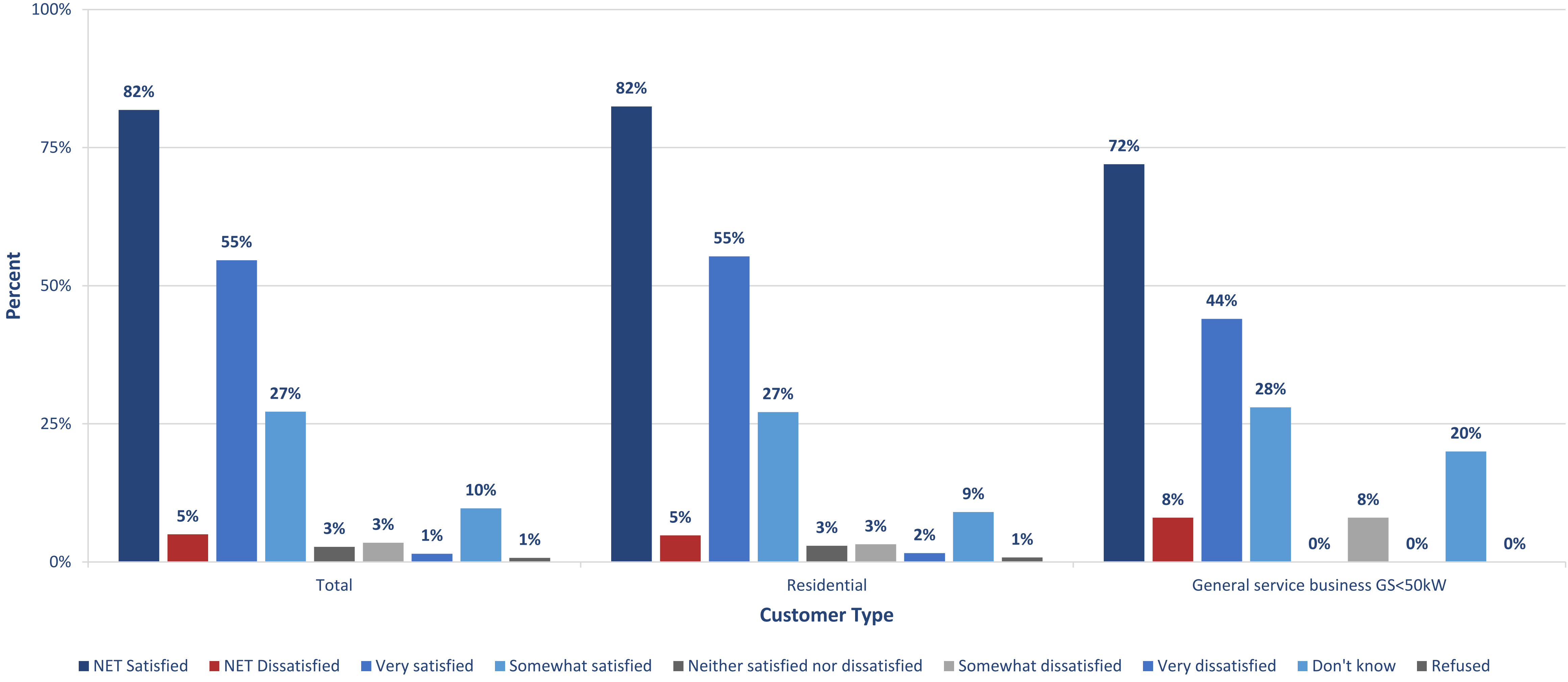
The quality of the power delivered to you as judged by the absence of voltage fluctuations that can result in [flickering/dimming of lights OR have an affect on equipment]: How satisfied are you with the electrical service that you receive from Tillsonburg Hydro based on...?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

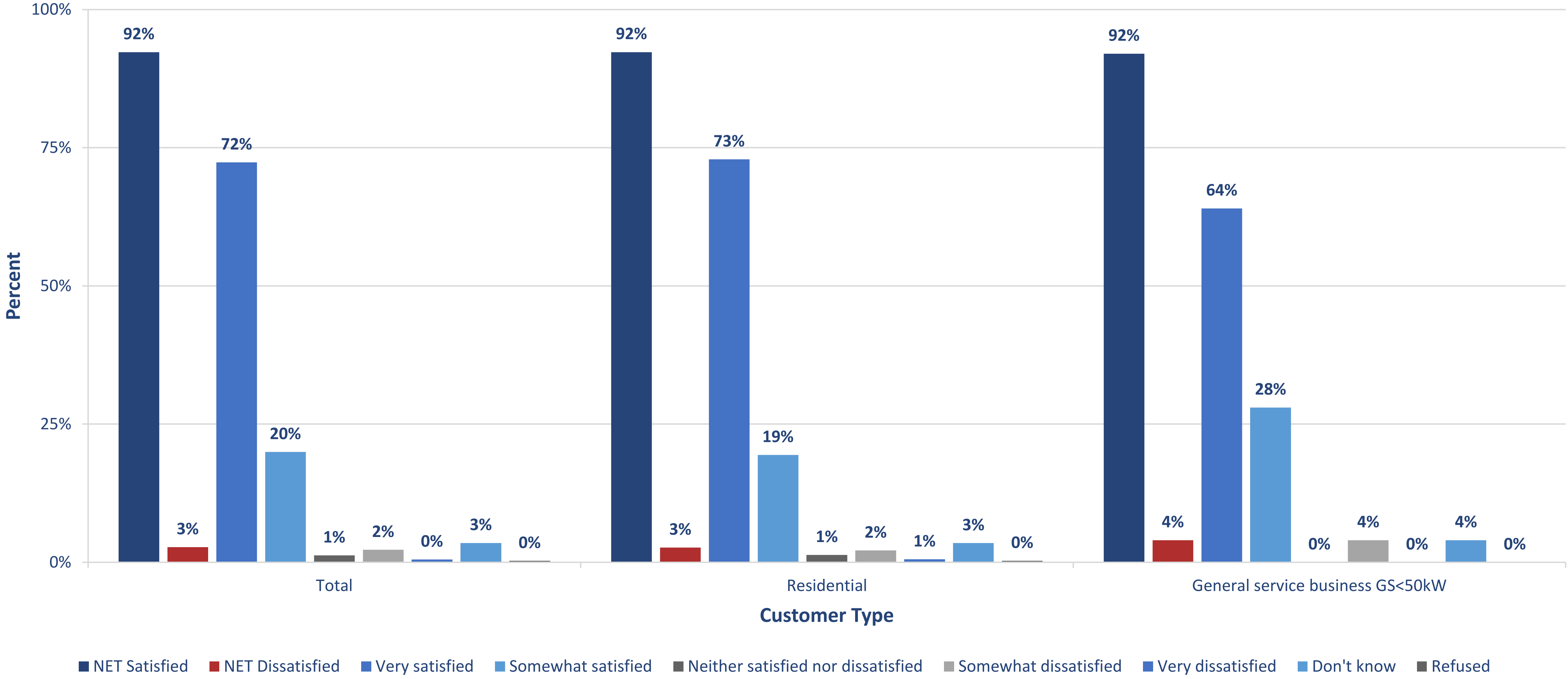
Providing accurate bills: How satisfied are you with the bills that you receive from Tillsonburg Hydro based on them...?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

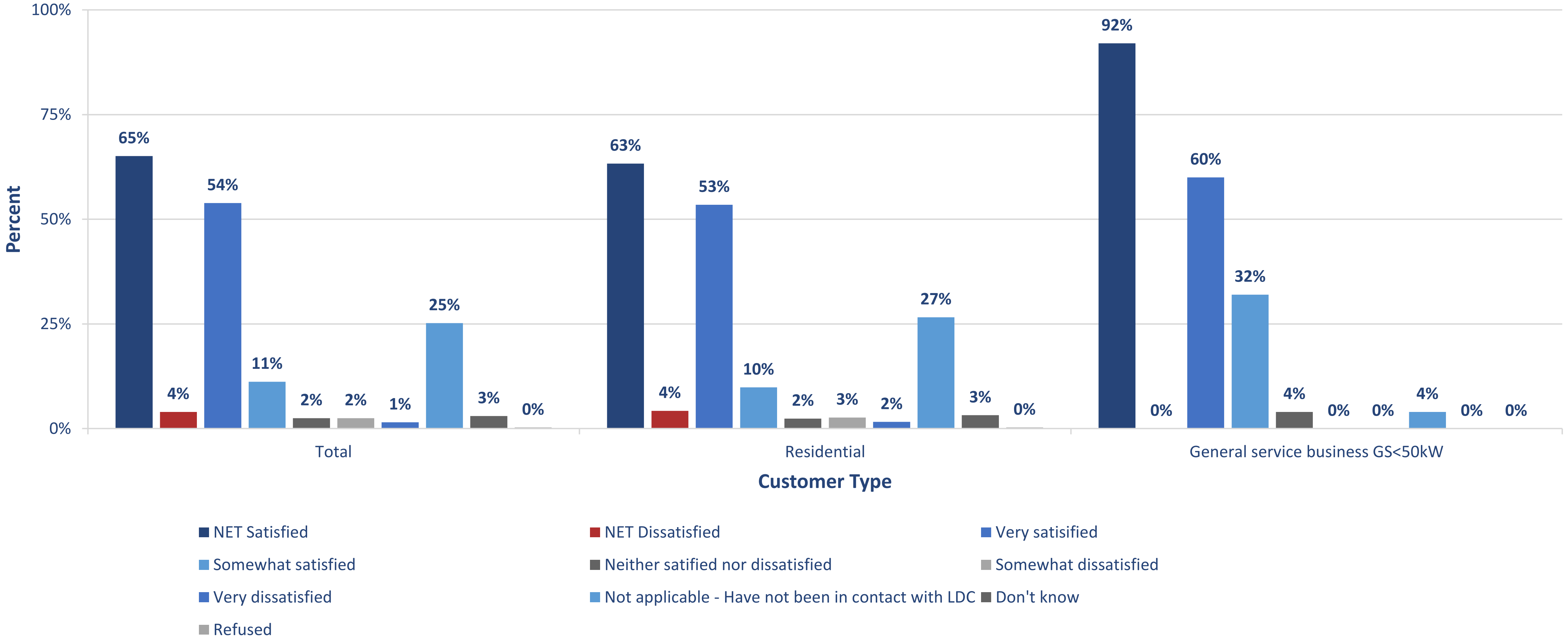
Providing convenient options to both receive and pay your bills: How satisfied are you with the bills that you receive from Tillsonburg Hydro based on them...?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

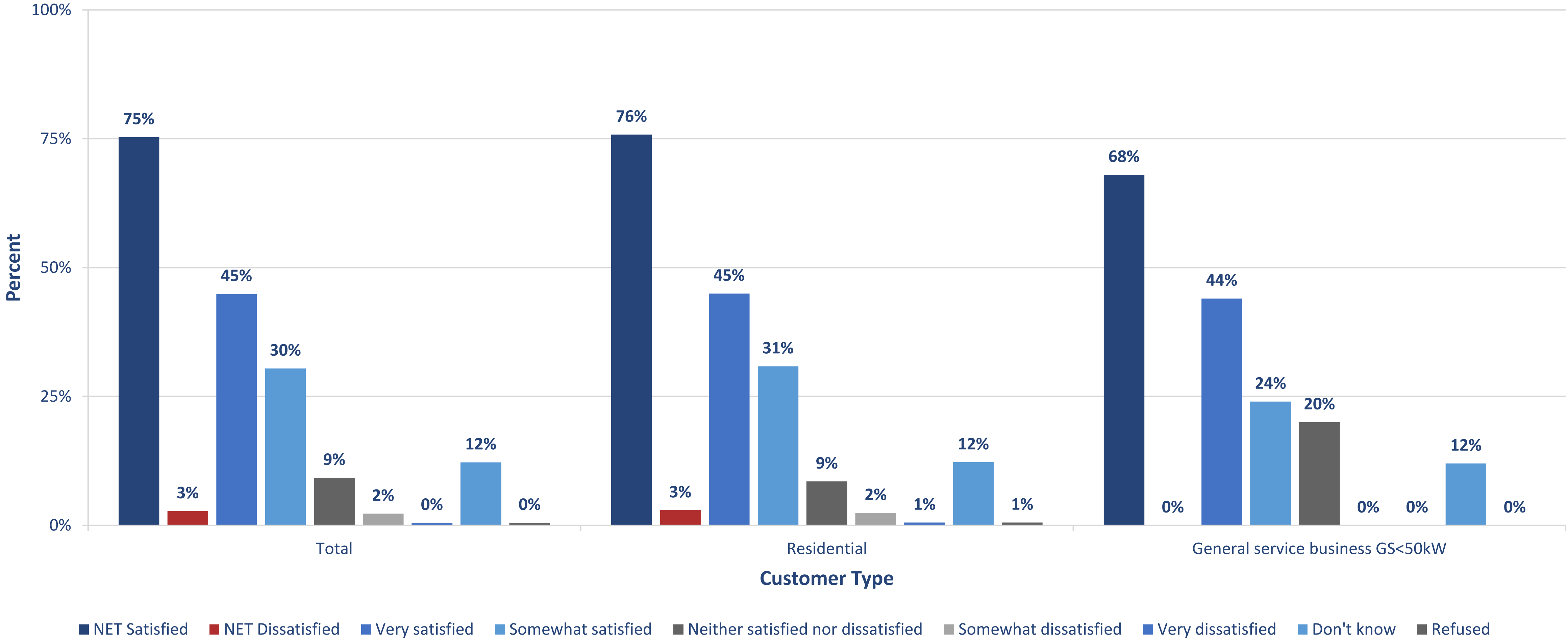
How satisfied are you with the customer service you have received when dealing with employees of Tillsonburg Hydro, whether on the telephone, via email, in person or through online conversations including social media?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

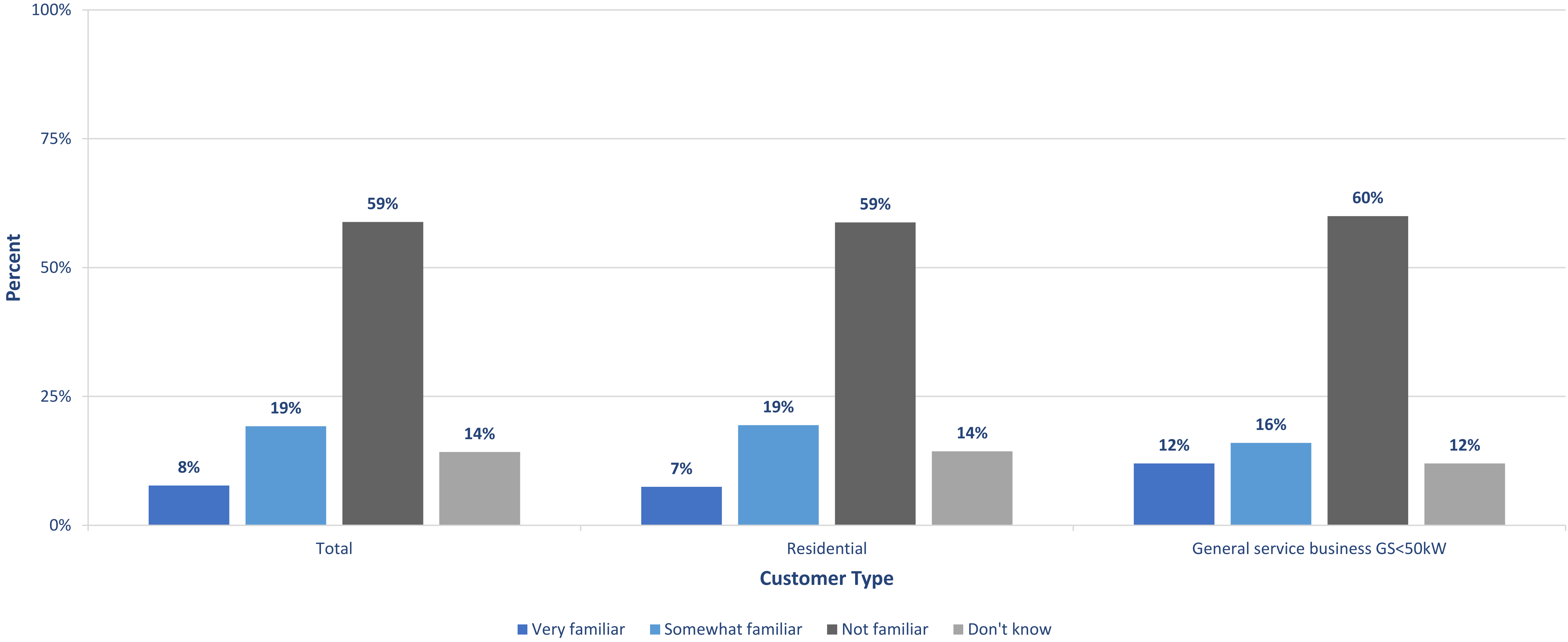
How satisfied are you with the communications that you may receive from Tillsonburg Hydro without talking directly to an employee, including information found on their website, bill inserts, advertising, notices, emails, or social media sites?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

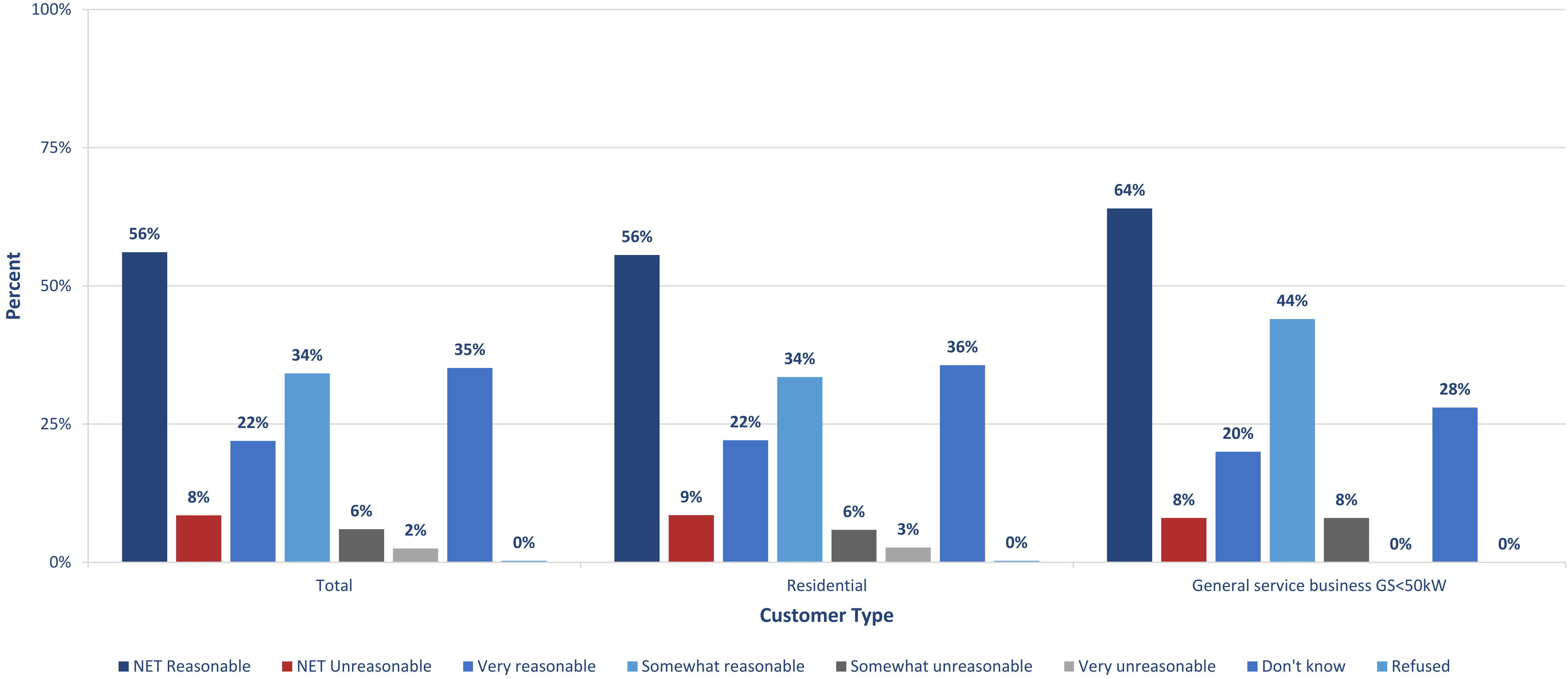
How familiar are you with the percentage of your electricity bill that went to Tillsonburg Hydro? So, NOT the portions allocated to power generation companies, transmission companies, the provincial government and regulatory agencies.



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

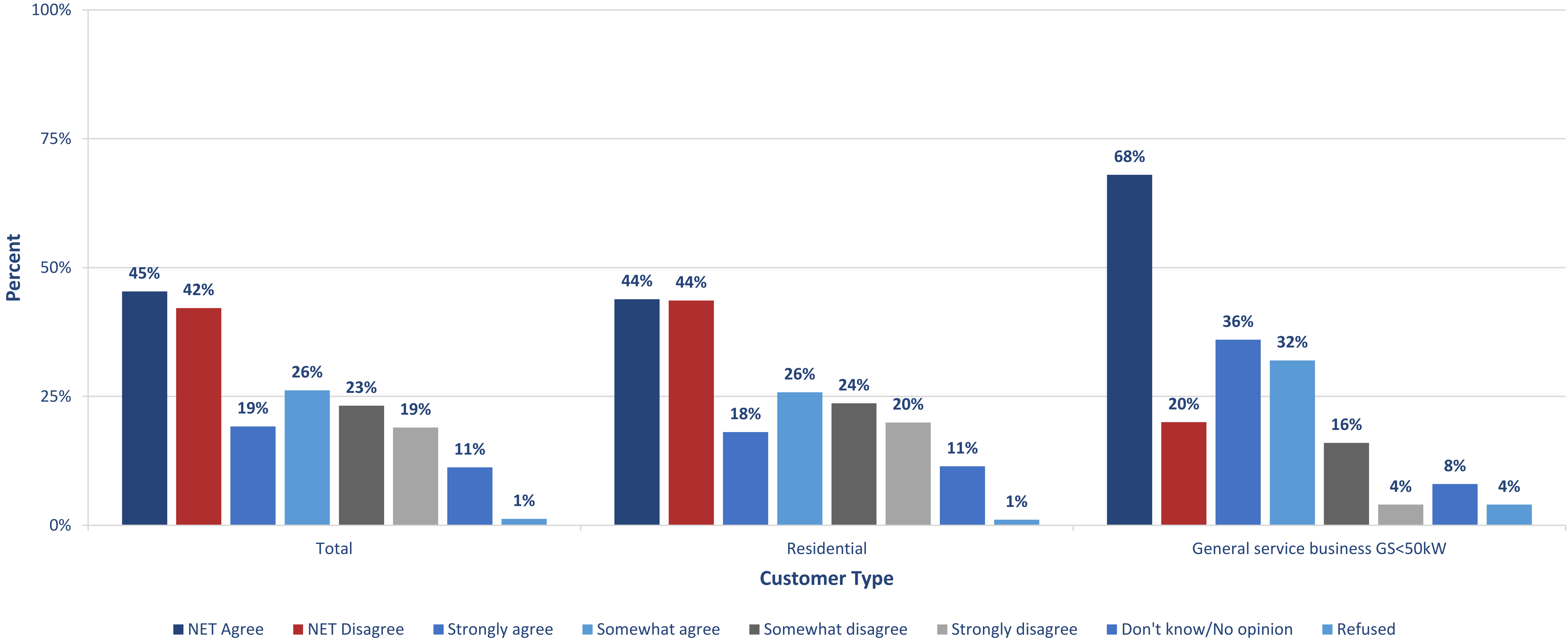
Do you feel that the percentage of your total electricity bill that you pay to Tillsonburg Hydro for the services they provide is...?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

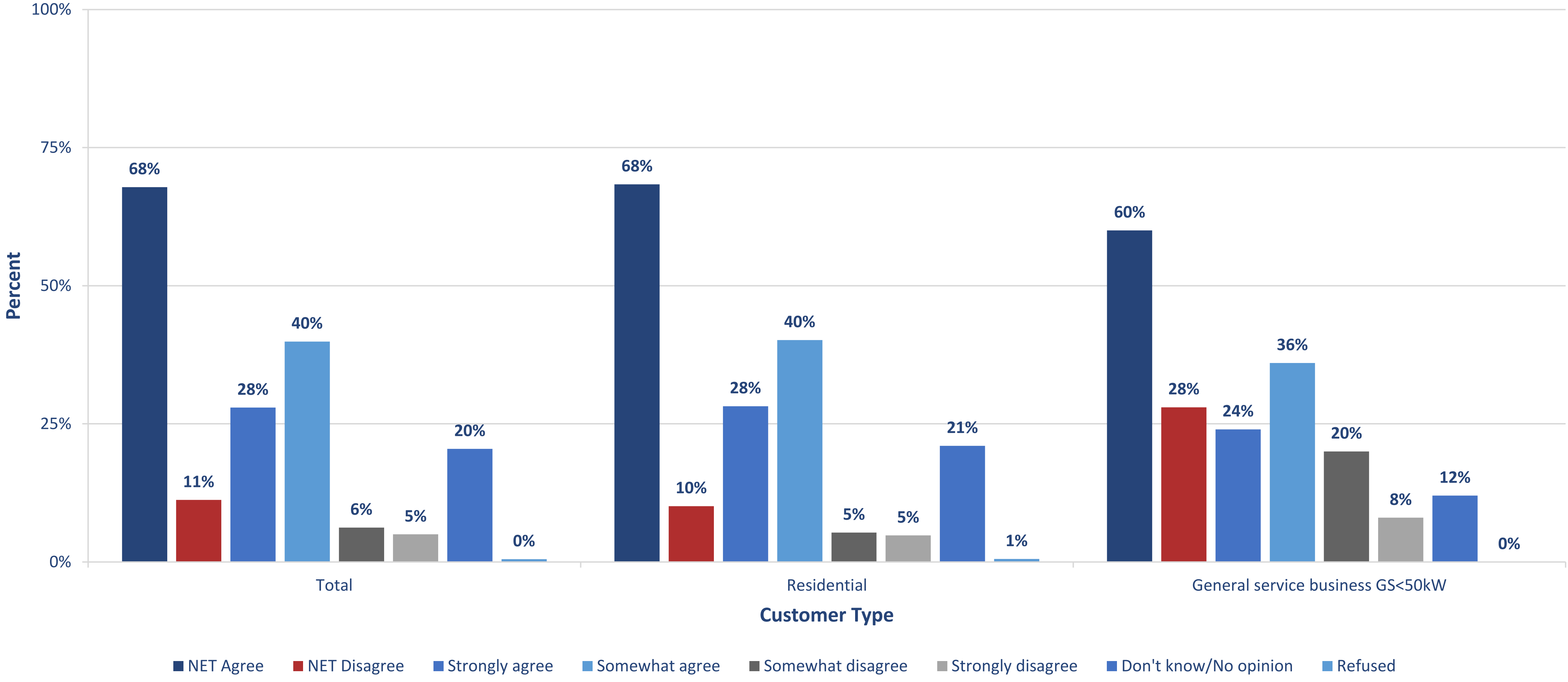
The cost of my electricity bill has a major impact [on personal finances OR bottom line of organization]: To what extent do you agree with the following statements regarding the electricity system in Ontario?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

Customers are well served by the electricity system in Ontario: To what extent do you agree with the following statements regarding the electricity system in Ontario?



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

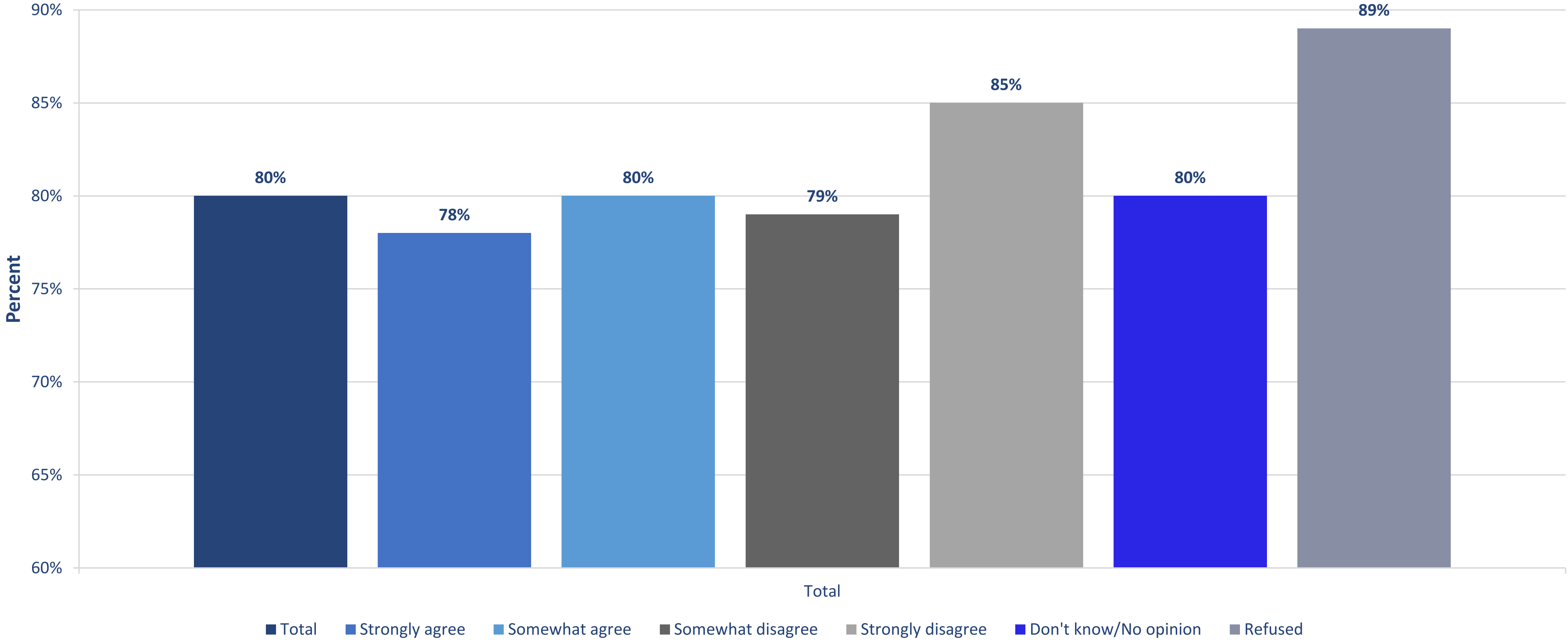
CUSTOMER SATISFACTION INDEX

REDHEAD MEDIA SOLUTIONS INC

Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

Customer Satisfaction Index by the following statement:

The cost of my electricity bill has a major impact on [my personal finances/bottom line]

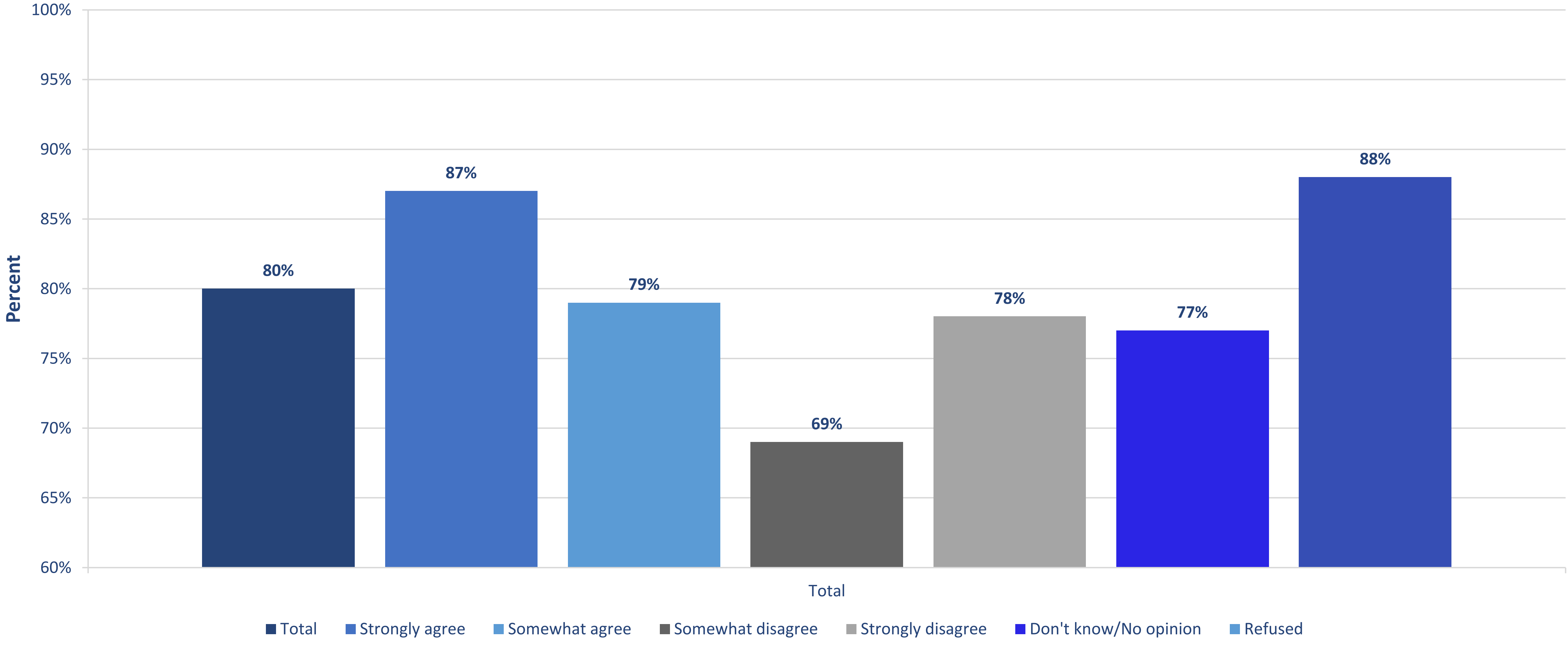


Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

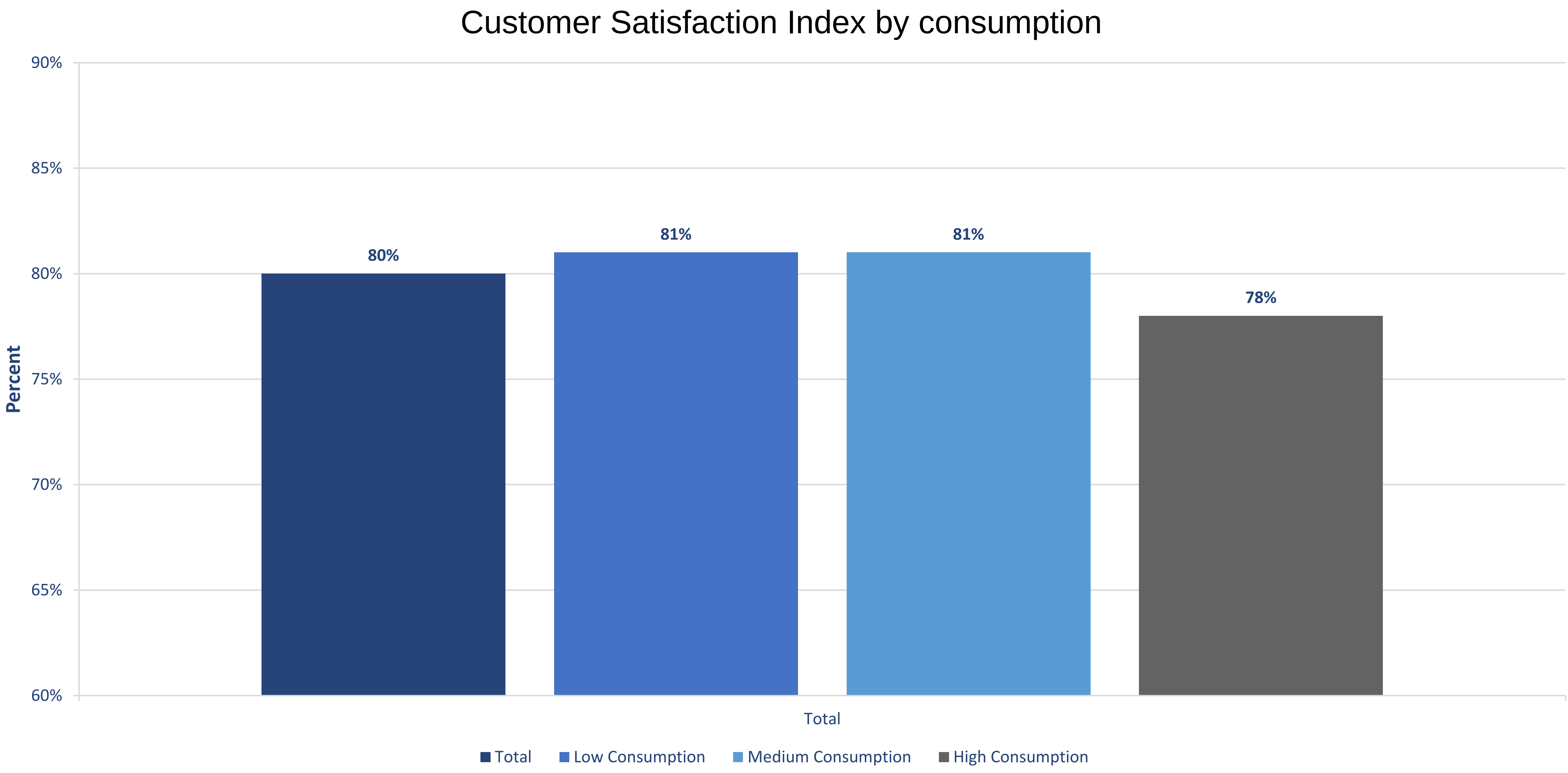
Customer Satisfaction Index by the following statement:

Customers are well served by the electricity system in Ontario



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

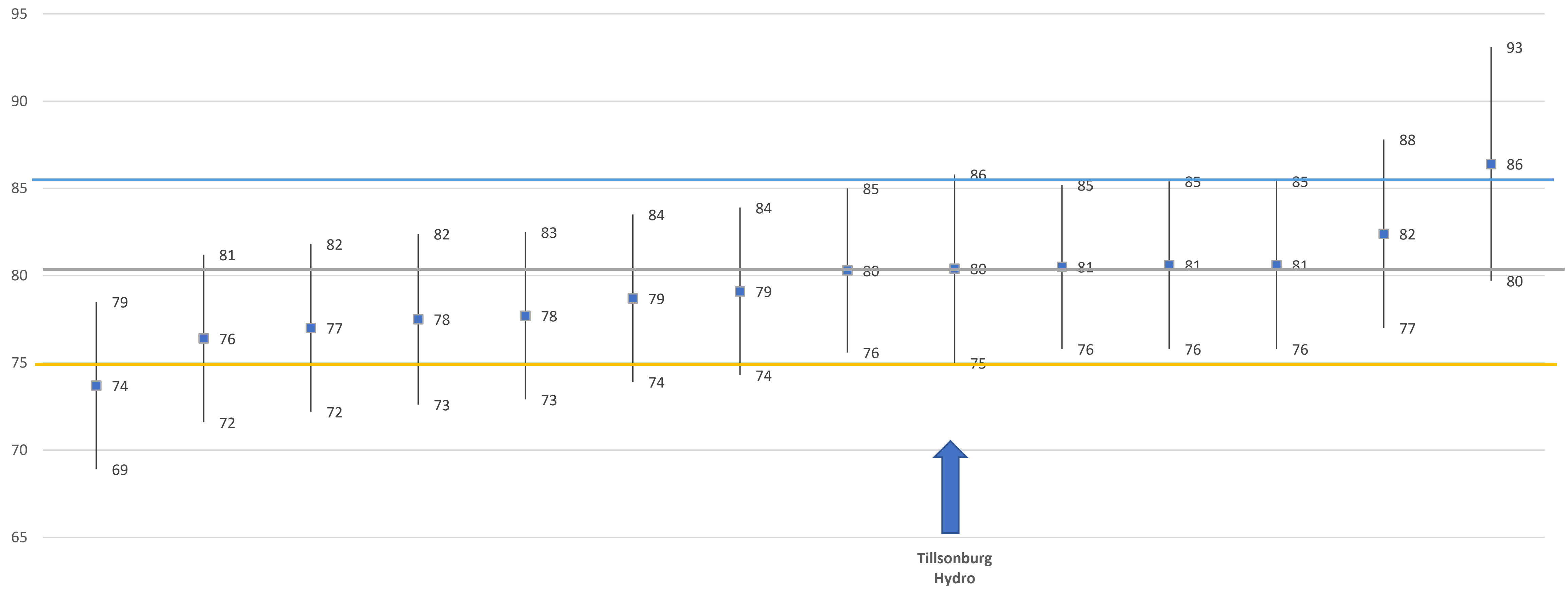
REDHEAD MEDIA SOLUTIONS INC



Source: Redhead Media Solutions/Advanis telephone random customer survey, January 11-February 17, 2021, n=401, accurate 4.7 percentage points plus or minus, 19 times out of 20.

REDHEAD MEDIA SOLUTIONS INC

Customer Satisfaction Index Score Comparison to External LDCs
Upper and Lower Bound

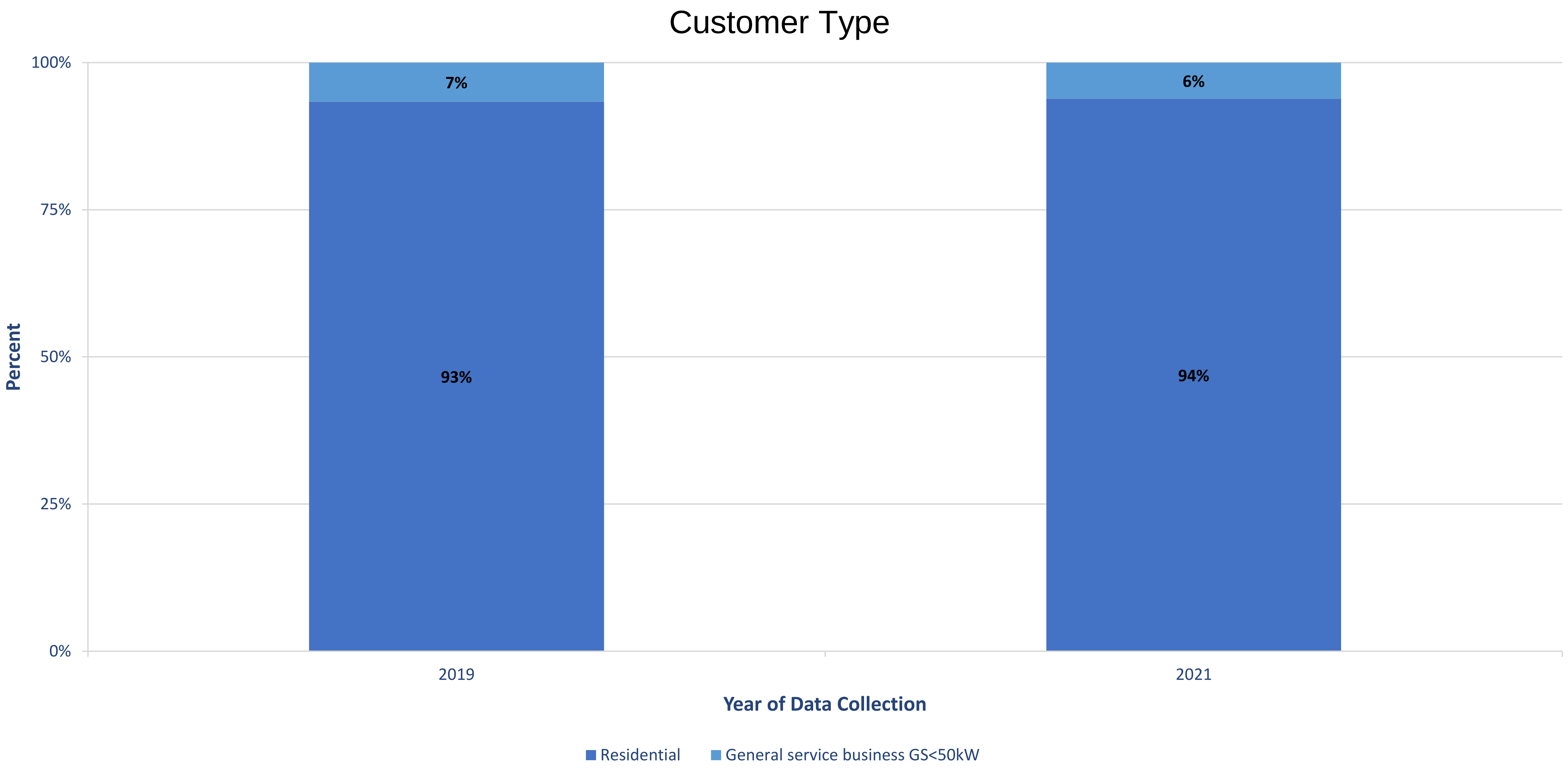


- The lines denote Tillsonburg Hydro's upper and lower bound based on the CSI Score.
- Almost all LDCs confidence intervals overlap, similar to 2019.
- Tillsonburg Hydro overlaps with all LDCs, indicating statistical uniformity.

REDHEAD MEDIA SOLUTIONS INC

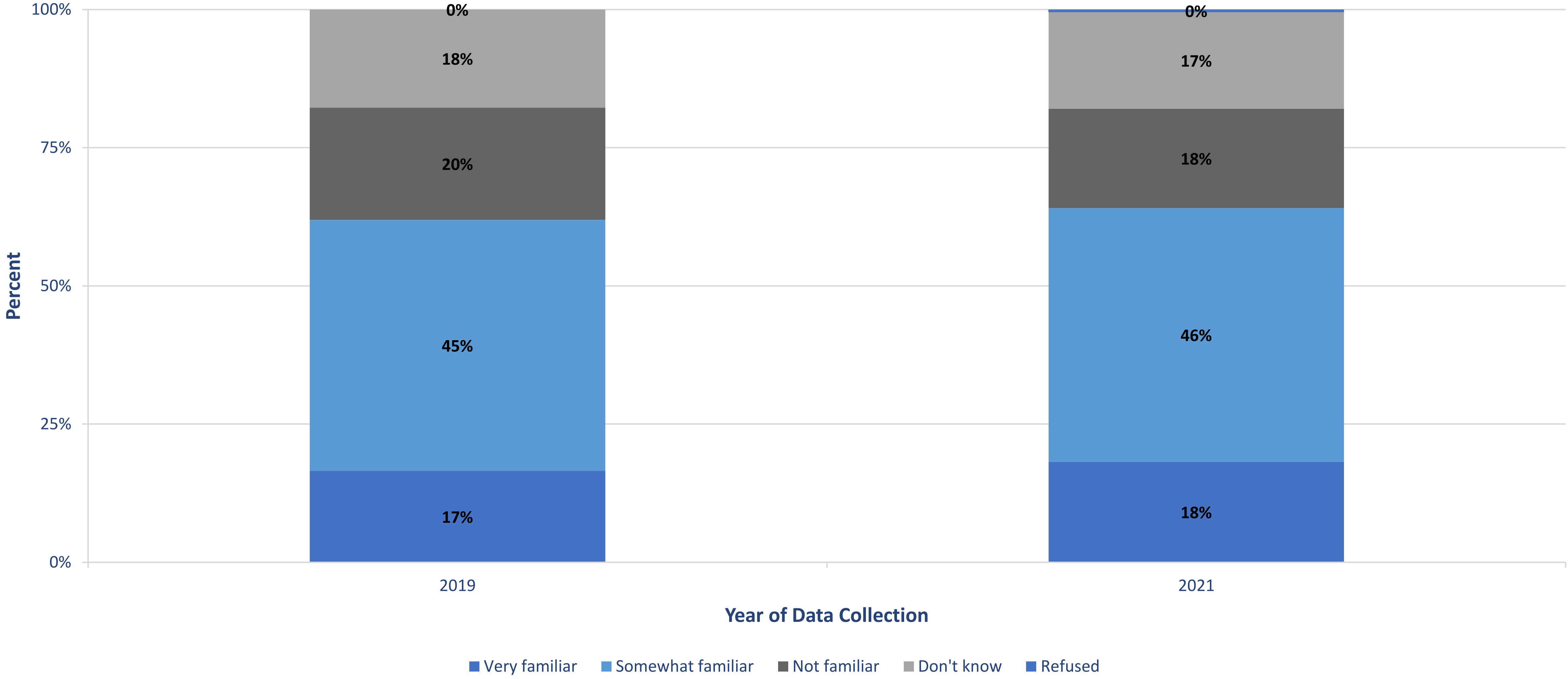
CORE COMPARATIVE DATA 2019-2021

REDHEAD INC
MEDIA SOLUTIONS



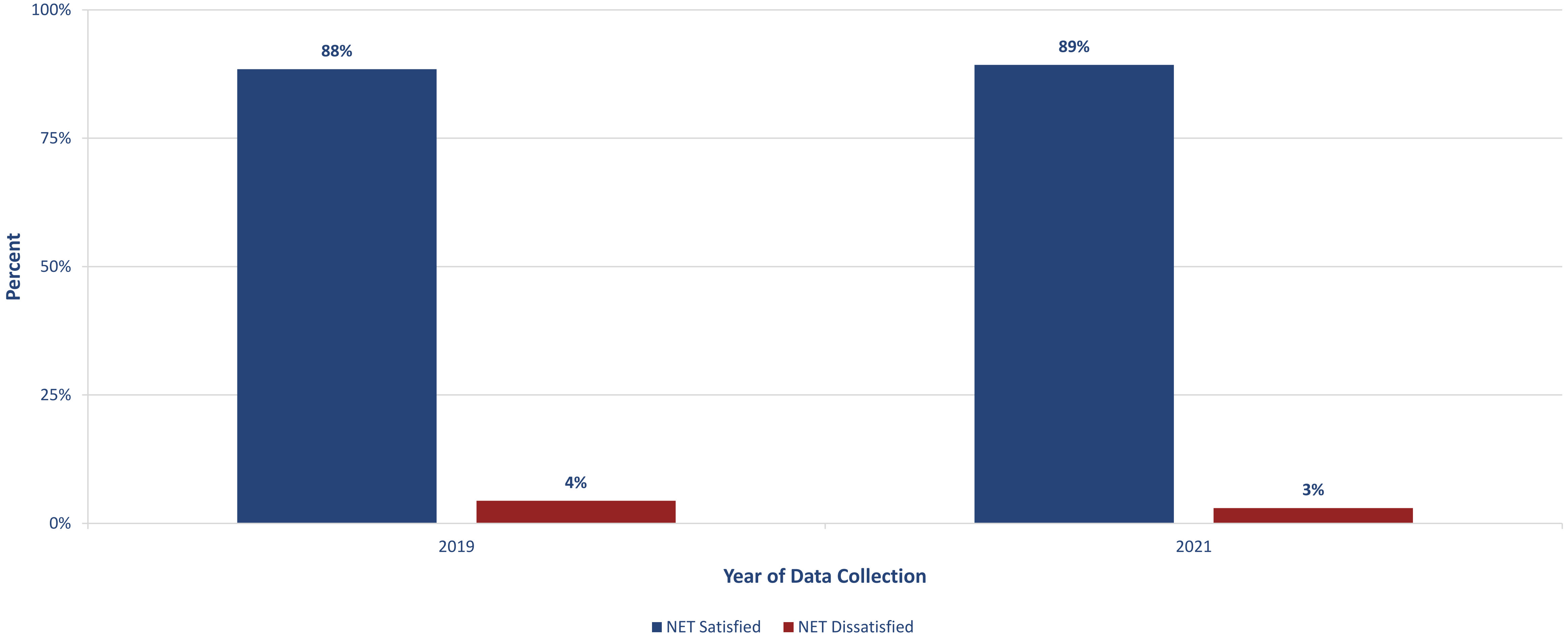
REDHEAD INC
MEDIA SOLUTIONS

How familiar are you with Tillsonburg Hydro, which operates the electricity distribution system in your community?



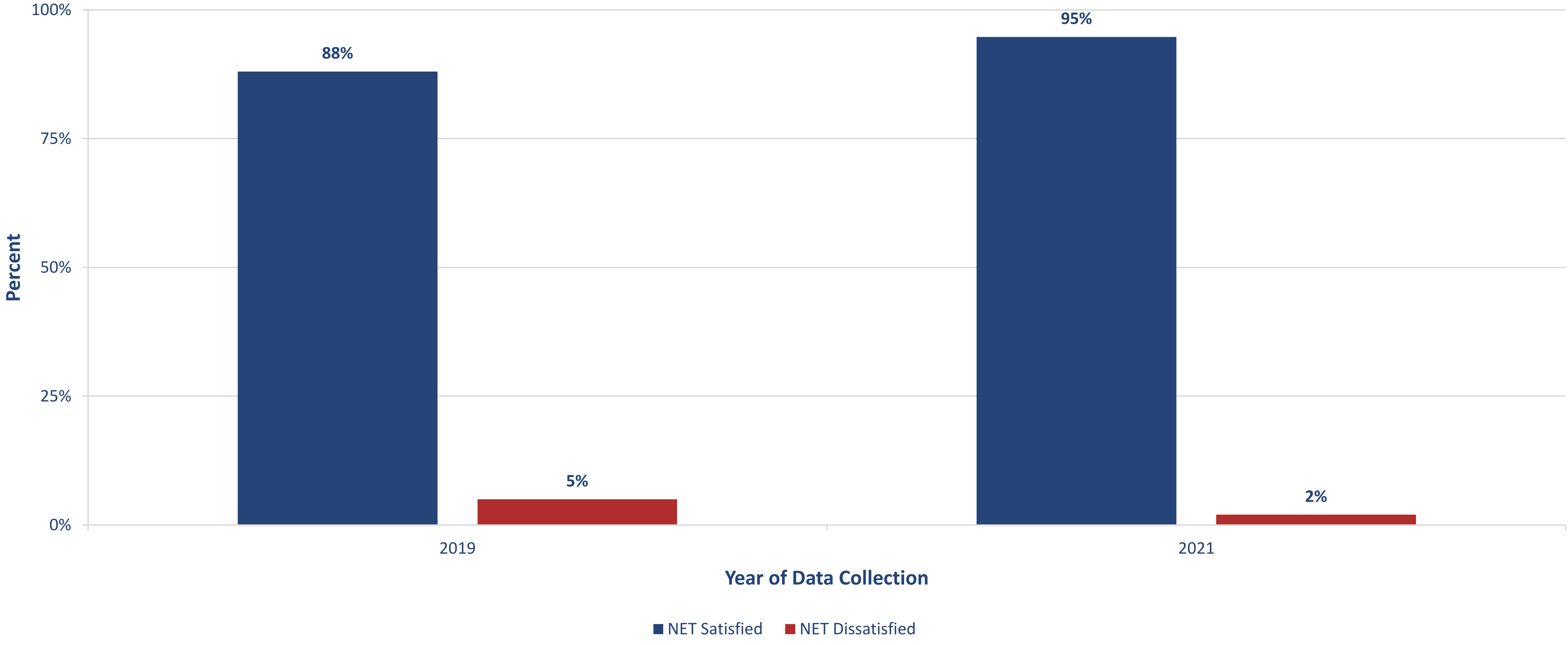
REDHEAD MEDIA SOLUTIONS INC

Thinking specifically about the services provided to you and your community by Tillsonburg Hydro, overall, how satisfied are you with the services that you receive from Tillsonburg Hydro?



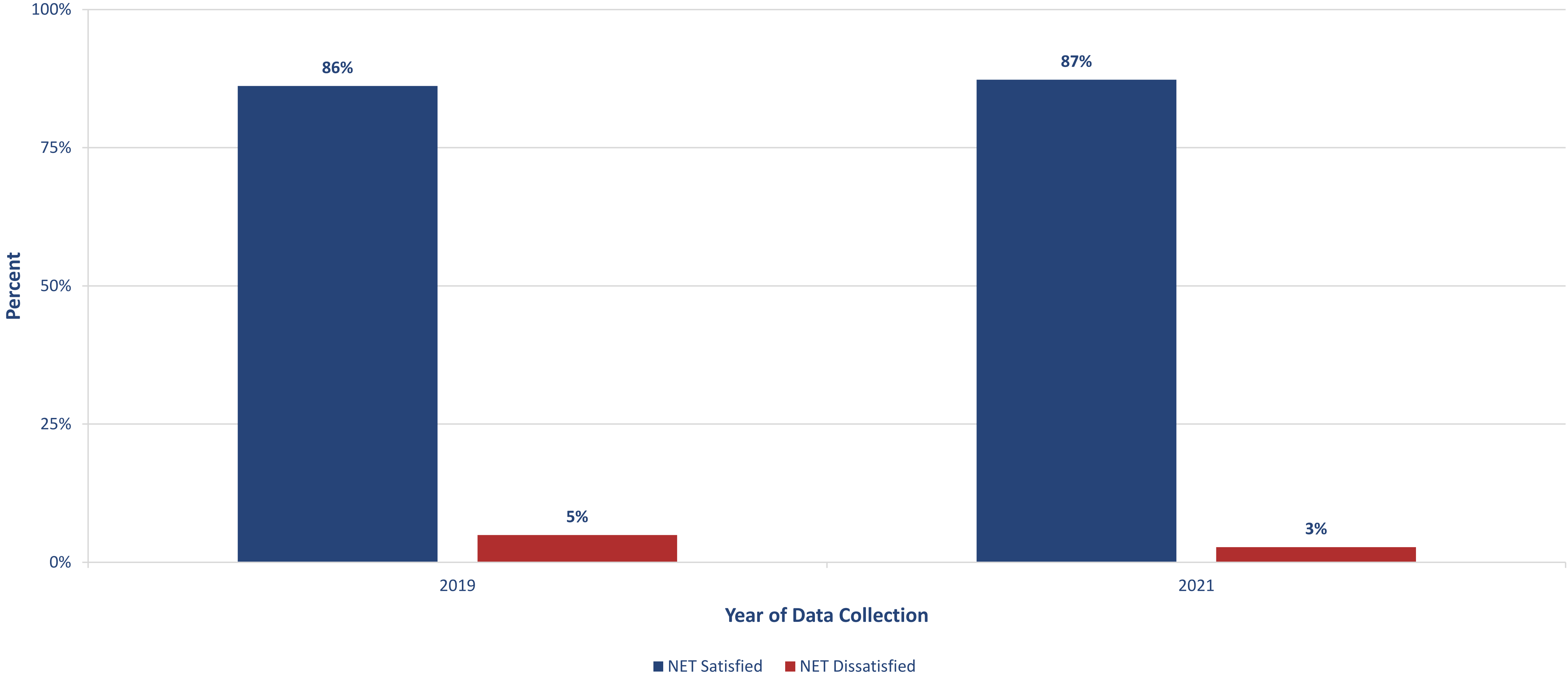
REDHEAD MEDIA SOLUTIONS INC

The reliability of your electricity service – as judged by the number of power outages you experience: How satisfied are you with the electrical service that you receive from Tillsonburg Hydro based on...?

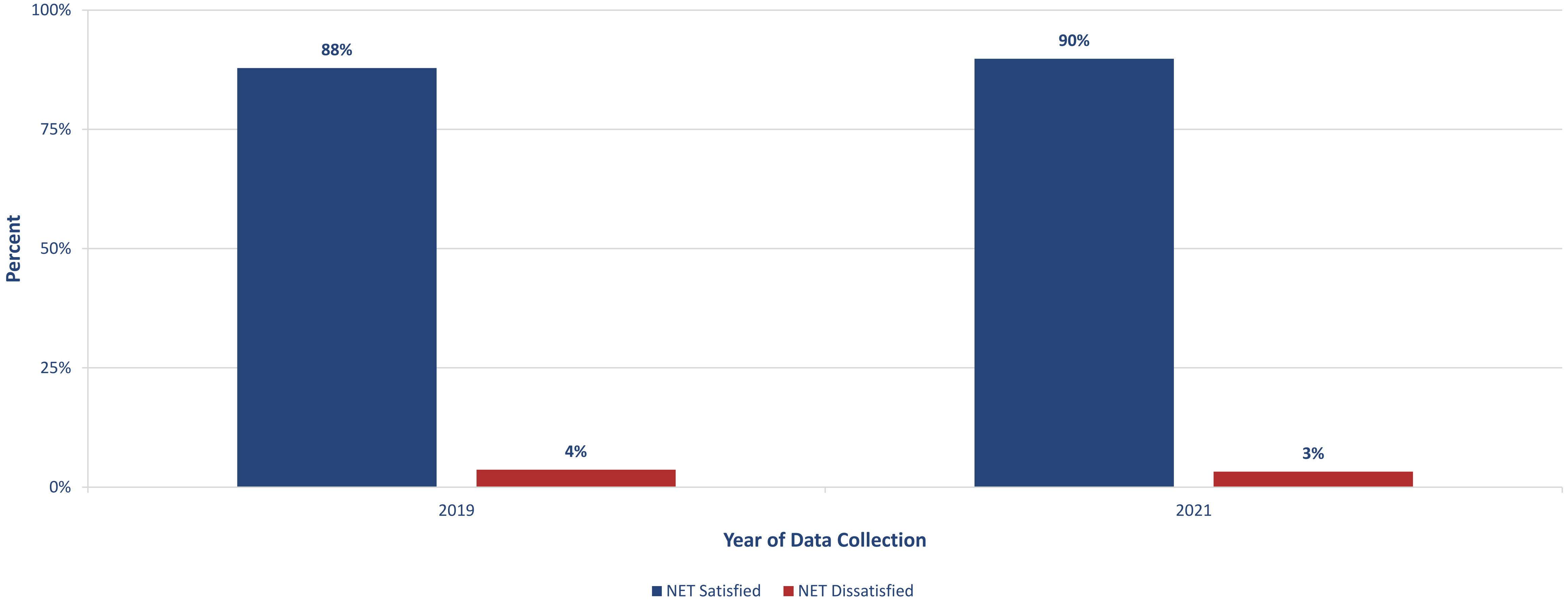


REDHEAD MEDIA SOLUTIONS INC

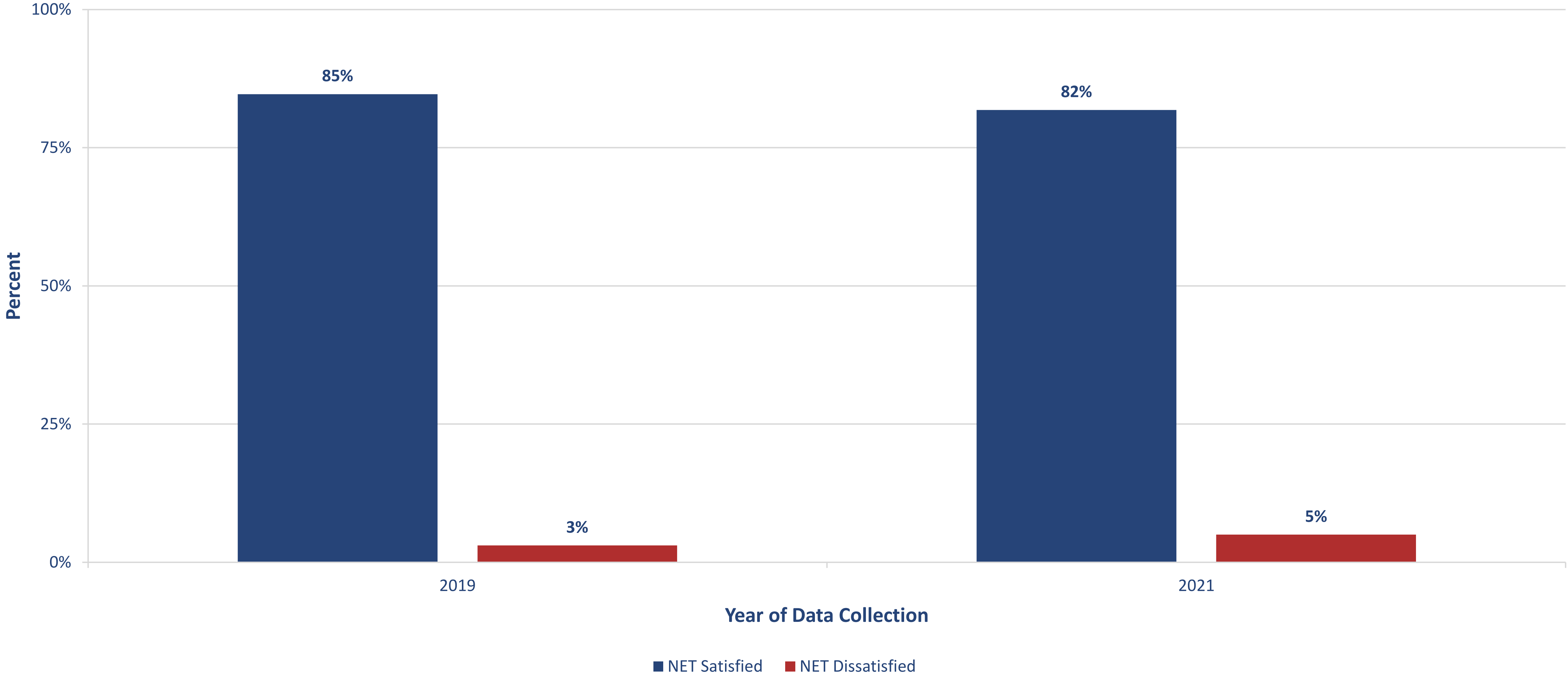
The amount of time it takes to restore power when power outages occur: How satisfied are you with the electrical service that you receive from Tillsonburg Hydro based on...?



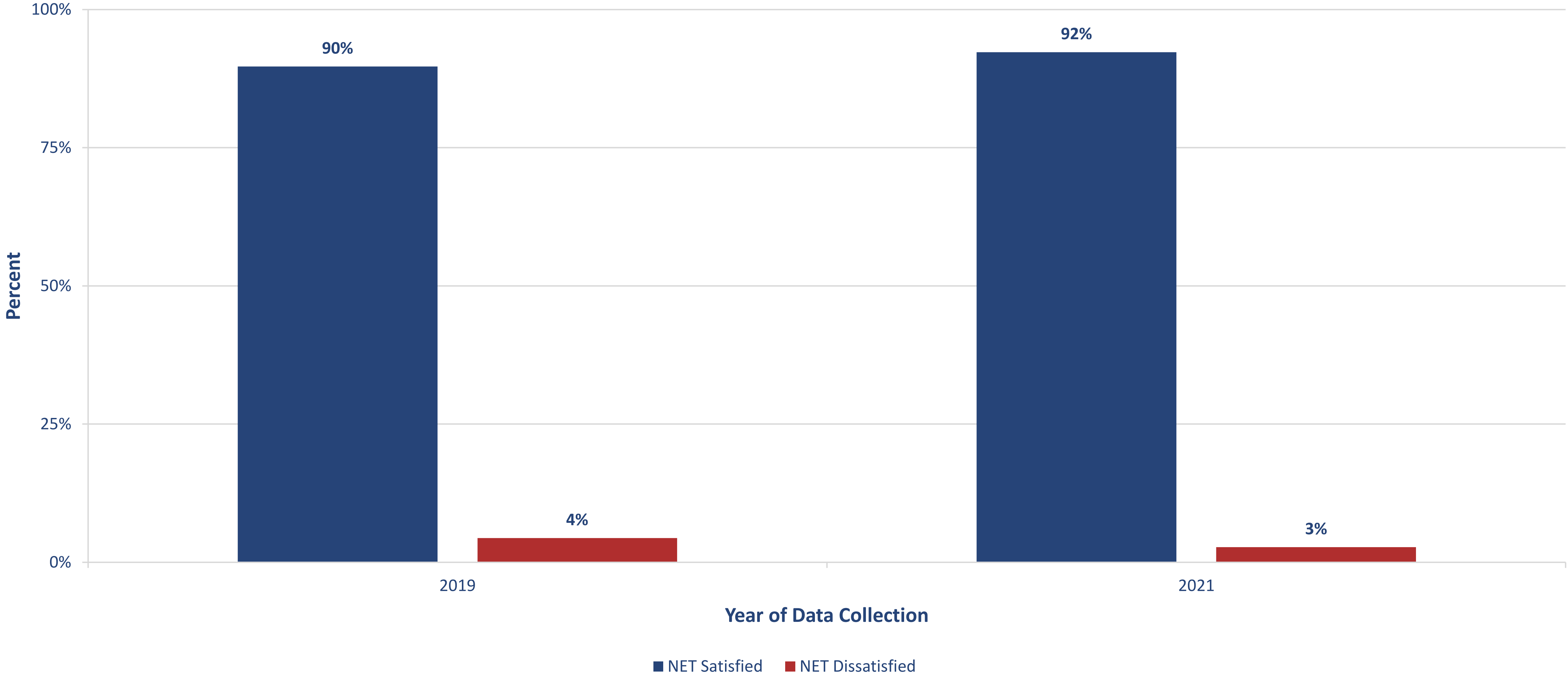
The quality of the power delivered to you as judged by the absence of voltage fluctuations that can result in [flickering/dimming of lights OR have an affect on equipment]: How satisfied are you with the electrical service that you receive from Tillsonburg Hydro based on...?



Providing accurate bills: How satisfied are you with the bills that you receive from Tillsonburg Hydro based on them...?

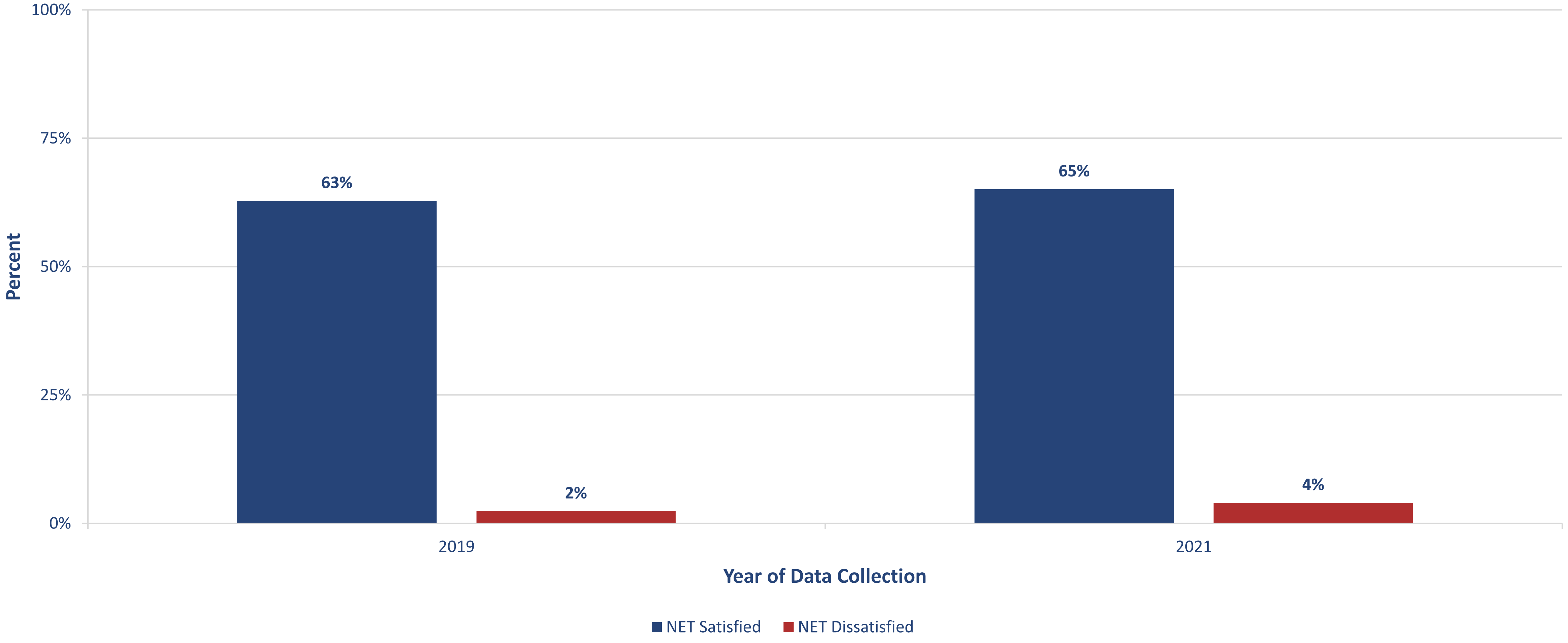


Providing convenient options to both receive and pay your bills: How satisfied are you with the bills that you receive from Tillsonburg Hydro based on them...?



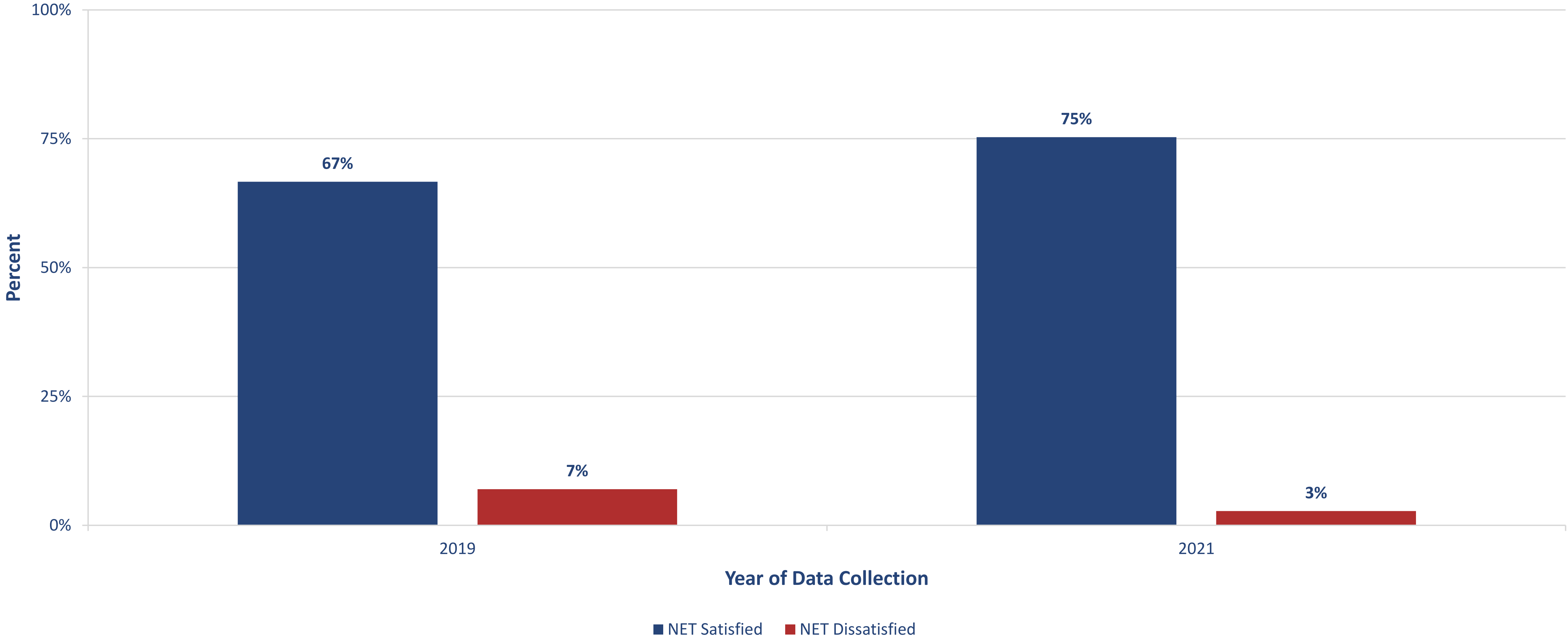
REDHEAD MEDIA SOLUTIONS INC

How satisfied are you with the customer service you have received when dealing with employees of Tillsonburg Hydro, whether on the telephone, via email, in person or through online conversations including social media?



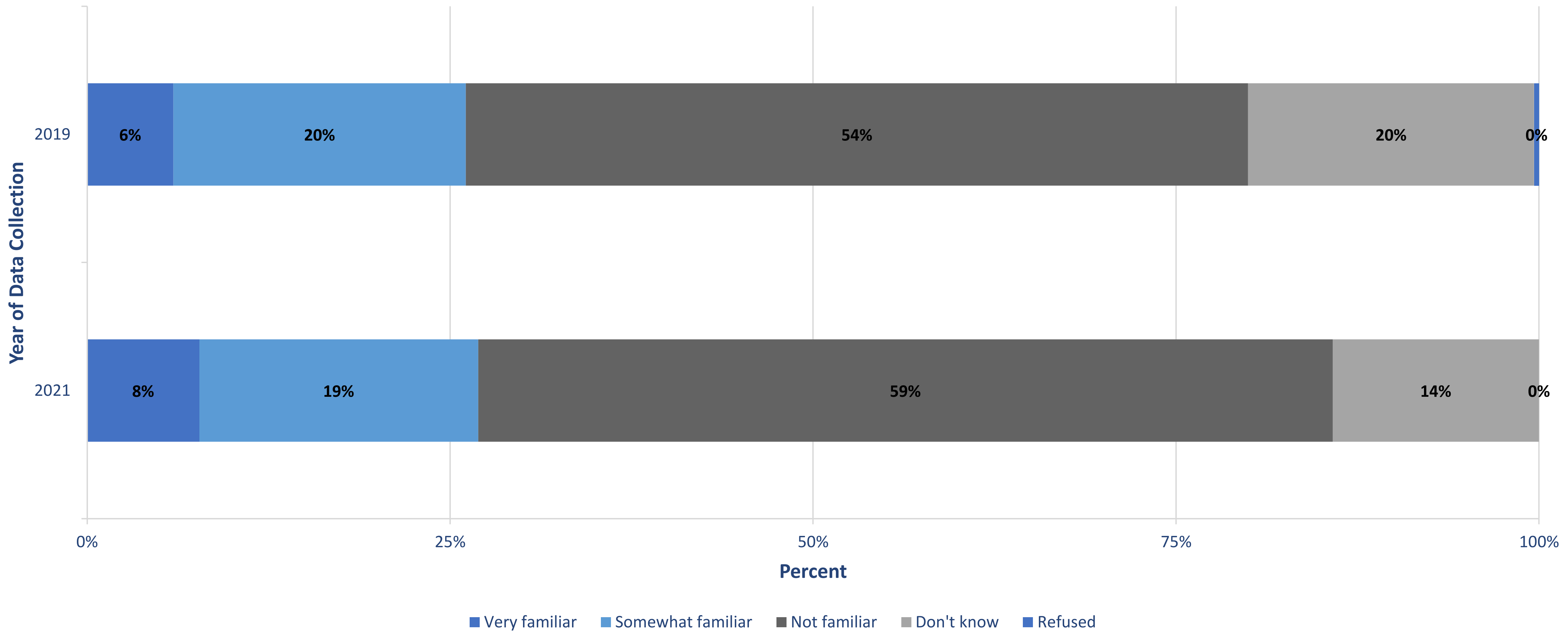
REDHEAD MEDIA SOLUTIONS INC

How satisfied are you with the communications that you may receive from Tillsonburg Hydro without talking directly to an employee, including information found on their website, bill inserts, advertising, notices, emails, or social media sites?



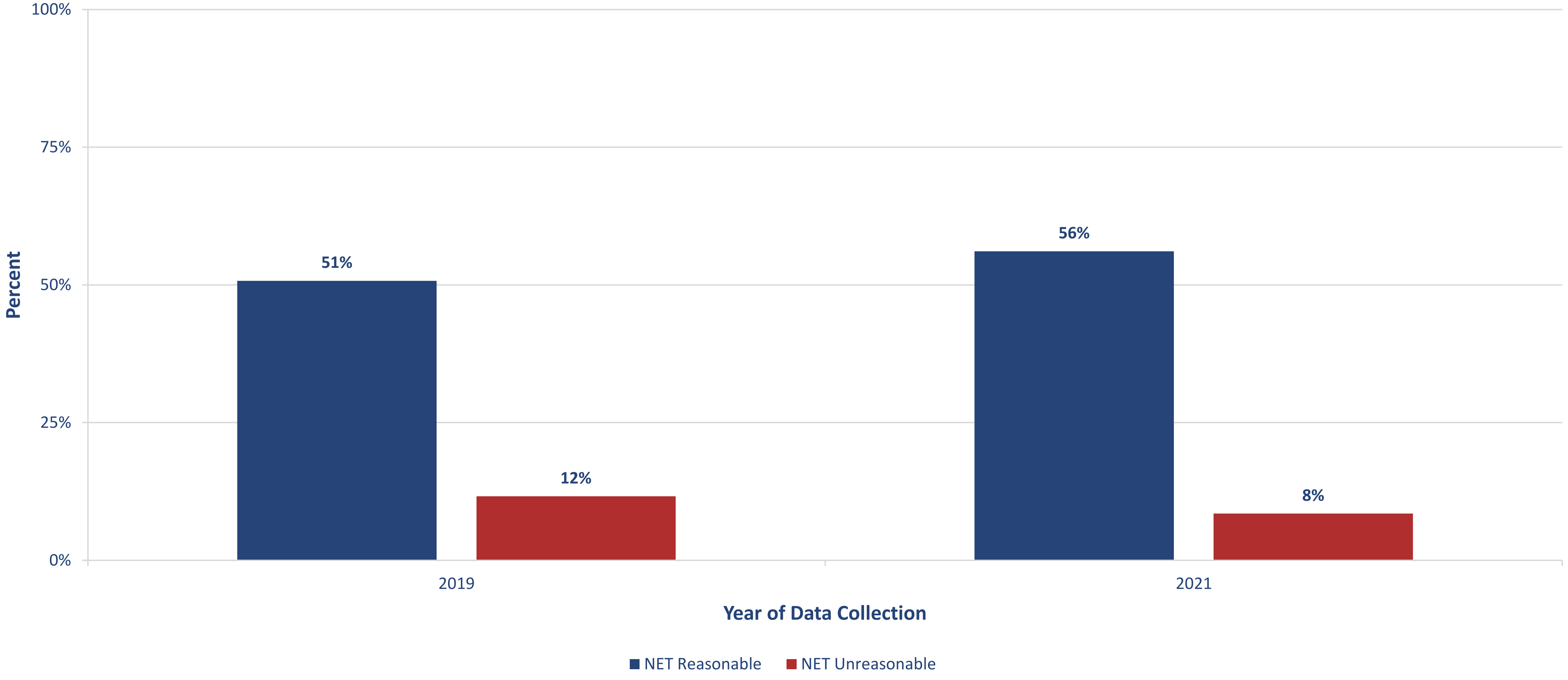
REDHEAD MEDIA SOLUTIONS INC

How familiar are you with the percentage of your electricity bill that went to Tillsonburg Hydro? So, NOT the portions allocated to power generation companies, transmission companies, the provincial government and regulatory agencies.



REDHEAD MEDIA SOLUTIONS INC

Do you feel that the percentage of your total electricity bill that you pay to Tillsonburg Hydro for the services they provide is...?



The cost of my electricity bill has a major impact [on personal finances OR bottom line of organization]: To what extent do you agree with the following statements regarding the electricity system in Ontario?

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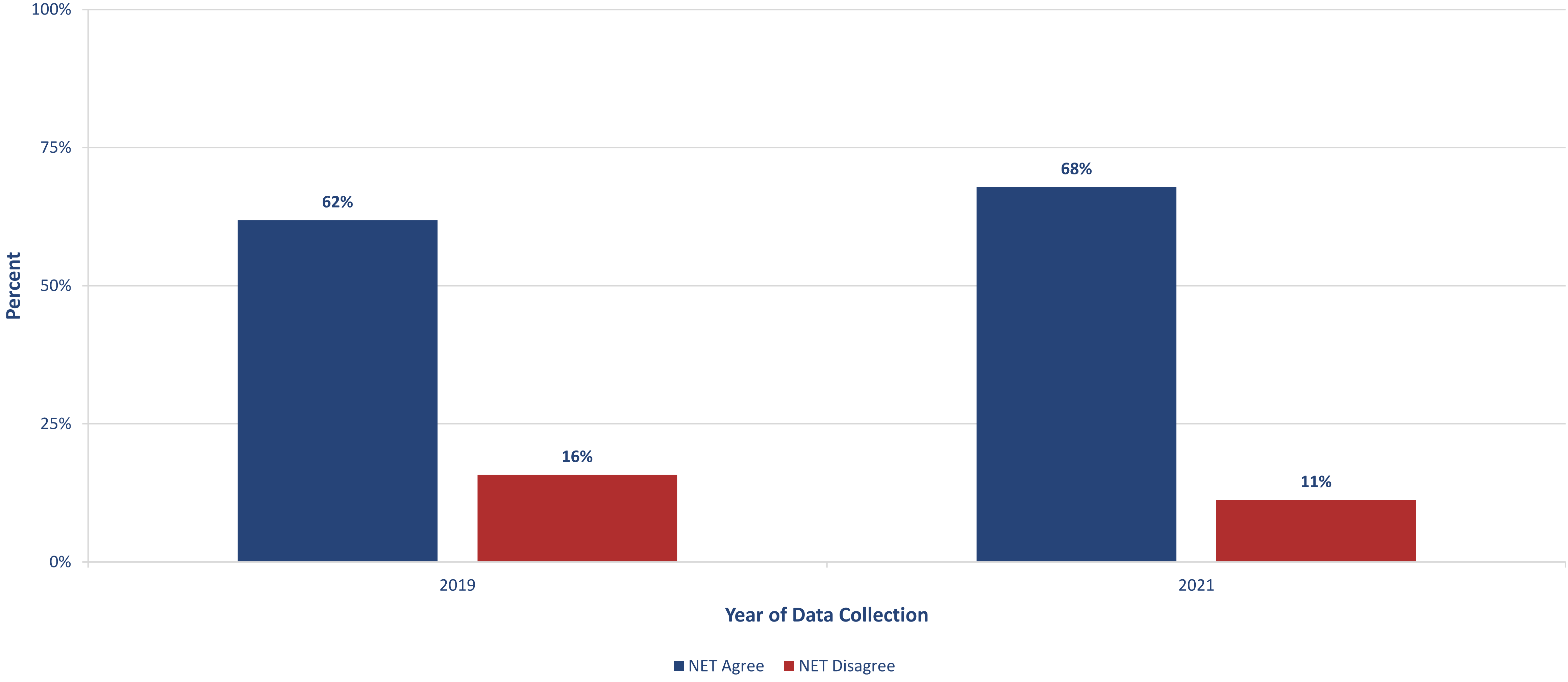
Customers are well served by the electricity system in Ontario: To what extent do you agree with the following statements regarding the electricity system in Ontario?



REDHEAD MEDIA SOLUTIONS INC

METHODOLOGY

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Methodology Summary

Commissioned by	Tillsonburg Hydro Inc.
Sample size	401 randomly selected customers
Margin of error	±4.7 percentage points, 19 times out of 20
Survey mode	Random telephone survey of customer base, CATI data collection
Survey sample	Residential and GS <50kWh customer lists provided by Tillsonburg Hydro
Time of calling	4PM-9PM Weekdays, 10AM-5PM Saturdays, scheduled callbacks
In-field dates	January 11-February 17, 2021
Language	English only
Survey author	Innovative Research/Electricity Distributors Association
Question Order	Report shown in order
Question Wording	Questions shown in report as asked
Survey Company	Redhead Media Solutions Inc/Advanis

REDHEAD MEDIA SOLUTIONS INC

Methodology Details

Target Respondents

The respondents of the survey were Ontario residents who are the primary bill payer or share the responsibility if residential or the person in-charge of managing the electricity bill at the organization if general service, and who resided within one of Tillsonburg Hydro's service territory(ies). Service territories were determined based on customer lists provided by Tillsonburg Hydro.

Sample Size and Statistical Reliability

The final total completed surveys by LDC, and the associated margin of error for each, are shown below.

All margins of error are shown at a 95% confidence level.

- E.g., the margin of error associated with a sample size of 400 for a large (infinite) population is ±4.7 percentage points, 19 times out of 20.

Since Tillsonburg Hydro has a finite population, we used the specific population sizes (i.e., the number of samples records received from Tillsonburg Hydro) in the calculation of margin of error. Doing so is more accurate, and results in a narrower margin of error than if we simply assumed large (infinite) population for each.

Sample sizes were set according to the *LDC Customer Satisfaction Survey: Methodology & Survey Implementation Guide*, prepared for the Electrical Distributors Association (April 19, 2016 revision):

Where possible, sample size of n=400.
Distributors with 3000 to 4999 customers (residential + GS<50), n=300
Distributors with <3000 customers (residential + GS<50), n=200

REDHEAD MEDIA SOLUTIONS INC

Methodology Details

Sampling Methodology

Redhead was provided sample lists from Tillsonburg Hydro. Customer lists included all basic information required such as name, telephone number, region (where applicable), customer type (residential or GS<50), LDC fee, Annual or Monthly consumption values. Redhead then calculated which quartile group each resident belonged to by evenly dividing them into four groups within each region and customer type. These quartiles were calculated based on annual consumption value.

To minimize low response:

- Sample was loaded in batches to ensure the sample was fully utilized before moving onto fresh sample records;
- Calls were made between the hours of 4pm and 9pm ET; and
- Call backs were scheduled and honored between the hours of 9am and 9pm ET.

Sample Cleaning

Redhead cleaned the customer lists individually once received from each LDC to ensure the customer list counts reflected actual individual records that could be called. The following steps were taken during sample cleaning.

- All records with no phone numbers were removed.
- All phone numbers were checked to see if they were valid numbers (i.e. 10 digits, all numerical, etc.) and any bad cases were removed.
- When duplicates were detected based on phone number, the average of the consumption value was calculated and kept for one consolidated record. All others were removed.
- Residential and GS<50KW were separated into their own lists to be loaded and managed separately in the calling system.

Regions within each customer list were given a numerical value to be used for calling quotas.

Methodology Details

Questionnaire

The survey instrument was provided by the Electricity Distributors Association (EDA) developed in conjunction with Innovative Research. The survey consisted of an introduction, overall satisfaction, power quality and reliability, billing and payment, customer service experience, communications, price, optional deeper dive questions, and final personal finance / sector mood measures. Additional questions were provided individually by Tillsonburg Hydro. These questions are not required as part of the survey and, as outlined in the methodology guideline, were asked after all the standard and required questions.

Data Collection

Computer aided telephone interviews (CATI) were conducted from January 11-February 17, 2021.

Quality Control

- Advanis, on behalf of Redhead, trained the interviewers to understand the study's objectives;
- Detailed call records are kept by the automated CATI system, and are supplemented by output files to SPSS for productivity analysis (i.e., not subject to human error);
- The survey was soft launched in LDCs that had the most available sample, and the data was then checked before calling began in full for Tillsonburg Hydro;
- 100% of all surveys are digitally recorded for potential review (see next bullet);
- Advanis' Quality Assurance team listened to the actual recordings of five percent of completed surveys and compared the responses to those entered by the interviewer to ensure that responses from respondents are properly recorded;
- Team Supervisors conduct regular more formal evaluations with each interviewer, in addition to nightly monitoring of each interviewer on their team;
- Project Managers closely monitored the progress of data collection, including call record dispositions;
- All SPSS code is reviewed by a more senior researcher;
- All Report Builder output is reviewed by a more senior researcher; and
- All values in the report are reviewed by another team member to ensure accuracy.

Methodology Details

Analysis of Findings & Data Weighting

Results were weighted to match the proportion of low volume rate class records as provided to Redhead after cleaning of the sample file. Where a region flag was also provided, results were weighted to the low volume rate class within each region and regions were weighted proportionately to one another based on the customer base as provided in the cleaned sample file.

The Customer Satisfaction index scores have been highlighted and were calculated as described below, based on instructions in the Survey Methodology Guidelines. The "response values" referenced in the description below were also determined and provided by the survey authors.

Data analysis and cross-tabulation have been conducted using SPSS and Report Builder software.

This **index score** is calculated using the following process:

Step 1: Weight data to n=400 with each low volume rate class proportionate to its share of LDC customer base.

Step 2: Rescale the index score variables onto the 0 to 1 scale as indicated by the response values detailed below.

Step 3: The average result of the questions asked for each OEB topic and the overall satisfaction score will be added together[3].

	B5
+	**[C6+C7+C8]** divided by 3
+	**[D9+D10]** divided by 2
+	**E11**
+	**F12**
+	**G14**
=	**Total cumulative scores**

Step 4: The total cumulative score from Step 2 will be divided by 6 to generate the **Customer Satisfaction Index Score** (bound between 0-1).

The chart on the following page illustrates how the **Customer Satisfaction Index Score** will be calculated.

As noted above, LDCs without a region flag were weighted to their low volume rate class proportion based on the cleaned sample file. LDCs with a region flag were weighted to their low volume rate class proportion within each region based on the cleaned sample file, and then regions were weighted proportionately to one another based on the customer base as provided in the cleaned sample file.

Specific values of the number of sample records, estimated population proportions, and final weighted sample counts within Tillsonburg Hydro are provided below. The sum of the regional population proportions within an LDC may not equal 100% due to rounding.

Methodology Tables

Margin of error

LDC	Customer Records from LDC	Completed Surveys	Sample Size as % of Customer list	Margin of Error @ 95% confidence level
Tillsonburg Hydro	6,727	401	5.96%	+/- 4.7%

Sample weighting

Tillsonburg Hydro						
Regions Flagged in Sample	Low Volume Rate Class	Clean, Deduplicated Sample Received	Rate Class Proportion	Estimated Customer Proportion	Weighted Sample Count	Unweighted Sample Count
TOTAL	Residential	6,312	94%	100%	376	376
	General Service < 50 kW	415	6%		25	25
					401	401

Thank You

We greatly appreciate working on this important project for Tillsonburg Hydro and hope we have met or exceeded your expectations.

We are happy to present this data to your staff or Board members upon request. If you wish to do so, please contact us for an appointment.

We look forward to working with you on future projects, including the Electricity Safety Awareness Survey later in 2021. Please note if you have any other projects that we may be able to help you with, don't hesitate to be in touch.

Graydon Smith - President
Redhead Media Solution Inc.
505 Hwy 118 W.
Suite 416
Bracebridge, ON
P1L 2G7

TILLSONBURG HYDRO INC.

REDHEAD MEDIA SOLUTIONS INC

Appendix E – THI Scorecards

Appendix E-1 – 2016 Scorecard

Scorecard - Tillsonburg Hydro Inc.

10/21/2020

Performance Outcomes	Performance Categories	Measures		2015	2016	2017	2018	2019	Trend	Target: Industry	Target: Distributor
Customer Focus Services are provided in a manner that responds to identified customer preferences.	**Service Quality**	New Residential/Small Business Services Connected on Time		94.60%	97.60%	99.47%	97.96%	99.56%	up	90.00%	
		Scheduled Appointments Met On Time		100.00%	98.30%	100.00%	100.00%	98.44%	down	90.00%	
		Telephone Calls Answered On Time		68.40%	64.00%	84.57%	88.18%	84.59%	up	65.00%	
	Customer Satisfaction	First Contact Resolution		95.04%	96.87%	99.3%	98.62%	97.7%			
		Billing Accuracy		99.94%	98.91%	99.36%	99.73%	99.83%	up	98.00%	
		Customer Satisfaction Survey Results		Satisfied	satisfied	satisfied	satisifed	satisfied			
Operational Effectiveness Continuous improvement in productivity and cost performance is achieved; and distributors deliver on system reliability and quality objectives.	**Safety**	Level of Public Awareness		83.00%	83.00%	81.60%	81.60%	83.70%			
		Level of Compliance with Ontario Regulation 22/04 [1]		NI	NC	NI	C	C	flat		C
		Serious Electrical Incident Index	Number of General Public Incidents	0	0	0	0	0	flat		0
			Rate per 10, 100, 1000 km of line	0.000	0.000	0.000	0.000	0.000	flat		0.000
	System Reliability	Average Number of Hours that Power to a Customer is Interrupted [2]		0.75	1.42	1.14	1.83	0.96	down		1.25
		Average Number of Times that Power to a Customer is Interrupted [2]		1.07	0.77	1.10	2.28	0.56	up		0.96
	Asset Management	Distribution System Plan Implementation Progress		In Progress	In progress	in progress	in progress	in-progress			
	Cost Control	Efficiency Assessment		3	3	3	3	3			
		Total Cost per Customer [3]		$648	$672	$654	$718	$748			
		Total Cost per Km of Line [3]		$34,135	$35,562	$35,137	$37,620	$40,406			
Public Policy Responsiveness Distributors deliver on obligations mandated by government (e.g., in legislation and in regulatory requirements imposed further to Ministerial directives to the Board).	**Conservation & Demand Management**	Net Cumulative Energy Savings [4]		16.68%	24.79%	61.79%	73.00%	106.00%			11.31 GWh
	Connection of Renewable Generation	Renewable Generation Connection Impact Assessments Completed On Time					100.00%	33.33%			
		New Micro-embedded Generation Facilities Connected On Time						100.00%	target met	90.00%	
Financial Performance Financial viability is maintained; and savings from operational effectiveness are sustainable.	**Financial Ratios**	Liquidity: Current Ratio (Current Assets/Current Liabilities)		1.78	2.03	2.04	1.64	2.82			
		Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio		0.04	0.02	0.05	0.07	0.31			
		Profitability: Regulatory Return on Equity	Deemed (included in rates)	8.98%	8.98%	8.98%	8.98%	8.98%			
			Achieved	11.02%	5.75%	9.73%	5.10%	4.74%			

1. Compliance with Ontario Regulation 22/04 assessed: Compliant (C); Needs Improvement (NI); or Non-Compliant (NC).
2. The trend's arrow direction is based on the comparison of the current 5-year rolling average to the distributor-specific target on the right. An upward arrow indicates decreasing reliability while downward indicates improving reliability.
3. A benchmarking analysis determines the total cost figures from the distributor's reported information.
4. The CDM measure is based on the now discontinued 2015-2020 Conservation First Framework. 2019 results include savings reported to the IESO up until the end of February 2020.

Legend:
5-year trend: up, down, flat
Current year: target met, target not met

2019 Scorecard MD&A- General Overview Tillsonburg Hydro Inc.

During 2019, Tillsonburg Hydro Inc. (THI) met all industry targets reported on the Scorecard including improvements over 2018 results in the System Reliability metrics. THI continues year-over-year improvements, when considering the Scorecard in entirety.

Service Quality

Tillsonburg Hydro Inc. (THI) strives to provide customer service that exceeds the Ontario Energy Board (OEB) Industry Targets. During 2019 THI continued to exceed the industry targets for all Service Quality measures on the scorecard.

- **New Residential/Small Business Services Connected on Time**
  THI connected 227 of 228 new services (99.56%) within the 5 business day standard during fiscal 2019; this exceeds the OEB target of 90%.

- **Scheduled Appointments Met On Time**
  During fiscal 2019, THI attended 126 of 128 scheduled appointments (98.44%) as scheduled. THI consistently exceeds the OEB target of 90%.

- **Telephone Calls Answered On Time**
  THI received a total of 4,419 incoming calls, which met OEB reporting guidelines, during 2019. Of these calls, 3,738 were answered within the 30 second metric used by the OEB resulting in an 84.59% metric. Please note, as a result of a telephone system change in Q4 2019, THI was only able to report on January to September phone calls, however, THI is confident that the same level of service was provided in the October to December 2019 timeframe.

Customer Satisfaction

The satisfaction of customers is of high importance to THI. The Customer Satisfaction metrics on the Scorecard both exceed OEB industry targets and have been consistent during 2014, 2015, 2016, 2017& 2018.

- **First Contact Resolution**

  THI resolved customer issues 97.70% during the first contact with THI staff during 2019. THI will continue to value customer's time by empowering our staff to resolve customer issues during the first contact.

- **Billing Accuracy**

  During 2019, THI produced 89,195 bills and achieved 99.83% accuracy metric. This metric exceeds the 98% industry target set by the OEB and is consistent with historical results.

- **Customer Satisfaction Survey Results**

  During 2019, THI conducted an independent Customer Satisfaction Survey to assist in obtaining information relating to Customer Satisfaction. THI's results were consistent with previous Satisfaction Surveys (last performed in 2017) where Customers were "Satisfied" with THI business results.

Safety

- **Public Safety**

  The Ontario Energy Board (OEB) introduced the Safety measure in 2015. This measure looks at safety from a customers' point of view as safety of the distribution system is a high priority. The Safety measure is generated by the Electrical Safety Authority (ESA) and includes three components: Public Awareness of Electrical Safety, Compliance with Ontario Regulation 22/04, and the Serious Electrical Incident Index.

  - **Component A – Public Awareness of Electrical Safety**

    THI engaged a 3rd party, during 2018 and will be updated in 2020, to survey residents within the THI service territory on the level of public awareness on electrical safety. THI achieved a result of 83.7%. While there is currently not an industry target published by the OEB, peer review of other Local Distribution Companies (LDCs), using our same vendor, show that of 15 LDCs data that was available the safety metrics were between 80.4% and 86.2% with the median score of 83.7%. THI's results are consistent with this group.

  - **Component B – Compliance with Ontario Regulation 22/04**

    During 2019, THI has achieved a "C" rating (Compliant).

  - **Component C – Serious Electrical Incident Index**

    For the years 2013 through 2019 THI has not had any "Serious Electrical Incidents". As a result the numbers submitted for THI's scorecard by the Electrical Safety Authority are zeros. THI continues to work with ESA to ensure the distributor has done everything necessary to maintain this level of compliance.

System Reliability

- **Average Number of Hours that Power to a Customer is Interrupted**
  During 2019, THI reported a decrease in the Average number of Hours that Power to a customer is interrupted (SAIDI) compared to 2018. 2019 results presorted a metric of 0.96 which is below the distributor target of 1.25 (2015 to 2019 average).

- **Average Number of Times that Power to a Customer is Interrupted**
  During 2019, THI reported a decrease in the Average Number of Times that Power to a customer is interrupted (SAIFI i.e. Frequency) compared to 2018 results. 2019 results (0.56) are below the distributor target of 0.96 (2015 to 2019 average).

Asset Management

- **Distribution System Plan Implementation Progress**
  Tillsonburg Hydro Inc. is in the process of completing our Distribution System Plan and anticipates filing a revised DSP during 2021.

Cost Control

- **Efficiency Assessment**
  The OEB contracts with 3rd party vendors to ranks LDCs in Ontario on an annual basis. The LDCs are ranked into 1 of 5 efficiency categories with category 1 being the most efficient and 5 being the least efficient. During 2019, THI maintained our ranking of group 3. Group 3 LDCs are defined as having actual costs within +/- 10% of predicted costs. Group 3 is the "average LDC".

- **Total Cost per Customer**
  Total cost per customer is calculated as the sum of THI capital and operating costs and dividing this cost figure by the total number of customers that THI serves. THI's total cost per customer in 2019 was $748 which is an increase compared to historical values, but retains THI within the 3 – Tranche of IRM stretch factors (the average grouping).

- **Total Cost per Km of Line**
  This measure uses the same total cost that is used in the Cost per Customer calculation above, The Total cost is divided by the kilometers of line that THI operates to serve its customers. THI's total cost per Km of Line in 2019 is $40,406 based on 132km of line. This is a slight increase compared 2018 values.

Conservation & Demand Management

- **Net Cumulative Energy Savings**

  THI's Net Cumulative Energy Savings for 2019, as a percentage of our 2015-2020 allocated target of 11,310 MWh, were reported 106% of the allocated target. THI has partnered with London Hydro to deliver the Conservation First Framework (CFF) conservation program.

Connection of Renewable Generation

- **Renewable Generation Connection Impact Assessments Completed on Time**
  THI has requests for 3 CIA during 2019 or which 2 were processed outside of the prescribed time frames. This is an atypical result for 2019 and future years' activity will be in line with 2018 results (100% metric).

- **New Micro-embedded Generation Facilities Connected On Time**
  THI did not connect any new micro-embedded generation facility during 2019.

Financial Ratios

- **Liquidity: Current Ratio (Current Assets/Current Liabilities)**

  As an indicator of financial health, a current ratio that is greater than 1 is considered good as it indicates that the company can pay its short term debts and financial obligations. Companies with a ratio of greater than 1 are often referred to as being "liquid". The higher the number, the more "liquid" and the larger the margin of risk to cover the company's short-term debts and financial obligations.

  Tillsonburg Hydro Inc.'s current ratio increased from 1.64 in 2018 to 2.82 during 2019.

- **Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio**

  The OEB uses a deemed capital structure of 60% debt, 40% equity for electricity distributors when establishing rates. This deemed capital mix is equal to a debt to equity ratio of 1.5 (60/40).

  A debt to equity ratio of more than 1.5 indicates that a distributor is more highly levered than the deemed capital structure. A high debt to equity ratio may indicate that an electricity distributor may have difficulty generating sufficient cash flows to make its debt payments.

  A debt to equity ratio of less than 1.5 indicates that the distributor is less levered than the deemed capital structure. A low debt-to-equity ratio may indicate that an electricity distributor is not taking advantage of the increased profits that financial leverage may bring.

  THI has a debt to equity structure that is less levered – this is demonstrated by the 2019 debt to equity ratio of 0.31.

  Capital investments during 2020 and future years will see this ratio continue to climb towards industry norms.

- **Profitability: Regulatory Return on Equity – Deemed (included in rates)**

  THI's current distribution rates were approved by the OEB and include an expected (deemed) regulatory return on equity of 8.98%. The OEB allows a distributor to earn within +/- 3% of the expected return on equity. When a distributor performs outside of this range, the actual performance may trigger a regulatory review of the distributor's revenues and costs structure by the OEB.

- **Profitability: Regulatory Return on Equity – Achieved**

  THI had an atypical year with increased costs (as identified below) in staffing and external Operations Expense (Transformer Maintenance and Line Clearing). These items were above the amounts contained within the 2013 CoS application. It is important to note that these higher levels of costs were known by the THI Board and were deemed necessary for operational and regulatory reasons and that these increased expenses are temporary in nature. Specifically during 2019 the addition of staff members in the management and workforce levels were identified for succession planning purposes. 2020 will see these temporary increased staffing positions removed from the expense base and will return THI to within the 3% ROE target band.

  THI has achieved the following ROE values as reported through the RRR process: 2015 - 11.02%, 2016 - 5.75%, 2017 - 9.73%, 2018 - 5.10%, 2019 – 4.74%. If these are averaged over the 5 year period an average ROE % of 7.3% is achieved. This multi-year average falls within the 3% ROE target band.

Note to Readers of 2019 Scorecard MD&A

The information provided by distributors on their future performance (or what can be construed as forward-looking information) may be subject to a number of risks, uncertainties and other factors that may cause actual events, conditions or results to differ materially from historical results or those contemplated by the distributor regarding their future performance. Some of the factors that could cause such differences include legislative or regulatory developments, financial market conditions, general economic conditions and the weather. For these reasons, the information on future performance is intended to be management's best judgement on the reporting date of the performance scorecard, and could be markedly different in the future.

Appendix E-2 – 2017 Scorecard

Scorecard - Tillsonburg Hydro Inc.

10/22/2021

Performance Outcomes	Performance Categories	Measures		2016	2017	2018	2019	2020	Trend	Target: Industry	Target: Distributor
Customer Focus Services are provided in a manner that responds to identified customer preferences.	Service Quality	New Residential/Small Business Services Connected on Time		97.60%	99.47%	97.96%	99.56%	100.00%	up	90.00%	
		Scheduled Appointments Met On Time		98.30%	100.00%	100.00%	98.44%	99.36%	up	90.00%	
		Telephone Calls Answered On Time		64.00%	84.57%	88.18%	84.59%	0.00%	down	65.00%	
	Customer Satisfaction	First Contact Resolution		96.87%	99.3	98.62	97.7%	97.2			
		Billing Accuracy		98.91%	99.36%	99.73%	99.83%	99.80%	up	98.00%	
		Customer Satisfaction Survey Results		satisfied	satisfied	satisfied	satisfied	satisfied			
Operational Effectiveness Continuous improvement in productivity and cost performance is achieved; and distributors deliver on system reliability and quality objectives.	Safety	Level of Public Awareness		83.00%	81.60%	81.60%	83.70%	83.70%			
		Level of Compliance with Ontario Regulation 22/04 [1]		NC	NI	C	C	C	up		C
		Serious Electrical Incident Index	Number of General Public Incidents	0	0	0	0	0	flat		0
			Rate per 10, 100, 1000 km of line	0.000	0.000	0.000	0.000	0.000	flat		0.000
	System Reliability	Average Number of Hours that Power to a Customer is Interrupted [2]		1.42	1.14	1.83	0.96	1.69	up		1.22
		Average Number of Times that Power to a Customer is Interrupted [2]		0.77	1.10	2.28	0.56	1.02	down		1.16
	Asset Management	Distribution System Plan Implementation Progress		In progress	in progress	in progress	in-progress	in-progress			
	Cost Control	Efficiency Assessment		3	3	3	3	3			
		Total Cost per Customer [3]		$672	$654	$718	$748	$695			
		Total Cost per Km of Line [3]		$35,562	$35,137	$37,620	$40,406	$40,648			
Public Policy Responsiveness Distributors deliver on obligations mandated by government (e.g., in legislation and in regulatory requirements imposed further to Ministerial directives to the Board).	Connection of Renewable Generation	Renewable Generation Connection Impact Assessments Completed On Time				100.00%	33.33%	100.00%			
		New Micro-embedded Generation Facilities Connected On Time					100.00%			90.00%	
Financial Performance Financial viability is maintained; and savings from operational effectiveness are sustainable.	Financial Ratios	Liquidity: Current Ratio (Current Assets/Current Liabilities)		2.03	2.04	1.64	2.82	2.16			
		Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio		0.02	0.05	0.07	0.31	0.42			
		Profitability: Regulatory Return on Equity	Deemed (included in rates)	8.98%	8.98%	8.98%	8.98%	8.98%			
			Achieved	5.75%	9.73%	5.10%	4.74%	2.42%			

1. Compliance with Ontario Regulation 22/04 assessed: Compliant (C); Needs Improvement (NI); or Non-Compliant (NC).
2. An upward arrow indicates decreasing reliability while downward indicates improving reliability.
3. A benchmarking analysis determines the total cost figures from the distributor 's reported information.

Legend:
5-year trend: up, down, flat
Current year: target met, target not met

2020 Scorecard MD&A- General Overview Tillsonburg Hydro Inc.

During 2020, Tillsonburg Hydro Inc. (THI) met most industry targets reported on the Scorecard including improvements over 2019 results in the System Quality metrics. THI continues year-over-year improvements, when considering the Scorecard in entirety.

Service Quality

Tillsonburg Hydro Inc. (THI) strives to provide customer service that exceeds the Ontario Energy Board (OEB) Industry Targets. During 2020, THI continued to exceed the industry targets for all Service Quality measures on the scorecard.

- **New Residential/Small Business Services Connected on Time**
  THI connected 284 of 284 new services (100.00%) within the 5-business day standard during fiscal 2020; this exceeds the OEB target of 90%.

- **Scheduled Appointments Met On Time**
  During fiscal 2020, THI attended 156 of 157 scheduled appointments (99.36%) as scheduled. THI consistently exceeds the OEB target of 90%.

- **Telephone Calls Answered On Time**
  Due to a telephone system change and a delay in the implementation of software THI is unable to provide data with respect to this performance category for 2020. THI anticipates that the software will be implemented in the fourth quarter of 2021. THI is confident that the same level of service in the past has been maintained.

Customer Satisfaction

The satisfaction of customers is of high importance to THI. The Customer Satisfaction metrics on the Scorecard exceed OEB industry targets and have been consistent during 2015 through 2020.

- **First Contact Resolution**
  THI resolved customer issues 97.20% during the first contact with THI staff during 2020. THI will continue to value customer's time by empowering our staff to resolve customer issues during the first contact.

- **Billing Accuracy**
  During 2020, THI produced 97,104 bills and achieved 99.80% accuracy metric. This metric exceeds the 98% industry target set by the OEB and is consistent with historical results.

- **Customer Satisfaction Survey Results**
  During 2019, THI conducted an independent Customer Satisfaction Survey to assist in obtaining information relating to Customer Satisfaction. THI's results were consistent with previous Satisfaction Surveys (last performed in 2017) where Customers were "Satisfied" with THI business results.

Safety

- **Public Safety**

  The Ontario Energy Board (OEB) introduced the Safety measure in 2015. This measure looks at safety from a customers' point of view as safety of the distribution system is a high priority. The Safety measure is generated by the Electrical Safety Authority (ESA) and includes three components: Public Awareness of Electrical Safety, Compliance with Ontario Regulation 22/04, and the Serious Electrical Incident Index.

  - **Component A – Public Awareness of Electrical Safety**

    THI engaged a 3rd party, during 2018 and will be updated in 2021 to survey residents within the THI service territory on the level of public awareness on electrical safety. THI achieved a result of 83.7%. While there is currently not an industry target published by the OEB, peer review of other Local Distribution Companies (LDCs), using our same vendor, show that of 15 LDCs data that was available the safety metrics were between 80.4% and 86.2% with the median score of 83.7%. THI's results are consistent with this group.

  - **Component B – Compliance with Ontario Regulation 22/04**

    During 2020, THI has achieved a "C" rating (Compliant).

  - **Component C – Serious Electrical Incident Index**

    For the years 2013 through 2020 THI has not had any "Serious Electrical Incidents". As a result, the numbers submitted for THI's scorecard by the Electrical Safety Authority are zeros. THI continues to work with ESA to ensure the distributor has done everything necessary to maintain this level of compliance.

System Reliability

- **Average Number of Hours that Power to a Customer is Interrupted**
  During 2020, THI reported an increase in the Average number of Hours that Power to a customer is interrupted (SAIDI) compared to 2019. The 2020 results presented a metric of 1.69, which is does not meet the distributor target of 1.22.

- **Average Number of Times that Power to a Customer is Interrupted**
  During 2020, THI reported an increase in the Average Number of Times that Power to a customer is interrupted (SAIFI i.e. Frequency) compared to 2019 results. The 2020 results of 1.02 is better than the distributor target of 1.16.

Asset Management

- **Distribution System Plan Implementation Progress**
  Tillsonburg Hydro Inc. is in the process of completing our Distribution System Plan and anticipates filing a revised DSP during 2021.

Cost Control

- **Efficiency Assessment**
  The OEB contracts with 3rd party vendors to ranks LDCs in Ontario on an annual basis. The LDCs are ranked into 1 of 5 efficiency categories with category 1 being the most efficient and 5 being the least efficient. During 2020, THI maintained our ranking of group 3. Group 3 LDC's are defined as having actual costs within +/- 10% of predicted costs. Group 3 is the "average LDC".

- **Total Cost per Customer**
  Total cost per customer is calculated as the sum of THI capital and operating costs and dividing this cost figure by the total number of customers that THI serves. THI's total cost per customer in 2020 was $695, which is an improvement compared to 2019 values, and retains THI within the 3 – Tranche of IRM stretch factors (the average grouping).

- **Total Cost per Km of Line**
  This measure uses the same total cost that is used in the Cost per Customer calculation above. The total cost is divided by the kilometers of line that THI operates to serve its customers. THI's total cost per Km of Line in 2020 is $40,648 based on 132km of line. This is a slight increase compared 2019 values.

Conservation & Demand Management

- **Net Cumulative Energy Savings**
  THI has exceeded the energy savings targets set for the program for 2019/2020. The Conservation and Demand Management (CDM) programs will be delivered by the IESO starting January 2021.

Connection of Renewable Generation

- **Renewable Generation Connection Impact Assessments Completed on Time**
  THI has requests for 2 CIA's during 2020 of which 2 were processed within the prescribed time frame.

- **New Micro-embedded Generation Facilities Connected On Time**
  THI did not connect any new micro-embedded generation facility during 2020.

Financial Ratios

- **Liquidity: Current Ratio (Current Assets/Current Liabilities)**
  As an indicator of financial health, a current ratio that is greater than 1 is considered good as it indicates that the company can pay its short term debts and financial obligations. Companies with a ratio of greater than 1 are often referred to as being "liquid". The higher the number, the more "liquid" and the larger the margin of risk to cover the company's short-term debts and financial obligations.

  Tillsonburg Hydro Inc.'s current ratio decreased from 2.82 in 2019 to 2.16 during 2020.

- **Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio**
  The OEB uses a deemed capital structure of 60% debt, 40% equity for electricity distributors when establishing rates. This deemed capital mix is equal to a debt to equity ratio of 1.5 (60/40).

  A debt to equity ratio of more than 1.5 indicates that a distributor is more highly levered than the deemed capital structure. A high debt to equity ratio may indicate that an electricity distributor may have difficulty generating sufficient cash flows to make its debt payments.

  A debt to equity ratio of less than 1.5 indicates that the distributor is less levered than the deemed capital structure. A low debt-to-equity ratio may indicate that an electricity distributor is not taking advantage of the increased profits that financial leverage may bring.

  THI has a debt to equity structure that is less levered – this is demonstrated by the 2020 debt to equity ratio of 0.42.

  Capital investments during 2021 and future years will see this ratio continue to climb towards industry norms.

- **Profitability: Regulatory Return on Equity – Deemed (included in rates)**
  THI's current distribution rates have been approved by the OEB and include an expected (deemed) regulatory return on equity of 8.98%. The OEB allows a distributor to earn within +/- 3% of the expected return on equity. When a distributor performs outside of this range, the actual performance may trigger a regulatory review of the distributor's revenues and costs structure by the OEB.

- **Profitability: Regulatory Return on Equity – Achieved**

  In 2020, the amortization expenses were adjusted to closer reflect the depreciated value of assets. The rates set in the 2013 CoS application no longer uphold the rate of inflation due to an associated 2017-2020 stretch factor of 0.60%. THI has deferred its CoS rebasing for several years due to the significant cost and effort required. Even with the lower Adjusted Operating Expenses in 2020, the result from lower Regulated Net Income and an increased Regulated Deemed Equity is a year over year decline ROE. THI is actively watching the OEB's streamlining of CoS applications for small utilities policy review and will look to rebase its rates under the rules resulting from this review.

  THI has achieved the following ROE values as reported through the RRR process: 2015 – 11.02%, 2016 - 5.75%, 2017 - 9.73%, 2018 - 5.10%, 2019 – 4.74%, 2020 – 2.42%. If these are averaged over the 6-year period an average ROE % of 6.46% is achieved. This multi-year average remains within the 3% ROE target band.

Note to Readers of 2020 Scorecard MD&A

The information provided by distributors on their future performance (or what can be construed as forward-looking information) may be subject to a number of risks, uncertainties and other factors that may cause actual events, conditions or results to differ materially from historical results or those contemplated by the distributor regarding their future performance. Some of the factors that could cause such differences include legislative or regulatory developments, financial market conditions, general economic conditions and the weather. For these reasons, the information on future performance is intended to be management's best judgement on the reporting date of the performance scorecard, and could be markedly different in the future.

Appendix E-3 – 2018 Scorecard

Scorecard - Tillsonburg Hydro Inc.

8/31/2022

										Target	
Performance Outcomes	**Performance Categories**	**Measures**		**2017**	**2018**	**2019**	**2020**	**2021**	**Trend**	**Industry**	**Distributor**
Customer Focus Services are provided in a manner that responds to identified customer preferences.	**Service Quality**	New Residential/Small Business Services Connected on Time		99.47%	97.96%	99.56%	100.00%	99.51%	↑	90.00%	
		Scheduled Appointments Met On Time		100.00%	100.00%	98.44%	99.36%	98.21%	↓	90.00%	
		Telephone Calls Answered On Time		84.57%	88.18%	84.59%	0.00%	0.00%	↓	65.00%	
	Customer Satisfaction	First Contact Resolution		99.3	98.62	97.7%	97.2	97.7%			
		Billing Accuracy		99.36%	99.73%	99.83%	99.80%	97.60%	↓	98.00%	
		Customer Satisfaction Survey Results		satisfied	satisifed	satisfied	satisfied	Satisfied			
Operational Effectiveness Continuous improvement in productivity and cost performance is achieved; and distributors deliver on system reliability and quality objectives.	**Safety**	Level of Public Awareness		81.60%	81.60%	83.70%	83.70%	83.70%			
		Level of Compliance with Ontario Regulation 22/04 [1]		NI	C	C	C	C	→		C
		Serious Electrical Incident Index	Number of General Public Incidents	0	0	0	0	0	→		0
			Rate per 10, 100, 1000 km of line	0.000	0.000	0.000	0.000	0.000	→		0.000
	System Reliability	Average Number of Hours that Power to a Customer is Interrupted [2]		1.14	1.83	0.96	1.69	0.53	↓		1.22
		Average Number of Times that Power to a Customer is Interrupted [2]		1.10	2.28	0.56	1.02	0.37	↓		1.16
	Asset Management	Distribution System Plan Implementation Progress		in progress	in progress	in-progress	in-progress	In-progress			
	Cost Control	Efficiency Assessment		3	3	3	3	3			
		Total Cost per Customer [3]		$654	$718	$748	$695	$686			
		Total Cost per Km of Line [3]		$35,137	$37,620	$40,406	$40,648	$39,137			
Public Policy Responsiveness Distributors deliver on obligations mandated by government (e.g., in legislation and in regulatory requirements imposed further to Ministerial directives to the Board).	**Connection of Renewable Generation**	Renewable Generation Connection Impact Assessments Completed On Time [4]			100.00%	33.33%	100.00%				
		New Micro-embedded Generation Facilities Connected On Time				100.00%		100.00%	→	90.00%	
Financial Performance Financial viability is maintained; and savings from operational effectiveness are sustainable.	**Financial Ratios**	Liquidity: Current Ratio (Current Assets/Current Liabilities)		2.04	1.64	2.82	2.16	1.49			
		Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio		0.05	0.07	0.31	0.42	0.41			
		Profitability: Regulatory Return on Equity	Deemed (included in rates)	8.98%	8.98%	8.98%	8.98%	8.98%			
			Achieved	9.73%	5.10%	4.74%	2.42%	1.43%			

1. Compliance with Ontario Regulation 22/04 assessed: Compliant (C); Needs Improvement (NI); or Non-Compliant (NC).
2. An upward arrow indicates decreasing reliability while downward indicates improving reliability.
3. A benchmarking analysis determines the total cost figures from the distributor 's reported information.
4. Value displayed for 2021 reflects data from the first quarter, as the filing requirement was subsequently removed from the Reporting and Record-keeping Requirements (RRR).

Legend:

5-year trend: ↑ up, ↓ down, → flat

Current year: ● target met, ● target not met

2021 Scorecard MD&A- General Overview Tillsonburg Hydro Inc.

During 2021, Tillsonburg Hydro Inc. (THI) met most industry targets reported on the Scorecard including improvements over 2020 results in the System Quality metrics. THI continues year-over-year improvements, when considering the Scorecard in entirety.

Service Quality

Tillsonburg Hydro Inc. (THI) strives to provide customer service that exceeds the Ontario Energy Board (OEB) Industry Targets. During 2021, THI continued to exceed the industry targets for all Service Quality measures on the scorecard.

- **New Residential/Small Business Services Connected on Time**
  THI connected 408 of 410 new services (99.51%) within the 5-business day standard during fiscal 2021; this exceeds the OEB target of 90%.

- **Scheduled Appointments Met On Time**
  During fiscal 2021, THI attended 526 of 530 scheduled appointments (99.25%) as scheduled. THI consistently exceeds the OEB target of 90%.

- **Telephone Calls Answered On Time**
  Due to a telephone system change and a delay in the implementation of software THI is unable to provide data with respect to this performance category for 2021. THI anticipates that the software will be implemented in the third quarter of 2022. THI is confident that the same level of service in the past has been maintained.

Customer Satisfaction

The satisfaction of customers is of high importance to THI. The Customer Satisfaction metrics on the Scorecard exceed OEB industry targets and have been consistent during 2017 through 2021.

- **First Contact Resolution**
  THI resolved customer issues 97.70% during the first contact with THI staff during 2021. THI will continue to value customer's time by empowering our staff to resolve customer issues during the first contact.

- **Billing Accuracy**
  During 2021, THI produced 98,099 bills and achieved 97.60% accuracy metric. This metric slightly below the 98% industry target set by the OEB. Software upgrades have impacted the results in 2021 and we expect to return to historical levels in 2022.

- **Customer Satisfaction Survey Results**
  During 2019, THI conducted an independent Customer Satisfaction Survey to assist in obtaining information relating to Customer Satisfaction. THI's results were consistent with previous Satisfaction Surveys (last performed in 2017) where Customers were "Satisfied" with THI business results. Ongoing customer surveys have been impacted by Covid-19. The next customer satisfaction survey is planned for 2023.

Safety

- **Public Safety**

  The Ontario Energy Board (OEB) introduced the Safety measure in 2015. This measure looks at safety from a customers' point of view as safety of the distribution system is a high priority. The Safety measure is generated by the Electrical Safety Authority (ESA) and includes three components: Public Awareness of Electrical Safety, Compliance with Ontario Regulation 22/04, and the Serious Electrical Incident Index.

  - **Component A – Public Awareness of Electrical Safety**

    THI engaged a 3rd party, during 2018 to survey residents within the THI service territory on the level of public awareness on electrical safety. THI achieved a result of 83.7%. While there is currently not an industry target published by the OEB, peer review of other Local Distribution Companies (LDCs), using our same vendor, show that of 15 LDCs data that was available the safety metrics were between 80.4% and 86.2% with the median score of 83.7%. THI's results are consistent with this group. A new public awareness of electrical safety survey has been completed in early 2022.

  - **Component B – Compliance with Ontario Regulation 22/04**

    During 2021, THI has achieved a "C" rating (Compliant).

  - **Component C – Serious Electrical Incident Index**

    For the years 2017 through 2021 THI has not had any "Serious Electrical Incidents". As a result, the numbers submitted for THI's scorecard by the Electrical Safety Authority are zeros. THI continues to work with ESA to ensure the distributor has done everything necessary to maintain this level of compliance.

System Reliability

- **Average Number of Hours that Power to a Customer is Interrupted**
  During 2021, THI reported an increase in the Average number of Hours that Power to a customer is interrupted (SAIDI) compared to 2020. The 2021 results presented a metric of 0.53, which exceeds the distributor target of 1.22.

- **Average Number of Times that Power to a Customer is Interrupted**
  During 2021, THI reported an increase in the Average Number of Times that Power to a customer is interrupted (SAIFI i.e. Frequency) compared to 2020 results. The 2021 results presented a metric of 0.37, which exceeds the distributor target of 1.16.

Asset Management

- **Distribution System Plan Implementation Progress**
  Tillsonburg Hydro Inc. is in the process of completing our Distribution System Plan and anticipates filing a revised DSP in 2024 as part of it cost of service rate application.

Cost Control

- **Efficiency Assessment**
  The OEB contracts with 3rd party vendors to ranks LDCs in Ontario on an annual basis. The LDCs are ranked into 1 of 5 efficiency categories with category 1 being the most efficient and 5 being the least efficient. During 2021, THI maintained our ranking of group 3. Group 3 LDC's are defined as having actual costs within +/- 10% of predicted costs. Group 3 is the "average LDC".

- **Total Cost per Customer**
  Total cost per customer is calculated as the sum of THI capital and operating costs and dividing this cost figure by the total number of customers that THI serves. THI's total cost per customer in 2021 was $686, which is an improvement compared to 2020 values, and retains THI within the 3 – Tranche of IRM stretch factors (the average grouping).

- **Total Cost per Km of Line**
  This measure uses the same total cost that is used in the Cost per Customer calculation above. The total cost is divided by the kilometers of line that THI operates to serve its customers. THI's total cost per Km of Line in 2021 is $39,137 based on 139km of line. This is a slight decrease compared 2020 values.

Conservation & Demand Management

- **Net Cumulative Energy Savings**
  THI has exceeded the energy savings targets set for the program for 2019/2020. The Conservation and Demand Management (CDM) programs will be delivered by the IESO starting January 2021.

Connection of Renewable Generation

- **Renewable Generation Connection Impact Assessments Completed on Time**
  THI had no requests CIA's during 2021.

- **New Micro-embedded Generation Facilities Connected On Time**
  THI connected one new micro-embedded generation facility which was completed on time during 2021.

Financial Ratios

- **Liquidity: Current Ratio (Current Assets/Current Liabilities)**
  As an indicator of financial health, a current ratio that is greater than 1 is considered good as it indicates that the company can pay its short term debts and financial obligations. Companies with a ratio of greater than 1 are often referred to as being "liquid". The higher the number, the more "liquid" and the larger the margin of risk to cover the company's short-term debts and financial obligations.

  Tillsonburg Hydro Inc.'s current ratio decreased from 2.16 in 2020 to 1.49 during 2021.

- **Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio**
  The OEB uses a deemed capital structure of 60% debt, 40% equity for electricity distributors when establishing rates. This deemed capital mix is equal to a debt to equity ratio of 1.5 (60/40).

  A debt to equity ratio of more than 1.5 indicates that a distributor is more highly levered than the deemed capital structure. A high debt to equity ratio may indicate that an electricity distributor may have difficulty generating sufficient cash flows to make its debt payments.

  A debt to equity ratio of less than 1.5 indicates that the distributor is less levered than the deemed capital structure. A low debt-to-equity ratio may indicate that an electricity distributor is not taking advantage of the increased profits that financial leverage may bring.

  THI has a debt to equity structure that is less levered – this is demonstrated by the 2021 debt to equity ratio of 0.41.

  Capital investments during 2022 and future years will see this ratio continue to climb towards industry norms.

- **Profitability: Regulatory Return on Equity – Deemed (included in rates)**
  THI's current distribution rates have been approved by the OEB and include an expected (deemed) regulatory return on equity of 9.98%. The OEB allows a distributor to earn within +/- 3% of the expected return on equity. When a distributor performs outside of this range, the actual performance may trigger a regulatory review of the distributor's revenues and costs structure by the OEB.

- **Profitability: Regulatory Return on Equity – Achieved**

  The rates set in the 2013 CoS application no longer uphold the rate of inflation due to an associated 2017-2021 stretch factor of 0.60%. THI has deferred its CoS rebasing for several years due to the significant cost and effort required. Even with the small increase in Adjusted Operating Expenses and higher Regulated Net Income, the result of increased Regulated Deemed Equity is a year over year decline ROE. THI plan to file a cost of service rate application in 2023 for rates effective 2024.

  THI has achieved the following ROE values as reported through the RRR process: 2017 - 9.73%, 2018 - 5.10%, 2019 – 4.74%, 2020 – 2.42%, 2021 – 1.43%. If these are averaged over the 5-year period an average ROE % of 4.68% is achieved. This multi-year average falls below the ROE target band for 2021.

Note to Readers of 2021 Scorecard MD&A

The information provided by distributors on their future performance (or what can be construed as forward-looking information) may be subject to a number of risks, uncertainties and other factors that may cause actual events, conditions or results to differ materially from historical results or those contemplated by the distributor regarding their future performance. Some of the factors that could cause such differences include legislative or regulatory developments, financial market conditions, general economic conditions and the weather. For these reasons, the information on future performance is intended to be management's best judgement on the reporting date of the performance scorecard, and could be markedly different in the future.

Appendix E-4 – 2019 Scorecard

Scorecard - Tillsonburg Hydro Inc.

8/30/2023

Performance Outcomes	Performance Categories	Measures		2018	2019	2020	2021	2022	Trend	Target: Industry	Target: Distributor
Customer Focus Services are provided in a manner that responds to identified customer preferences.	Service Quality	New Residential/Small Business Services Connected on Time		97.96%	99.56%	100.00%	99.51%	95.34%	down	90.00%	
		Scheduled Appointments Met On Time		100.00%	98.44%	99.36%	98.21%	99.33%	down	90.00%	
		Telephone Calls Answered On Time		88.18%	84.59%	0.00%	0.00%	98.68%	down	65.00%	
	Customer Satisfaction	First Contact Resolution		98.62	97.7%	97.2	97.7%	94.7%			
		Billing Accuracy		99.73%	99.83%	99.80%	97.60%	99.70%	down	98.00%	
		Customer Satisfaction Survey Results		satisifed	satisfied	satisfied	Satisfied	Satisfied			
Operational Effectiveness Continuous improvement in productivity and cost performance is achieved; and distributors deliver on system reliability and quality objectives.	Safety	Level of Public Awareness		81.60%	83.70%	83.70%	83.70%	86.00%			
		Level of Compliance with Ontario Regulation 22/04 [1]		C	C	C	C	C	flat		C
		Serious Electrical Incident Index	Number of General Public Incidents	0	0	0	0	0	flat		0
			Rate per 10, 100, 1000 km of line	0.000	0.000	0.000	0.000	0.000	flat		0.000
	System Reliability	Average Number of Hours that Power to a Customer is Interrupted [2]		1.83	0.96	1.69	0.53	0.95	down		1.22
		Average Number of Times that Power to a Customer is Interrupted [2]		2.28	0.56	1.02	0.37	0.99	down		1.16
	Asset Management	Distribution System Plan Implementation Progress		in progress	in-progress	in-progress	In-progress	In-progress			
	Cost Control	Efficiency Assessment		3	3	3	3	2			
		Total Cost per Customer [3]		$718	$748	$695	$686	$703			
		Total Cost per Km of Line [3]		$37,620	$40,406	$40,648	$39,137	$39,997			
Public Policy Responsiveness Distributors deliver on obligations mandated by government (e.g., in legislation and in regulatory requirements imposed further to Ministerial directives to the Board).	Connection of Renewable Generation	Renewable Generation Connection Impact Assessments Completed On Time [4]		100.00%	33.33%	100.00%					
		New Micro-embedded Generation Facilities Connected On Time			100.00%		100.00%	100.00%	flat	90.00%	
Financial Performance Financial viability is maintained; and savings from operational effectiveness are sustainable.	Financial Ratios	Liquidity: Current Ratio (Current Assets/Current Liabilities)		1.64	2.82	2.16	1.49	1.12			
		Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio		0.07	0.31	0.42	0.41	0.40			
		Profitability: Regulatory Return on Equity	Deemed (included in rates)	8.98%	8.98%	8.98%	8.98%	8.98%			
			Achieved	5.10%	4.74%	2.42%	1.43%	-0.32%			

1. Compliance with Ontario Regulation 22/04 assessed: Compliant (C); Needs Improvement (NI); or Non-Compliant (NC).
2. An upward arrow indicates decreasing reliability while downward indicates improving reliability.
3. A benchmarking analysis determines the total cost figures from the distributor 's reported information.
4. Value displayed for 2021 reflects data from the first quarter, as the filing requirement was subsequently removed from the Reporting and Record-keeping Requirements (RRR).

Legend:

5-year trend: up, down, flat

Current year: target met, target not met

2022 Scorecard MD&A - General Overview Tillsonburg Hydro Inc.

Tillsonburg Hydro Inc. provides delivery of electricity, billing and maintenance services to the residents of the Town of Tillsonburg. Our goal is to provide a personal and exceptional level of service. We have our office open to serve the public along with staff and equipment located locally to quickly respond to the needs of the community. During 2022, Tillsonburg Hydro Inc. (THI) met the industry targets reported on the Scorecard including some improvements over 2021 results. THI continues year-over-year improvements, when considering the Scorecard in its entirety.

Service Quality

Tillsonburg Hydro Inc. (THI) strives to provide customer service that exceeds the Ontario Energy Board (OEB) Industry Targets. During 2022, THI continued to exceed the industry targets for all Service Quality measures on the scorecard.

- **New Residential/Small Business Services Connected on Time**
  THI connected 266 of 279 new services (95.34%) within the 5-business day standard during fiscal 2022; this exceeds the OEB target of 90%.

- **Scheduled Appointments Met On Time**
  During fiscal 2022, THI attended 295 of 297 scheduled appointments (99.33%) as scheduled. THI consistently exceeds the OEB target of 90%.

- **Telephone Calls Answered On Time**
  THI has maintained the same level of service as in the past, answering 98.68% of calls with the 30-second time period.

Customer Satisfaction

The satisfaction of customers is of high importance to THI. The Customer Satisfaction metrics on the Scorecard exceed OEB industry targets and have been consistent during 2017 through 2022.

- **First Contact Resolution**
  THI resolved customer issues 94.7% during the first contact with THI staff during 2022. THI will continue to value customer's time by empowering our staff to resolve customer issues during the first contact. A process review is planned for 2023 to identify any additional training that could be offered to improve results.

- **Billing Accuracy**
  During 2022, THI produced 96,768 bills and achieved 99.7% accuracy metric. This metric exceeds the 98% industry target set by the OEB.

- **Customer Satisfaction Survey Results**
  During 2023, THI conducted an independent Customer Satisfaction Survey to assist in obtaining information relating to Customer Satisfaction. THI's results were consistent with previous Satisfaction Surveys (last performed in 2019) where customers were "Satisfied" with THI's business results.

Safety

- **Public Safety**
  The Ontario Energy Board (OEB) introduced the Safety measure in 2015. This measure looks at safety from a customers' point of view as safety of the distribution system is a high priority. The Safety measure is generated by the Electrical Safety Authority (ESA) and includes three components: Public Awareness of Electrical Safety, Compliance with Ontario Regulation 22/04, and the Serious Electrical Incident Index.

  - **Component A – Public Awareness of Electrical Safety**
    THI engaged a 3rd party, during 2022 to survey residents within the THI service territory on the level of public awareness on electrical safety. THI achieved a result of 86.0%. While there is currently not an industry target published by the OEB, peer review of other Local Distribution Companies (LDCs), using our same vendor, show that of 14 LDCs data that was available the safety metrics had an average score of 83.8%. THI's results are above average of with this group.

  - **Component B – Compliance with Ontario Regulation 22/04**
    The ESA report was issued on July 5, 2023 for the audit period of May 1, 2022 to April 2023 in which THI has achieved a "C" rating (Compliant).

  - **Component C – Serious Electrical Incident Index**
    For the years 2017 through 2022 THI has not had any "Serious Electrical Incidents". As a result, the numbers submitted for THI's scorecard by the Electrical Safety Authority are zeros. THI continues to work with ESA to ensure the distributor has done everything necessary to maintain this level of compliance.

System Reliability

- **Average Number of Hours that Power to a Customer is Interrupted**
  During 2022, THI reported an increase in the Average number of Hours that Power to a customer is interrupted (SAIDI) compared to 2021. The 2022 results presented a metric of 0.95, which exceeds the distributor target of 1.22.

- **Average Number of Times that Power to a Customer is Interrupted**
  During 2022, THI reported an increase in the Average Number of Times that Power to a customer is interrupted (SAIFI i.e. Frequency) compared to 2021 results. The 2022 results presented a metric of 0.99, which exceeds the distributor target of 1.16.

Asset Management

- **Distribution System Plan Implementation Progress**
  Tillsonburg Hydro Inc. is in the process of completing our Distribution System Plan and anticipates filing a revised DSP in 2024 as part of its cost of service rate application. THI completed 97% of the planned investment in our distribution system in 2022.

Cost Control

- **Efficiency Assessment**
  The OEB contracts with 3rd party vendors to ranks LDCs in Ontario on an annual basis. The LDC's are ranked into 1 of 5 efficiency categories with category 1 being the most efficient and 5 being the least efficient. During 2022, THI improved our ranking from Group 3 to Group 2. Group 2 LDC's are defined as having actual costs 10% to 25% below predicted costs. Group 3 is the "average LDC".

- **Total Cost per Customer**
  Total cost per customer is calculated as the sum of THI capital and operating costs and dividing this cost figure by the total number of customers that THI serves. THI's total cost per customer in 2022 was $703, which is a 2.4% increase compared to 2021 values.

- **Total Cost per Km of Line**
  This measure uses the same total cost that is used in the Cost per Customer calculation above. The total cost is divided by the kilometers of line that THI operates to serve its customers. THI's total cost per Km of Line in 2022 is $39,997 based on 144km of line. This is a 2.2% increase compared 2021 values.

Connection of Renewable Generation

- **Renewable Generation Connection Impact Assessments Completed on Time**
  THI had no requests CIA’s during 2022.

- **New Micro-embedded Generation Facilities Connected On Time**
  THI connected one new micro-embedded generation facility which was completed on time during 2022.

Financial Ratios

- **Liquidity: Current Ratio (Current Assets/Current Liabilities)**

  As an indicator of financial health, a current ratio that is greater than 1 is considered good as it indicates that the company can pay its short term debts and financial obligations. Companies with a ratio of greater than 1 are often referred to as being “liquid”. The higher the number, the more “liquid” and the larger the margin of risk to cover the company’s short-term debts and financial obligations.

  Tillsonburg Hydro Inc.’s current ratio decreased from 1.49 in 2021 to 1.12 during 2022.

- **Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio**

  The OEB uses a deemed capital structure of 60% debt, 40% equity for electricity distributors when establishing rates. This deemed capital mix is equal to a debt to equity ratio of 1.5 (60/40).

  A debt to equity ratio of more than 1.5 indicates that a distributor is more highly levered than the deemed capital structure. A high debt to equity ratio may indicate that an electricity distributor may have difficulty generating sufficient cash flows to make its debt payments.

  A debt to equity ratio of less than 1.5 indicates that the distributor is less levered than the deemed capital structure. A low debt-to-equity ratio may indicate that an electricity distributor is not taking advantage of the increased profits that financial leverage may bring.

  THI has a debt to equity structure that is less levered – this is demonstrated by the 2022 debt to equity ratio of 0.40.

  Capital investments during 2023 and future years will see this ratio continue to climb towards industry norms.

- **Profitability: Regulatory Return on Equity – Deemed (included in rates)**

  THI’s current distribution rates have been approved by the OEB and include an expected (deemed) regulatory return on equity of 9.98%. The OEB allows a distributor to earn within +/- 3% of the expected return on equity. When a distributor performs outside of this range, the actual performance may trigger a regulatory review of the distributor’s revenues and costs structure by the OEB.

- **Profitability: Regulatory Return on Equity – Achieved**

  The rates set in the 2013 CoS application no longer uphold the rate of inflation due to an associated 2017-2022 stretch factor of 0.60%. THI has deferred its CoS rebasing for several years due to the significant cost and effort required. There was a small increase in Adjusted Operating Expenses, a decrease in Regulated Net Income, and an increase in Regulated Deemed Equity resulting in a year over year decline ROE. THI plans to file a cost of service rate application in 2023 for rates effective 2024.

  THI has achieved the following ROE values as reported through the RRR process: 2018 = 5.10%, 2019 = 4.74%, 2020 = 2.42%, 2021 = 1.43%, 2022 = (0.32%). The ROE has been impacted by costs that have not been recovered in our current rates.

Note to Readers of 2022 Scorecard MD&A

The information provided by distributors on their future performance (or what can be construed as forward-looking information) may be subject to a number of risks, uncertainties and other factors that may cause actual events, conditions or results to differ materially from historical results or those contemplated by the distributor regarding their future performance. Some of the factors that could cause such differences include legislative or regulatory developments, financial market conditions, general economic conditions and the weather. For these reasons, the information on future performance is intended to be management's best judgement on the reporting date of the performance scorecard, and could be markedly different in the future.

Appendix F – Reliability Analysis 2017 to 2022

Appendix F – Reliability Analysis 2017 to 2022

Summary:
Note: THI has not historically tracked outages by feeder. This data should be available using the Utilismart Smart Map within the forecast period. With this in mind, it was determined it was not worth the effort to manually review outage records to determine the worst performing feeder prior to 2022.

Generally, THI's system reliability is close to target and meets customer expectations. Fluctuations from year to year are expected due to weather effects and the random nature of animal contacts and equipment failures.

The biggest contributor to SAIFI and SAIDI is Loss of Supply. With a single transformer station (Tillsonburg TS) and only four supply feeders, a single feeder outage affects about 25% of the service area, often for long durations (30 minutes to several hours). Through Regional Planning, this poor performance has been noted and plans are in place to re-supply the TS from a more reliable transmission circuit.

The biggest contributor to SAIFI and SAIDI within THI control (excludes Loss of Supply, Major Event Days, and Scheduled) is Defective Equipment and Adverse Weather. These two causes have resulted in 50% of the number of outages, 54% of the number of customers interrupted, and 69% of the customer hours of interruption.

The contributing factors for Defective Equipment outages are diverse, such as pole fires, cable faults, porcelain switch failures, and other minor components. There is insufficient data to accurately determine an overall trend for Defective Equipment causes, but it is reasonable to assume that many of these components are simply failing at end of life. The 2016 and 2021 Asset Management Plan noted that the pace of asset replacement was insufficient to match the aging demographics of the assets, and THI has taken steps to increase investment in System Renewal Projects.

The main contributor to Adverse Weather outages has been both ice storms and high wind events. Although these events are impossible to control it is recommended that THI continue to harden its system through System Renewal spending to increase its resiliency during adverse weather events.

In addition, Foreign Interference outages continues to be a noticeable cause of outages. This is typically caused by animal contacts, with squirrels the dominant animal type. Tillsonburg has a notable amount of green space with the Town, providing a habitat for squirrels to thrive. THI should continue with best practices for animal proofing overhead distribution systems.

It is worth noting that outages due to Tree Contacts are very infrequent, and have a negligible contribution to SAIDI and SAIFI. This suggests the tree trimming program is effective and should be continued.

Recommendations:

1. Continue to focus annual capital investment plans on system renewal projects, targeting the highest risk assets (based on age, actual condition, impact to customers).

2. Continue to pursue best practices for preventing animal contacts.
3. Maintain present practices for tree trimming.

Reliability Summary Information:

Summary by Year:

2017						
Cause Code	**# of Interruptions**	**# Customer Interrupted**	**# Customer Hours Interruption**	**Total Customer Base**	**SAIDI**	**SAIFI**
0	1	1	1	7191	0.0001	0.0001
1	23	512	1184	7191	0.1647	0.0712
2	2	5230	549	7191	0.0763	0.7273
3	3	35	63	7191	0.0088	0.0049
4	1	40	110	7191	0.0153	0.0056
5	17	7209	6654	7191	0.9253	1.0025
6	1	3	3	7191	0.0004	0.0004
7	0	0	0	7191	0.0000	0.0000
8	0	0	0	7191	0.0000	0.0000
9	10	139	185	7191	0.0257	0.0193
Total	**58**	**13169**	**8749**	**7191**	**1.22**	**1.83**
Total (Less LOS; code 2)	**56**	**7939**	**8200**	**7191**	**1.14**	**1.10**

2018						
Cause Code	**# of Interruptions**	**# Customer Interrupted**	**# Customer Hours Interruption**	**Total Customer Base**	**SAIDI**	**SAIFI**
0	3	7268	493	7281	0.0677	0.9982
1	28	901	1759	7281	0.2416	0.1237
2	2	14676	1651	7281	0.2268	2.0157
3	0	0	0	7281	0.0000	0.0000
4	1	23	19	7281	0.0026	0.0032
5	18	5458	8014	7281	1.1007	0.7496
6	4	2409	2409	7281	0.3309	0.3309
7	0	0	0	7281	0.0000	0.0000
8	1	1	1	7281	0.0001	0.0001
9	30	569	593	7281	0.0814	0.0781
Total	**87**	**31305**	**14939**	**7281**	**2.05**	**4.30**
Total (Less LOS; code 2)	**85**	**16629**	**13288**	**7281**	**1.83**	**2.28**

2019						
Cause Code	**# of Interruptions**	**# Customer Interrupted**	**# Customer Hours Interruption**	**Total Customer Base**	**SAIDI**	**SAIFI**
0	3	47	114	7412	0.0154	0.0063
1	66	1417	5719	7412	0.7716	0.1912
2	3	14860	54547	7412	7.3593	2.0049
3	6	131	281	7412	0.0379	0.0177
4	1	42	95	7412	0.0128	0.0057
5	15	183	350	7412	0.0472	0.0247
6	0	0	0	7412	0.0000	0.0000
7	0	0	0	7412	0.0000	0.0000
8	1	2269	379	7412	0.0511	0.3061
9	14	97	148	7412	0.0200	0.0131
Total	**109**	**19046**	**61633**	**7412**	**8.32**	**2.57**
Total (Less LOS; code 2)	**106**	**4186**	**7086**	**7412**	**0.96**	**0.56**

2020						
Cause Code	**# of Interruptions**	**# Customer Interrupted**	**# Customer Hours Interruption**	**Total Customer Base**	**SAIDI**	**SAIFI**
0	6	147	147	7614	0.0193	0.0193
1	47	473	1604	7614	0.2107	0.0621
2	3	14434	13883	7614	1.8234	1.8957
3	1	15	14	7614	0.0018	0.0020
4	1	1500	2250	7614	0.2955	0.1970
5	9	1535	3335	7614	0.4380	0.2016
6	6	3896	5366	7614	0.7048	0.5117
7	0	0	0	7614	0.0000	0.0000
8	1	1	1	7614	0.0001	0.0001
9	12	179	187	7614	0.0246	0.0235
Total	**86**	**22180**	**26787**	**7614**	**3.52**	**2.91**
Total (Less LOS; code 2)	**83**	**7746**	**12904**	**7614**	**1.69**	**1.02**

2021						
Cause Code	**# of Interruptions**	**# Customer Interrupted**	**# Customer Hours Interruption**	**Total Customer Base**	**SAIDI**	**SAIFI**
0	6	184	222	7872	0.0282	0.0234
1	32	426	1541	7872	0.1958	0.0541
2	3	17448	72236	7872	9.1763	2.2165
3	4	2006	1900	7872	0.2414	0.2548
4	0	0	0	7872	0.0000	0.0000
5	8	166	261	7872	0.0332	0.0211
6	1	2	3	7872	0.0004	0.0003
7	0	0	0	7872	0.0000	0.0000
8	0	0	0	7872	0.0000	0.0000
9	11	114	212	7872	0.0269	0.0145
Total	**65**	**20346**	**76375**	**7872**	**9.70**	**2.58**
Total (Less LOS; code 2)	**62**	**2898**	**4139**	**7872**	**0.53**	**0.37**

2022						
Cause Code	**# of Interruptions**	**# Customer Interrupted**	**# Customer Hours Interruption**	**Total Customer Base**	**SAIDI**	**SAIFI**
0	2	41	33	8160	0.0041	0.0050
1	120	724	1520	8160	0.1863	0.0887
2	0	0	0	8160	0.0000	0.0000
3	1	4453	4453	8160	0.5457	0.5457
4	1	1	7	8160	0.0009	0.0001
5	7	2480	1219	8160	0.1494	0.3039
6	1	1	1	8160	0.0001	0.0001
7	0	0	0	8160	0.0000	0.0000
8	0	0	0	8160	0.0000	0.0000
9	26	391	519	8160	0.0636	0.0479
Total	**158**	**8091**	**7752**	**8160**	**0.95**	**0.99**
Total (Less LOS; code 2)	**158**	**8091**	**7752**	**8160**	**0.95**	**0.99**

Summary by Cause:

Number of Interruptions								
Cause Code	Name	2017	2018	2019	2020	2021	2022	Total
0	Unknown/Other	1	3	3	6	6	2	21
1	Scheduled Outage	23	28	66	47	32	120	316
2	Loss of Supply	2	2	3	3	3	0	13
3	Tree Contacts	3	0	6	1	4	1	15
4	Lightning	1	1	1	1	0	1	5
5	Defective Equipment	17	18	15	9	8	7	74
6	Adverse Weather	1	4	0	6	1	1	13
7	Adverse Environment	0	0	0	0	0	0	0
8	Human Element	0	1	1	1	0	0	3
9	Foreign Interference	10	30	14	12	11	26	103

Number of Customer Interruptions								
Cause Code	Name	2017	2018	2019	2020	2021	2022	Total
0	Unknown/Other	1	7268	47	147	184	41	7688
1	Scheduled Outage	512	901	1417	473	426	724	4453
2	Loss of Supply	5230	14676	14860	14434	17448	0	66648
3	Tree Contacts	35	0	131	15	2006	4453	6640
4	Lightning	40	23	42	1500	0	1	1606
5	Defective Equipment	7209	5458	183	1535	166	2480	17031
6	Adverse Weather	3	2409	0	3896	2	1	6311
7	Adverse Environment	0	0	0	0	0	0	0
8	Human Element	0	1	2269	1	0	0	2271
9	Foreign Interference	139	569	97	179	114	391	1489

Number of Customer Hours of Interruptions								
Cause Code	Name	2017	2018	2019	2020	2021	2022	Total
0	Unknown/Other	1	493	114	147	222	33	1010
1	Scheduled Outage	1184	1759	5719	1604	1541	1520	13327
2	Loss of Supply	549	1651	54547	13883	72236	0	142866
3	Tree Contacts	63	0	281	14	1900	4453	6711
4	Lightning	110	19	95	2250	0	7	2481
5	Defective Equipment	6654	8014	350	3335	261	1219	19833
6	Adverse Weather	3	2409	0	5366	3	1	7782
7	Adverse Environment	0	0	0	0	0	0	0
8	Human Element	0	1	379	1	0	0	381
9	Foreign Interference	185	593	148	187	212	519	1844

Ranked Controllable Causes (Excludes Loss of Supply and Scheduled Outages):

Number of Interruptions - Ranked by Total (Highest to Lowest)									
Cause Code	**Name**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**	**% of Total**
9	Foreign Interference	10	30	14	12	11	26	103	44%
5	Defective Equipment	17	18	15	9	8	7	74	32%
0	Unknown/Other	1	3	3	6	6	2	21	9%
3	Tree Contacts	3	0	6	1	4	1	15	6%
6	Adverse Weather	1	4	0	6	1	1	13	6%
4	Lightning	1	1	1	1	0	1	5	2%
8	Human Element	0	1	1	1	0	0	3	1%
7	Adverse Environment	0	0	0	0	0	0	0	0%

Number of Customer Interruptions - Ranked by Total (Highest to Lowest)									
Cause Code	**Name**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**	**% of Total**
5	Defective Equipment	7209	5458	183	1535	166	2480	17031	40%
0	Unknown/Other	1	7268	47	147	184	41	7688	18%
6	Adverse Weather	3	2409	0	3896	2	1	6311	15%
3	Tree Contacts	35	0	131	15	2006	4453	6640	15%
8	Human Element	0	1	2269	1	0	0	2271	5%
4	Lightning	40	23	42	1500	0	1	1606	4%
9	Foreign Interference	139	569	97	179	114	391	1489	3%
7	Adverse Environment	0	0	0	0	0	0	0	0%

Number of Customer Hours of Interruptions - Ranked by Total (Highest to Lowest)									
Cause Code	**Name**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Total**	**% of Total**
5	Defective Equipment	6654	8014	350	3335	261	1219	19833	50%
6	Adverse Weather	3	2409	0	5366	3	1	7782	19%
3	Tree Contacts	63	0	281	14	1900	4453	6711	17%
4	Lightning	110	19	95	2250	0	7	2481	6%
9	Foreign Interference	185	593	148	187	212	519	1844	5%
0	Unknown/Other	1	493	114	147	222	33.25	1010.25	3%
8	Human Element	0	1	379	1	0	0	381	1%
7	Adverse Environment	0	0	0	0	0	0	0	0%

Appendix G – 2021 Capital Program

2023 CAPITAL SUMMARY

	Project Name	Labour Estimate ($)	Labour Estimate (hrs)	Fleet Estimate ($)	Fleet Estimate (hrs)	Material Estimate	Contractor Estimate	BUDGET ESTIMATE
SR	Rolling Meadows Remainder	24,470	372	16,368	558	44,000	110,350	195,188
SR	Lisgar Heights Phase II - Distribution	31,574	480	12,720	480	136,000	622,500	802,794
SR	Lisgar Heights Phase II - Servicing	72,095	1,096	48,224	1,644	100,000	277,500	497,819
SS	Fairgrounds Conversion	3,157	48	1,680	48	31,000	-	35,837
SR	Vintage UG - T-Splice Replacements	6,315	96	2,544	96	21,875	4,000	34,734
SR	Vintage TX Replacements	29,601	-	19,800	-	123,150	5,000	177,551
SR	Porcelain Switches & Insulator Changes	13,156	200	4,400	150	15,000	-	32,556
SS	MVI Replacement	7,894	120	3,520	120	110,000	10,500	131,914
SS	MS5 De-commissioning	10,525	160	5,600	160	-	18,000	34,125
SR	End of Life Poles	46,046	700	21,100	700	71,250	7,125	145,521
SS	Spruce St Remainder	39,468	200	18,450	200	50,000	48,750	156,668
SS	Cedar St - 336AL Feeder Upgrade	19,734	300	12,300	400	31,250	3,125	66,409
SR	System Air Pole Replacement (Rouse St Phas	19,734	300	8,800	300	55,000	7,500	91,034
SS	Valleyview Dr - Primary Extension	6,578	100	4,400	150	10,000	1,000	21,978
SR	Andover Secondary Relocations	4,736	72	3,168	108	2,500	50,000	60,404
	Sub Total:	**335,083**	**4,244**	**183,074**	**5,114**	**801,025**	**1,165,350**	**2,484,532**
SA	Technical Services	150,110	1,382	100,408	3,423	633,845	113,450	997,813
SA	New Development	74,726	1,736	49,984	1,704	587,500	75,000	787,210
	Grand Total:	**559,919**	**7,362**	**333,466**	**10,241**	**2,022,370**	**1,353,800**	**4,269,555**

SA System access investments are modifications (including asset relocation) to a distributor's distribution system a distributor is obligated to perform to provide a customer (including a generator customer) or group of customers with access to electricity services via the distribution system.

SR System renewal investments involve replacing and/or refurbishing system assets to extend the original service life of the assets and thereby maintain the ability of the distributor's distribution system to provide customers with electricity services

SS System service investments are modifications to a distributor's distribution system to ensure the distribution system continues to meet distributor operational objectives while addressing anticipated future customer electricity service requirements.

GP General plant investments are modifications, replacements or additions to a distributor's assets that are not part of its distribution system including land and buildings, tools and equipment, rolling stock and electronic devices and software used to support day to day business and operations activities.

Appendix H – 2020 THI Strategic Plan

TILLSONBURG HYDRO INC.

Strategic Plan
2020 - 2023

Mission

A local energy distribution company committed to maximizing value to our stakeholders through innovative solutions.

Vision

To deliver electricity through safe, dependable, cost-effective and environmentally responsible practices.

Our Values

Safety
Promoting safe and efficient practices in the supply, delivery, education and use of energy.

People
Creating an atmosphere for employees that promotes empowerment and commitment to the THI vision.

Integrity
Focusing on transparent, responsible and fiscally sound leadership.

Agility
Responding to our customers, community and industry trends while seeking excellence and continuous improvement in all business areas.

Objectives

Corporate & Social Responsibility
Committed to being a socially, financially and environmentally sustainable company.

Leadership Responsibilities
THI works to achieve its Mission, Vision and Values through strategic direction, targeted outcomes and ethical practices consistent with all statutory and regulatory requirements.

Customer Care
Enhance customer engagement by seeking feedback and monitoring customer satisfaction.

Reliability
Maximize system performance utilizing best practices for asset management to align with customer needs, industry practices and corporate goals.

Financial
Maximize value to our stakeholders through responsible financial management and industry best practices to improve efficiencies and reduce costs to our rate payers.

High Performance Teams
Promote a culture that will retain and attract high performance talent that will maximize Corporate and Board performance.

Risk Management
Continue to identify and manage risks within the changing digital environment and leverage technology to enhance our operations and service delivery.

Powering your community

TILLSONBURG HYDRO INC.

Tillsonburg Hydro Inc. is 100% owned by the Town of Tillsonburg and operates as a regulated company under the auspices of the Ontario Energy Board. THI serves more than 7,500 customers in the Town of Tillsonburg.

10 Lisgar Ave.,
Tillsonburg, ON
N4G 5A5

www.tillsonburghydro.ca

Appendix I – THI Service Area

SCHEDULE 1 DEFINITION OF DISTRIBUTION SERVICE AREA

This Schedule specifies the area in which the Licensee is authorized to distribute and sell electricity in accordance with paragraph 8.1 of this Licence.

The Town of Tillsonburg as of November 7, 1998.

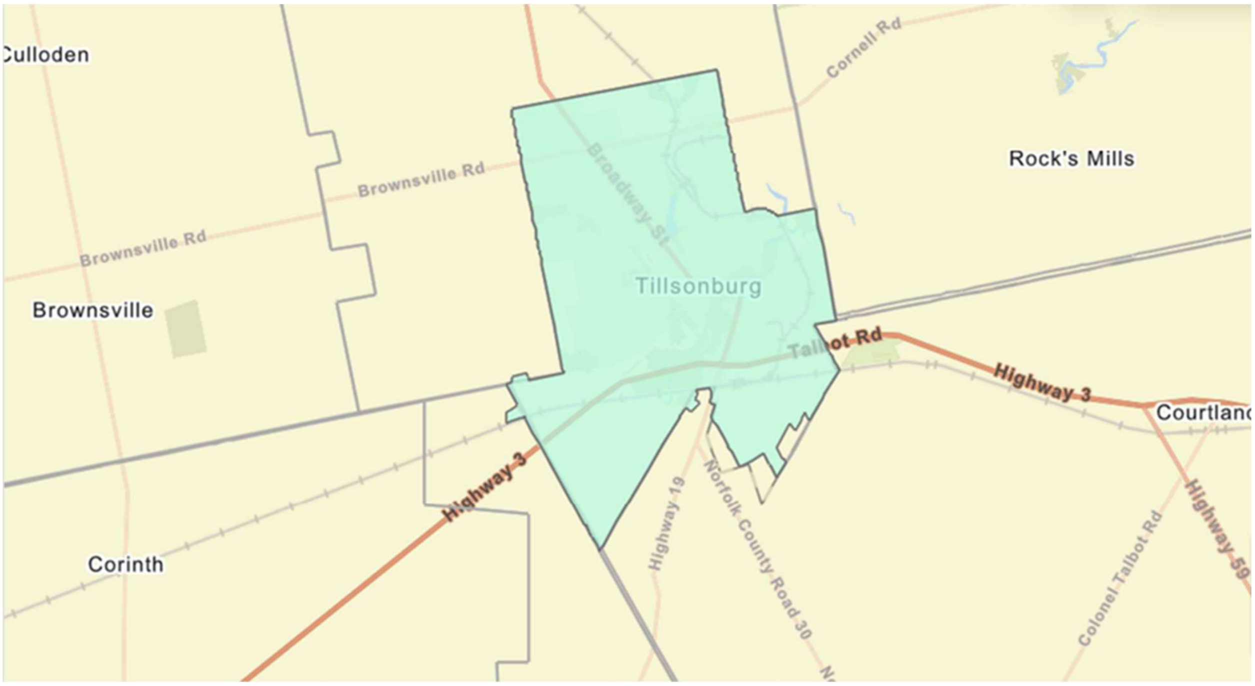
- Excluding the customers located at the following addresses:
  - i. 165 Rokeby Road, Tillsonburg, ON N4G 4G9
  - ii. 233 Rokeby Road, Tillsonburg, ON N4G 4G9
  - iii. 239 Rokeby Road, Tillsonburg, ON N4G 4G9
  - iv. 247 Rokeby Road, Tillsonburg, ON N4G 4G9
  - v. 253 Rokeby Road, Tillsonburg, ON N4G 4G9
  - vi. 259 Rokeby Road, Tillsonburg, ON N4G 4G9
- Including the customers located at the following addresses:
  - i. 176 Young Street, Tillsonburg, ON N4G 3H9
  - ii. 180 Young Street, Tillsonburg, ON N4G 3H9
  - iii. 183 Young Street, Tillsonburg, ON N4G 3H9
  - iv. 184 Young Street, Tillsonburg, ON N4G 3H9

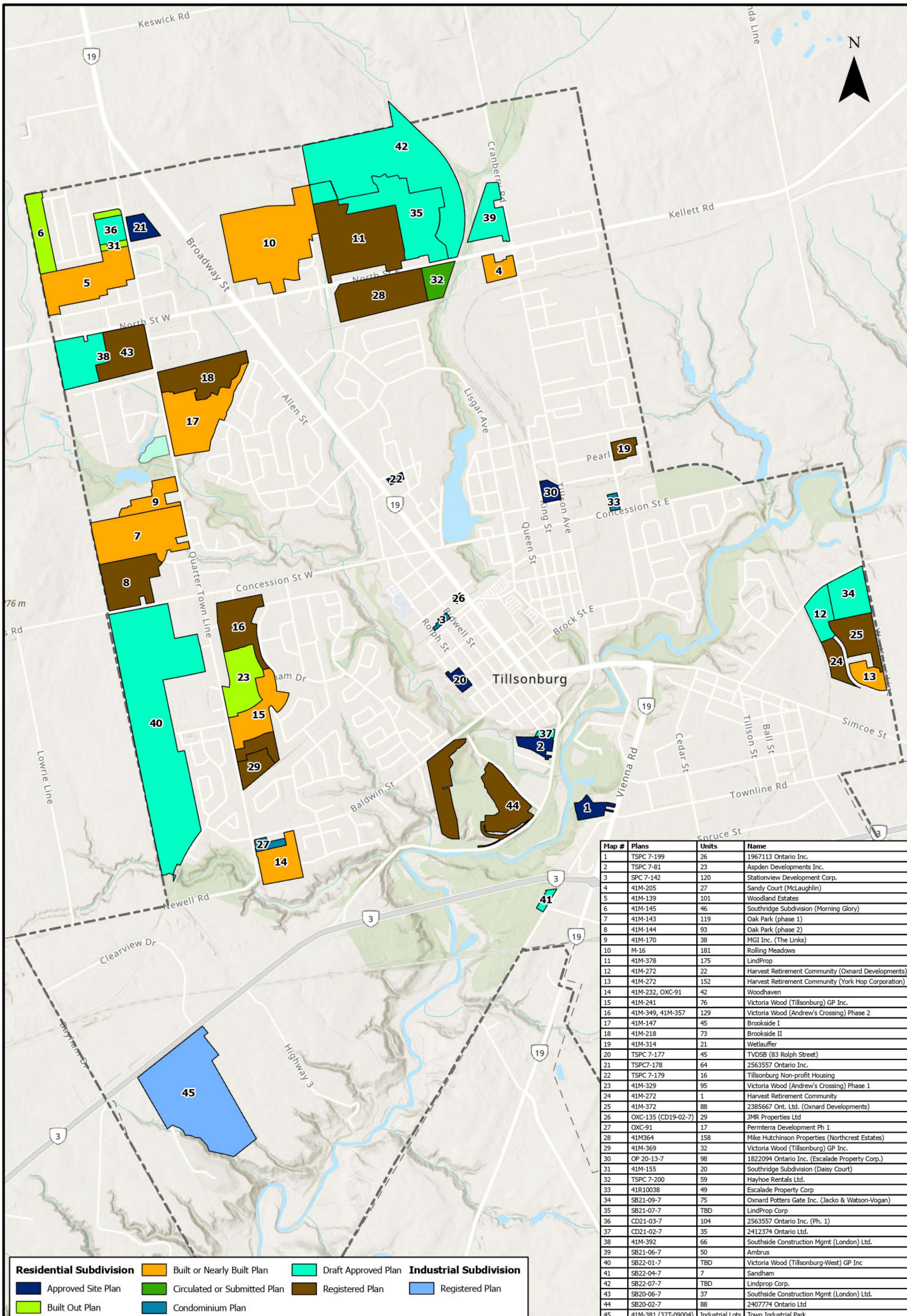
The customer located in the Township of South-West Oxford formerly known as the Township of West Oxford, Township of Dereham, Village of Beachville, as at December 31, 1974.

- 124127 Pressey Road, Dereham, ON N4G 4G8

The customer located in the Municipality of Bayham, formerly known as Township of Baymen, Village of Port Burwell, Village of Vienna as at December 31, 1997.

- 14719 Bayham Drive, Bayham, ON N4G 4G8


Culloden
Cornell Rd
Rock's Mills
Brownsville Rd
Broadway St
Brownsville Rd
Tillsonburg
Brownsville
Talbot Rd
Highway 3
Courtland
Highway 3
Highway 19
Norfolk County Road 30
Colonel Talbot Rd
Highway 59
Corinth



Map #	Plans	Units	Name
1	TSPC 7-199	26	1967113 Ontario Inc.
2	TSPC 7-81	23	Aspden Developments Inc.
3	SPC 7-142	120	Stationview Development Corp.
4	41M-205	27	Sandy Court (McLaughlin)
5	41M-139	101	Woodland Estates
6	41M-145	46	Southridge Subdivision (Morning Glory)
7	41M-143	119	Oak Park (phase 1)
8	41M-144	93	Oak Park (phase 2)
9	41M-170	38	MGI Inc. (The Links)
10	M-16	181	Rolling Meadows
11	41M-378	175	LindProp
12	41M-272	22	Harvest Retirement Community (Oxnard Developments)
13	41M-272	152	Harvest Retirement Community (York Hop Corporation)
14	41M-232, OXC-91	42	Woodhaven
15	41M-241	76	Victoria Wood (Tillsonburg) GP Inc.
16	41M-349, 41M-357	129	Victoria Wood (Andrew's Crossing) Phase 2
17	41M-147	45	Brookside I
18	41M-218	73	Brookside II
19	41M-314	21	Wetlauffer
20	TSPC 7-177	45	TVDSB (83 Rolph Street)
21	TSPC7-178	64	2563557 Ontario Inc.
22	TSPC 7-179	16	Tillsonburg Non-profit Housing
23	41M-329	95	Victoria Wood (Andrew's Crossing) Phase 1
24	41M-272	1	Harvest Retirement Community
25	41M-372	88	2385667 Ont. Ltd. (Oxnard Developments)
26	OXC-135 (CD19-02-7)	29	JMR Properties Ltd
27	OXC-91	17	Permterra Development Ph 1
28	41M364	158	Mike Hutchinson Properties (Northcrest Estates)
29	41M-369	32	Victoria Wood (Tillsonburg) GP Inc.
30	OP 20-13-7	98	1822094 Ontario Inc. (Escalade Property Corp.)
31	41M-155	20	Southridge Subdivision (Daisy Court)
32	TSPC 7-200	59	Hayhoe Rentals Ltd.
33	41R10038	49	Escalade Property Corp
34	SB21-09-7	75	Oxnard Potters Gate Inc. (Jacko & Watson-Vogan)
35	SB21-07-7	TBD	LindProp Corp
36	CD21-03-7	104	2563557 Ontario Inc. (Ph. 1)
37	CD21-02-7	35	2412374 Ontario Ltd.
38	41M-392	66	Southside Construction Mgmt (London) Ltd.
39	SB21-06-7	50	Ambrus
40	SB22-01-7	TBD	Victoria Wood (Tillsonburg-West) GP Inc
41	SB22-04-7	7	Sandham
42	SB22-07-7	TBD	Lindprop Corp.
43	SB20-06-7	37	Southside Construction Mgmt (London) Ltd.
44	SB20-02-7	88	2407774 Ontario Ltd
45	41M-381 (32T-09004)	Industrial Lots	Town Industrial Park

TILLSONBURG HYDRO INC.

TILLSONBURG HYDRO INC.
ENGINEERING SERVICES

CUSTOMER SERVICE CENTRE
10 LISGAR AVE, TILLSONBURG, ON, N4G 5A5

0 95 190 380 570 760 950
Meters

DEVELOPMENT ACTIVITY TOWN OF TILLSONBURG