EB-2018-0028

Redacted Version

ONTARIO ENERGY BOARD

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IN THE MATTER the *Ontario Energy Board Act*, 1998, S.O. 1998, c. 15 (Schedule B);

AND IN THE MATTER OF an application to the Ontario Energy Board by Energy+ Inc. pursuant to Section 78 of the *Ontario Energy Board Act* for approval of its proposed distribution rates and other charges effective January 1, 2019.

Written Evidence

of

Melody Collis

(Toyota Motor Manufacturing Canada Inc.)

September 27, 2018

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I. INTRODUCTION

Q.1 Who is TMMC and what is its business?

A. Toyota Motor Manufacturing Canada Inc. ("**TMMC**") is a Canadian federally incorporated company that is wholly-owned by Toyota Motor Corporation ("**Toyota**") in Japan. TMMC owns and operates two automobile assembly plants in Ontario, one in Cambridge (the "**Cambridge Plant**") and one in Woodstock (the "**Woodstock Plant**"). TMMC established the Cambridge Plant in 1986 with an initial annual production mandate of 50,000 vehicles. TMMC enjoyed early success and attracted additional investment from Toyota, culminating in the construction of the Woodstock Plant in 2006. Since that time, TMMC has grown to become one of the largest automotive manufacturing companies in the world. Together, the Cambridge and Woodstock Plants represent a cumulative investment of $8 billion, with 8,000 employees and the capacity to assemble over 500,000 vehicles annually. This puts TMMC's Ontario operations in the top five of Toyota assembly plants worldwide.

Q.2 What is your position and what are your responsibilities as an employee of TMMC?

A. I have been an employee of TMMC since 1996. In my current role as the Assistant Manager, Facilities Maintenance, Cambridge, I am responsible for the powerhouse and building maintenance. I lead a team of 35 trades people and operating engineers who are responsible for plant utilities, high voltage distribution system, building infrastructure and site management.

Plant utilities comprising steam, compressed air, water and wastewater treatment are provided by a licensed first class high pressure plant (the "**Power House**"). The Power House includes the 9.2 megawatt ("**MW**") Combined Heat and Power plant located at the Cambridge Plant ("**CHP Facility**") which went into operation on January 1, 2016. I directly oversee the operation of the Power House, including issues related to safety, operation, scheduling, maintenance, uptime and reliability activities, performance and long-term strategy. Reporting to me is the First Class Chief Operating Engineer who is responsible for managing the operations of the Power House in accordance with the *Operating Engineers Act*.[1]

Prior to being rotated to my current position in 2017, I was the Facilities Engineering Assistant Manager. In this role, I was the lead for the construction and commissioning of the CHP Facility. My project responsibilities included oversight of the construction of the CHP Facility, negotiating contracts for goods and services (including equipment, electricity and natural gas), establishing operational protocols and procedures, determining operational strategies and supervising equipment buyoff and team member training.

In both roles, I had oversight responsibility for energy conservation and demand management initiatives at the Cambridge Plant. These initiatives included such things as lighting and equipment retrofits, building system renewals and upgrades to the metering and monitoring system. I developed systems to track use and assign costs to business units, developed energy management plans and established and tracked key performance indicators. I had and still have, responsibility for high voltage maintenance and refurbishment activities for the Cambridge Plant, which I coordinate in conjunction with our local distribution company, Energy+ Inc. ("**Energy+**"), and with Hydro One Networks Inc. ("**Hydro One**"). I provide gas and electricity cost forecasts, negotiate energy-related agreements and prepare and implement cost-reduction strategies, including those related to Global Adjustment.

I have responsibility for keeping TMMC's upper management informed about all aspect of the operation of TMMC's energy projects (including the CHP Facility) and energy management activities. I am also responsible for external communications regarding TMMC's energy initiatives. Most notably, I presented at the World Energy Engineering Congress in Washington D.C in 2016. Finally, TMMC is proud that its CHP Facility project won "Energy Project of the Year – Canada Region" at the World Energy Engineering Congress in 2017.

[1] RSO 1990, c. O.42

My *curriculum vitae* is attached as **Schedule MC-1.**

Q.3 What is the purpose of your Written Evidence?

A. My evidence:

(i) provides contextual information about TMMC's electrical configuration and the design, development and operation of the CHP Facility;

(ii) explains TMMC's interest in Energy+'s cost-of-service application for approval of proposed distribution rates and other charges, effective January 1, 2019 ("Application") and the reasons for TMMC's intervention in this proceeding;

(iii) describes the nature of the standby distribution service that TMMC requires from Energy+ and comments on Energy+ Standby Rate from the perspective of a large industrial customer; and

(iv) provides recommendations on how Energy+ could improve its customer consultation process.

II. TMMC'S ELECTRICAL CONFIGURATION

Q.4 How does the Cambridge Plant receive electricity?

A. The Cambridge Plant is connected to the electricity distribution system of Energy+ via two dedicated 27.6 kV feeder lines (M24 and M30) that are connected to Hydro One's Preston Transformer Station ("**Preston TS**"). These feeders operate in parallel and, due to a differential protection scheme, ensure that electricity supply is maintained without interruption in the event that one feeder is out of operation. This unique system was constructed by Energy+ in 1996 to support a significant addition to the Cambridge Plant to accommodate increased production of the Corolla line. No changes or upgrades to Energy+'s system were required in connection with a further expansion of the Cambridge Plant in 2003, related to the Lexus line.

A single-line electrical diagram that depicts the TMMC – Energy+ – Hydro One connections is attached as **Schedule MC-2**. An aerial view of the connection configuration is attached as **Schedule MC-3**.

Q.5 Under which Energy+ rate class does TMMC receive service?

A. TMMC is one of two customers in Energy+'s Large Use, General Service (>5,000 kW) ("**Large Use Class"**).

III. <u>TMMC'S CHP FACILITY</u>

Q.6 When and why did TMMC decide to install the CHP Facility?

A. The CHP Facility went into operation on January 1, 2016. TMMC's decision to invest $27 million in a CHP Facility was driven by a number of different factors, including:

- our desire to increase our energy efficiency and realize cost savings, helping TMMC to stay competitive within the global manufacturing landscape;
- our desire to meet Toyota's corporate "Environmental 2050 Challenge" which sets targets that will help Toyota realize its global sustainable development goals; and
- our desire to benefit the community in which we are located by reducing TMMC's demand and freeing up energy for our neighbours to use.

TMMC worked closely with Cambridge Hydro during the planning and development phase of the CHP Facility. During that time, Mr. Ian Miles, the Chief Executive Officer and President of Energy+, was quoted in the press as saying "[T]hrough this collaboration, our community will benefit from improved system reliability and avoided power generation costs. Toyota's leadership has been pivotal to the success of working towards meeting our mandated energy and demand reduction targets."

Q.7 Could you describe the CHP Facility?

A. Yes. The CHP Facility comprises two gas-fired turbine generators, each with a nameplate capacity of 4.6 MW and two (2) heat recovery steam generators with the total capacity to produce over 100,000 lbs/hour of steam. TMMC uses this steam for heating, cooling and processes.

The following considerations were factored into in the design of the CHP Facility:

- the decision to install two gas-fired generation units instead of one was made to better match our load profile, coordinate maintenance activities and increase reliability and uptime;
- TMMC carefully considered associated equipment to effectively use the steam produced by the waste heat in both the summer and winter months; and
- due to the reduction of electricity generated as ambient temperatures increase, TMMC invested in chilled inlet air coolers (CIAC) to increase electricity production in the summer months; expected generation of 3.8 MW per unit during the summer has been raised to 4.2 MW through this addition.

Q.8 Are you able to comment on the relationship between the electrical load of the Cambridge Plant and the operation and output of the CHP Facility?

A. Yes. I compared data related to the operation of the CHP Facility to data related to the electricity loads of the Cambridge Plant, for the period January 1, 2016 to June, 2018. My analysis is attached as **Schedule MC-4**.

Q.9 Can you summarize the key conclusions of your analysis?

A. Yes. My two key conclusions are as follows:

- Since it went into operation on January, 2016,TMMC's CHP Facility has had the effect of reducing the electrical load of the Cambridge Plant and, therefore, the load on Energy+'s system during critical periods of peak summer demand.

- TMMC schedules the operation of its CHP Facility in parallel with underlying Plant loads, thus minimizing fluctuations in demand and peak demand on the Energy+ system. For example, we typically operate only one CHP unit during the weekend, when the load of the Cambridge Plant is less than during the week; we bring both CHP units back online prior to the start up of production at the beginning of each work week.

Q.10 Can you summarize your conclusions regarding CHP unit outages and, thus, TMMC's requirements for standby power?

A. Yes. My two key conclusions in this regard are:

- Most of the CHP unit outages that occurred in the period January 2018 to June 2018 did not have the effect of increasing maximum monthly demands on the Energy+ system.

- During periods of planned or unplanned outages of the CHP Facility, corresponding increases in the electrical load of the Cambridge Plant were well within the normal range of the variations in TMMC's electrical load that are caused by variations in the scheduling of production. In other words, the electrical load of the Cambridge Plant varies much more as a result of the start-up and shut-down of our production lines than it does as a result of changes in the operation of the CHP Facility. Similarly, the load varies with the season.

IV. <u>TMMC'S INTEREST IN ENERGY+'S APPLICATION</u>

Q.11 Why is TMMC participating in this proceeding?

A. Energy+'s Application includes two proposals which, if approved, would affect what TMMC pays for distribution service. The first is a proposal to implement a Standby" Rate that would also be applicable to customers in the Large Use Class who have load displacement generation ("**LDG**") facilities and who require Energy+ to provide additional distribution service during planned or unplanned outages of their LDG facility.[2] The second is a proposal to adjust its Retail Transmission Service Rates-Connection to reflect the pass-through of Hydro One connection charges on a gross, rather than a net load basis for customers with embedded distribution facilities ("**Gross Load Billing**").

Q.12 When did TMMC first lean the details of the Application and the rate proposals that would affect TMMC?

A. TMMC first learned of details pertaining to the Application at a customer engagement meeting with representatives of Energy+ on January 19, 2018.

Q.13 What happened at this meeting?

A. Representatives of TMMC met with representatives of Energy+ who made a presentation which included a PowerPoint presentation on the "whys and whats" of the Standby Rate proposal. This presentation is included in Energy+'s Application.[3] This was the first time that we learned about the Standby Rate proposal. Given the complex nature of the subject matter and the fact that it was quite foreign to the TMMC representatives at the meeting, we were understandably left with many questions and concerns.

Q.14 What happened next?

A. In a follow-up telephone call with Energy+'s Vice President of Customer Care & Communications on February 16, 2019, I posed a number of questions arising from our initial meeting. Energy+ then followed up with written responses.[4] Even after this, however, we still did not have a clear understanding of the rate proposals and how they would impact us. For example, with respect to Energy+'s proposed Standby Rate, TMMC did not know whether and, if so how, Energy+ had taken into account the system and other benefits attributable to the installation of LDG facilities at TMMC. TMMC did

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[2] Application, Exhibit 1, page 58 of 1145 (April 30, 2018).

[3] Application, Exhibit 1, Appendix 1-16, pp. 1104-1110.

[4] Application, Exhibit 1, Appendix 1-16, pp. 1116-1121.

not know, and did not have the information required to ascertain, whether a Standby Rate based on contract capacity would properly reflect Energy+'s costs of providing Standby service. Moreover, and quite apart from the design of the Standby Rate, TMMC did not have a good understanding of how the Contract Demand that formed the basis of the new rate would be determined. TMMC had similar questions about Energy+'s gross load billing proposal.

Q.15 What did TMMC do next to gain a better understanding of Energy+'s proposal?

A. We did three things. First, we retained a consultant to assist us in understanding Energy+ proposals. Second, we sent two sets of written questions to Energy+.[5] Third, with the assistance of our consultant, we embarked on an intensive course of study about distribution rates and utility cost allocation in order to educate ourselves about a topic we knew next to nothing about. The views that I express on behalf of TMMC in this evidence have been informed by our investigations and research in this regard.

Q.16 Why was it so important for TMMC to go to such lengths to understand Energy+'s proposals?

A. TMMC operates in a highly competitive business environment. The most important factor that has contributed to our continuous growth has been our ability to compete for investment with other Toyota facilities in Japan and the United States. Toyota's investment decisions are based on the competitiveness of each of its plants, measured in terms of manufacturing cost per vehicle, skills, safety and quality assurance. Energy costs are a key contributor to cost per vehicle. While Ontario offers a manufacturing landscape with many benefits, energy costs lag behind other jurisdictions in North America where Toyota manufactures vehicles.

Companies in the automobile manufacturing industry must drive cost reductions in all aspects of their business in order to remain competitive. TMMC works closely with its suppliers to look for ways to reduce its costs. It is a fundamental aspect of our business

[5] Application, Exhibit 1, Appendix 1-16.

culture. Prior to purchasing any good or service, we ask ourselves three basic questions:

- What is the basis of the cost?
- Is the cost reasonable?
- What drives that cost?

These questions help us understand and better manage our costs. The concept of continuous improvement …which we refer to as "kaizen"…is key to the management of our business.

Cost consistency and predictability are also very important to TMMC. As stated above, we compete with other manufacturers but we also compete with other Toyota companies world-wide. Cost comparisons across plants play an important part when Toyota is considering possible locations for proposed new model production lines. Wherever possible, Toyota seeks to ensure level playing fields across its facilities.

The significant increase in electricity costs in Ontario has undermined the competitiveness of TMMC. A reliable supply of fairly-priced electricity is vital to the success of TMMC's Ontario operations. There are limited measures that we can take to control costs in this area. We cannot, for example, shut down production to avoid system demand peaks. As a result, escalating Global Adjustment (GA) costs have, in particular, posed a serious business challenge. Further, TMMC air-conditions its Cambridge plant in order to provide a comfortable environment for its employees and to enhance the quality and consistency of the product we produce. Relative to other manufacturers that may not air-condition their plants, this practice means we have additional exposure to electricity costs in the summer months.

V. <u>ENERGY'S STANDBY RATE PROPOSAL</u>

Q.17 Does TMMC oppose the imposition of a Standby Rate on Large Use Class customers with LDG facilities?

No, provided the applicable rate is cost-based, non-discriminatory and not subject to change at Energy+'s sole discretion. From our perspective, the rate should also incent TMMC to manage its costs by minimizing its use of standby service and maximize the benefits that the CHP Facility provides to the electricity grid. This involves taking reliability-related steps to minimize the number and duration of outages and scheduling planned maintenance shut-downs during off-peak and shoulder periods.

Q.18 Is Energy+'s Proposed Standby Rate Appropriate?

A. From our perspective, it is not. Based on the materials filed to date in this proceeding, TMMC believes that Energy+'s Standby Rate proposal does not meet the essential elements of a fair rate design that I described above.

First, TMMC cannot accept the Standby Rate proposal because it does not appear to be based on costs. The dedicated feeders that serve TMMC have been in place since 1996, are still in service today and their associated costs are not any different than they were before.

Second, the rate appears to discriminate between customers who have LDG facilities and those who do not. Under Energy+'s proposal, in any month TMMC would pay the full distribution tariff on the Contract Demand, regardless of TMMC's actual peak demand in that month. Other distribution customers of Energy+ are not charged if their demand in any month falls below their peak demand in prior periods.

Third, there is no clarity on how the Contract Demand … a key feature of the proposal … has been established and how it will be adjusted going forward.

Fourth, the TMMC Contract Demand proposed by Energy+ appears to be punitive because it is based on peak demands established in the summer months. TMMC has a seasonal load profile and draws significantly lower levels of power in the winter months.

However, under Energy's proposal, the Contract Demand rate structure proposed by Energy+ means that TMMC would pay distribution charges throughout the year, based on TMMC's summer demand. This is unfair and discriminatory because other distribution customers with seasonal load profiles do not pay distribution charges throughout the year, based on their maximum load.

Q.19 What should the Board do with respect to Energy+'s Standby Rate proposal?

A. The Board should reject the proposal for the reasons set out in my evidence and in the Written Evidence of Mr. Jeffry Pollock, filed on behalf of TMMC in this proceeding. Counsel for TMMC retained Mr. Pollock in late July 2018, to provide his independent and expert opinions and recommendations on Energy+'s Standby Rate proposal.

VI. <u>GROSS LOAD BILLING PROPOSAL</u>

Q.20 What is TMMC's position with respect to Energy+'s Gross Load Billing Proposal?

A. Our position is that the Board should not approve Energy+'s Gross Load Billing Proposal because the Board has effectively put this issue "on hold" in response to concerns raised by parties about de-incentivizing distributed generation.[6] In so doing, the Board has noted that "it may review this matter further on a generic basis and provide information in due course.[7] This issue deserves a thorough examination that includes examination of how and why retail transmission charges are passed through to local distribution companies.

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[6] Board letter dated April 29, 2016 to Guelph Hydro regarding an application for approval of Gross Load Billing (EB-2015-0380) and Decision and Rate Order EB-2017-0064 at pp. 11-12 (March 22, 2018).

[7] Id.

VII. ENERGY+'S CUSTOMER ENGAGEMENT

Q.21 Can you describe how and when Energy+ consulted with TMMC prior to filing its Application on April 30, 2018?

A. As stated earlier in my evidence, Energy+ met with TMMC on January 19, 2018 to present details of its proposals, just three months or so before its April 27, 2018 filing deadline. Energy+'s compressed, three-month engagement schedule put TMMC in the difficult position of trying to come up a steep learning curve, in areas where it has no expertise and in respect of which only high-level information was initially provided. Although TMMC attempted to be responsive to Energy+'s requests for feedback, there was no real opportunity to do anything but pose further questions. The result of late engagement with TMMC was that there was insufficient time, from the date of the first meeting (January 19, 2018) to the date the Application was filed with the Board at the end of April, 2018, for a comprehensive and meaningful consultation where TMMC would have been able to propose changes to Energy+'s proposals that addressed issues and concerns. Such consultation could have served to reduce areas of misunderstanding and disagreement.

Finally, Energy+ declined TMMC's request to review a draft of the Application prior to the formal filing of the Application with the Board. That meant that we had few actual details about the as-filed proposals (relative to what had been presented to us in January) and no opportunity to request Energy+ to reconsider or revisit certain aspects of these before filing its Application.

Q.22 Did TMMC share these concerns with Energy+?

A. Yes. TMMC brought the above-described concerns to the attention of Energy+ in a letter dated April 19, 2018 to Ms. Sarah Hughes, Chief Financial Officer of Energy+.[8] Ms. Hughes responded by letter dated April 23, 2018.[9] In her letter Ms. Hughes noted that Energy+ had not received TMMC's feedback by Energy+'s deadline of mid-February,

[8] Application, Exhibit 1, Appendix 1-16, p. 1146.

[9] Application, Exhibit 1, Appendix 1-16, p. 1133.

2018. Ms. Hughes further noted that Energy+ had advised TMMC of the required timing for the receipt of TMMC's feedback. She also noted that Energy+'s consultant had followed up with TMMC in February and March, 2018 to solicit such feedback.

Q.23 What is your response to Ms. Hughes' letter?

A. Ms. Hughes is correct that TMMC did not provide its feedback to Energy+ within the one month deadline imposed by Energy+. As explained previously in my evidence, there were good reasons for this, all related to the fact that without more information and answers to many questions, TMMC was not in a position to provide meaningful feedback by Energy+'s deadline or even by the end of March 2018.

Q.24 Do you have any recommendations as to how Energy+ could improve its customer consultation?

A. I do. It would be beneficial for all parties if Energy+ were to establish a schedule of regular meetings with its large industrial customers to advise of planned, short and long term initiatives and proposed changes that have the potential to affect those customers from the perspective of cost, service or both. In particular, Energy+ should meet with its larger load customers well in advance of any significant regulatory filing or application in order to ensure that these customers have the opportunity to have meaningful input into the application or filing. Energy+ should also consult with customers before taking positions in regulatory policy and other proceedings which could adversely affect all or certain of its customers.

We also have a number of suggestions as to how Energy+ could make such engagement more meaningful and less confrontational. First, it would be helpful to receive detailed and understandable answers to our questions, with minimal use of jargon and acronyms. Second, and of critical importance to TMMC, is the need for Energy+ to understand and take TMMC's perspective into account when making proposals that will affect TMMC's business and its competitive position. Finally, it would be helpful if Energy+ were to advise TMMC of expected and significant new costs or material increases to existing costs (including rate riders), once every calendar year, in advance of TMMC's budget year.

Q.25 Does this complete your evidence?

A. Yes.

Melody Collis
Toyota Motor Manufacturing Canada Inc.
1055 Fountain St.
Cambridge, Ontario

SUMMARY STATEMENT

I am a results oriented individual with over 20 years of experience working in a fast-paces industrial environment. At Toyota Motor Manufacturing Canada (TMMC), I manage a team of specialists, skilled tradespersons and operating engineers. I am responsible for daily operations, maintenance and issue resolution for the power house, building, high voltage distribution and site. I effectively collaborate with internal business units and external parties to achieve company objectives. Over the course of my career at Toyota, I have championed energy reduction activities including lighting and equipment retrofits, building system renewals, and metering and monitoring system upgrades. I have been the project lead for several construction projects with the most notable being construction of a $26 M combined heat & power (CHP) plant that generates 9.2 MW of electricity for TMMC and provides steam used for heating, cooling, and processes.

PROFESSIONAL CERTIFICATION

- Professional Engineer of Ontario

EDUCATION

- University of Waterloo, Bachelor of Applied Science 1996 – Chemical Engineering

PROFESSIONAL EXPERIENCE

Toyota Motor Manufacturing (TMMC) **May 1996 - Current**

Facilities Maintenance Assistant Manager **Jan 2017 - Current**

- Lead a team of 35 operating engineers and skilled tradespersons
- Oversee daily operations of the powerhouse including the Combined Heat & Power Plant (CHP) to ensure on-time delivery of utilities to the production facility
- Coordinate maintenance and trouble-shooting of building and systems for a 3.5 M square foot facility
- Manage operations and maintenance of internal electrical distribution system (23.6kV to 480V) in alignment with local distributor (Energy+) and Hydro One, and best practices
- Develop and implement the long term strategy for operations and key performance indicators to monitor and improve downtime and reliability
- Execute reliability centered maintenance and refurbishment strategies

- Oversee compliance requirements related to Technical Safety & Standards Authority (TSSA), wastewater discharges, and Electrical Safety Authority

Facilities Engineering Assistant Manager **Jan 2010 – Dec 2016**

- Led a team of 10 engineering specialist
- Managed a $10 M operating budget, $12 M capital budget, and $30 M utilities budget
- Responsible for compliance & risk management including control of building permits, electrical tie-ins, regional by-law wastewater discharge requirements, electrical safety inspections, loss prevention and lifting devices
- Acted as the “Owner’s representative” for the $26M Combined Heat & Power Project (CHP). Effectively met the compressed schedule from approval through building expansion and implementation in less than 2 years
- CHP responsibilities included construction oversight, contract negotiations including equipment, electrical and gas contracts, operational strategies and procedures, equipment buyoff and team member training
- Project manager for building refurbishment including $2 M building façade refurbishment. Responsibilities included project justification, architectural design oversight, permitting, construction management and contract negotiation, and performance review
- Project manager for parking lot, marshalling yard and parts yard expansion with a budget of $10M. Responsibilities included project justification and funding, design oversight, permitting, and construction management. Completed to timeline and under budget
- Headed the Energy Management Organization with the mandate to mentor energy reduction activities throughout the organization
- Led multiple energy reduction projections including: high bay, administration & parking lot lighting retrofits to LED, implementation of VFDs, dock shelters, condensate return and metering & data collection improvements

Facilities Engineering Specialist **Jan 2007 – Dec 2009**

- Managed civil refurbishment projects in excess of $2 M including storm sewer modifications, and road refurbishment
- Coordinated the task force to audit, recommend improvements, and implement systems for improved management of lifting devices. Activities included improved documentation, status visualization, contractor management selection and audit.
- Managed $1.5 M contract for onsite summer and winter maintenance ensuring snow removal activity did not impact safety and production
- Updated energy data collection systems, shop billing and monthly reports.

Environmental Engineering Specialist **May 1996 – Jan 2007**

- Established tracking and reporting systems for energy management including energy reduction activities, reconciliation of meters, correlations of gas usage, and assignment protocols for shops to establish data defendable cost allocation to business units
- Lead for Enhanced Toyota Environmental Management Systems (EMS) - First North American plant to achieve new Toyota standards (2005)
- Enhanced EMS responsibilities included risk evaluation, update of EMS procedures, assisting business unit implementation and training. Managed $2M in upgrades to reduce risk related to compliance and groundwater.
- Led environmental evaluation of Lexus expansion project including air, waste, storm water, noise, waste water and construction impacts. Successfully communicated best site for new plant expansion considering current requirements and completed required permitting per target
- Represented Toyota with the Canadian Councils of Ministers of Environment (CCME) in the development of a standard for reducing air emissions for painting automotive parts
- Established Recommended CCME Standards and guidelines for the Reduction of VOC Emissions from Canadian Automotive Parts Coatings Operations http://toc.proceedings.com/32101webtoc.pdf
- Member of implementation team for ISO14001 certification, which included EMS development and documentation, establishment of significant aspects and key activities, management of key performance indicators, and establishing environmental management plans (EMPs) for energy, waste and air emissions.

SPEAKING ENGAGEMENT AND TRAINING EXPERIENCE

Cogeneration Network **Nov 2016**
Toyota Canada has installed a 9.2 MW plant
https://www.youtube.com/watch?v=MK-BUCitx-U

39th World Energy Engineering Congress (WEEC 2016) Washington, D.C **Sept 2016**
Why Combined Heat & Power? The Business Case for Toyota
http://toc.proceedings.com/32101webtoc.pdf

Union Gas Annual General Meeting **Aug 2016**
TMMC's Combined Heat & Power Plant Making Electricity since December 2015
https://www.uniongas.com/-/media/business/communication-centre/meeting-presentations/2016/customer-meeting-presentations-june-2016/toyota-chp.pdf?la=en&hash=CADB33E6CD53460909B229D7E0DC880CCF90D7F6

Engineering and Maintenance Training **2005 - Present**

- Coordinated certification of maintenance team members on Industrial Mechanics Training regulated by the Technical Standards & Safety s Authority (TSSA) and high voltage equipment
- Developed & delivered technical training with external engineering consultants on Building Construction and Lifting Devices
- Managed TMMC coop student program including hiring, monitoring progress, mentoring and critiquing final officer presentation using Toyota problem solving techniques

Environmental Training **1996 - 2005**

- Created training packages and led training for environmental programs including training on Toyota environmental standards, spills awareness, waste handling, and ISO 14001 auditor
- Delivered school outreach programs on industry and environmental initiatives

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TMMC – Energy+ – Hydro One Electrical Single Line Connection

[redacted]

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Aerial View of the Connection Configuration

[redacted]

Toyota Load Profile

This document provides an overview of Toyota's net load on the Energy+ system, and the relationship of this load to Toyota's behind-the-meter generation. The intent is to shed light on the nature of standby service that may be required by Toyota and the extent to which this standby support is already incorporated into Toyota's existing load profile and the distribution tariffs it currently pays.

Toyota's onsite generation consists of two 4.6 MW (nameplate capacity) combustion-turbine generating units, providing a total capacity of 9.2 MW (electrical). In addition to electrical power to serve Toyota's on-site needs, the units provide steam to serve Toyota process requirements.

Figure 1 below provides a profile of Toyota's hourly net load on the system for a representative month (October 2016). In this graph, which is presented as an area chart, Toyota's net load is shown in dark blue. The output from Toyota's generation units are shown in light blue immediately in front. Load data are shown in time sequence.

Figure 1

[redacted]

The following can be observed from this figure:

- There is a weekly pattern to the data. Toyota's net load falls on the weekends, as expected, when production shuts down. During this month, weekends correspond to hours 1-48, 169-241 (including the Thanksgiving holiday), 337-384, 504-576, and 673-720.

- Toyota typically operates one cogeneration unit during the weekend, although sometimes both units are down (as a result of both planned and unplanned outages). Having both units down on the weekend results in higher net loads on the Energy+ system (shown in dark blue)than would otherwise be the case. Any additional power requirements during the weekend are well within the peak loads generally observed on weekdays.

[redacted]

Some overall conclusions from this analysis are as follows:

- The provision of standby power is already being accounted for in Toyota's existing observed values for billed demand.

- The variation in load as a result of generation outages is well within the range of normal load variation at the plant as a result of general production scheduling. For example, net load at the plant increases more at the beginning of the week at production start-up than it does when one cogeneration unit goes off line.

Another useful way of looking at the inter-relationships between net load and cogeneration output is to use a scatter-plot. A scatter-plot is an easy way to graph large amounts of data and to look at patterns or correlations among variables. (Scatterplots, however, are not useful in identifying relationships through time.)

In the scatter-plots below, points on the graph represents data from one hour in the year: The value on the Y or left-hand axis represents generation output by Toyota's generating units during that hour, while the value on the X or bottom axis represents net load observed on the Energy+ system.

Points are formatted differently depending on their nature:

- Hours representing monthly net demand peaks on the Energy+ system are shown in red.
- Other on-peak hours are shown as dark blue circles.
- Other off-peak hours are shown in the form of ochre crossed lines.

Figures 2, 3 and 4 show data for calendar years 2016, 2017 and 2018 YTD.

Figure 2

[redacted]

[redacted]

Some patterns in the data are immediately apparent. In particular, data points in each of the graphs are arrayed in three distinct horizontal bands. The largest and thickest band is at the level corresponding to generation output from 8,000 to 10,000 kW. The second thickest bank is at about 4,000 kW, while the third and narrowest band is along the bottom axis (zero generation output). This pattern is not unexpected and reflects the following:

- If a cogeneration unit is in operation, it generally operates at full output (the exact level will vary with ambient temperature and by season). The three bands observed reflect hours with output at full load of zero, one, or two cogen units.
- In each of the periods, there are many hours when only one cogeneration unit is operating. There are far fewer hours when neither cogeneration unit operates. This is shown by the fact that there are many more points in the band at 4,000 kW than in the band along the bottom axis. As a result, Energy+ rarely has to cover the full gross load at the Toyota plant (i.e. with both cogen units down).

[redacted]

[redacted]

- Individual months may have unique patterns. Figure 5 looks in isolation at May 2018, which is the month highlighted in the notes above. In this month, all hours showed at least some cogeneration output, and the outages of one unit were associated with lower net demand peaks. Outages coincided with lower plant demand.

Figure 5

[redacted]

[redacted]

Figure 6

[redacted]

Some observations from the scatter-plot analyses are as follows:

- It is, in practice, difficult to disentangle changes in net load on the Energy+ system attributable to the need to provide standby power from general changes in load simply because of production variation at Toyota. Changes attributable to normal demand fluctuation are greater than those caused by cogen outages.
- The majority of hours with outages of cogeneration units occur within the envelope of demand already accounted for by normal load variation.

It is certainly true that the addition of cogeneration results in a load profile for Energy+ that is peakier. Since Toyota pays distribution charges on its NCP in any given month, however, the additional 'peakiness' of the load within any month is already taken into account in the billing process.

We have also examined the relationship between generation at Toyota and Energy+'s overall system peak, based on data provided by Energy+ through the Interrogatory process.

These data show that:

- The Energy+ system is characterized by increased demand in the summer months.
- Generation at Toyota has consistently helped to reduce Energy+'s peak loads during these summer months of high demand.

Figure 7 below shows both net and gross peak loads for the Energy+ system over the period since January 2016. Gross peaks are those set by adding output from generation at TMMC to Energy+'s reported net loads in each hour. This data was provided by Energy+ in response to TMMC IR-14 Question 2.

<u>Figure 7</u>

[redacted]

Figure 7 confirms that Energy+ system loads are higher in the summer months than in the winter months.

Figure 8 shows generation at Toyota during the system peaks graphed above. We graphed Toyota generation output at both the gross and net peaks for the Energy+ system. Since the net and gross peak loads generally occurred in the same hour, the two lines overlap except for the following three months:

- January 2016
- March 2016
- April 2017.

Figure 8

[redacted]

Another way to examine the data is to show the relationship between net peak loads for the Energy+ system and Toyota generation output in the form of a scatter graph. Figure 9 provides this perspective. In Figure 9, each data point represents one month; generation output by Toyota at the Energy+ net system peak is shown on the vertical axis, while the magnitude of the net system peak is shown along the horizontal axis.

Figure 9

[redacted]

Figure 9 shows that periods of high demand on the Energy+ system are strongly correlated with high output from Toyota generation. [redacted]