Ontario Energy Board:

LDC Capital / DSP Programs Review – Benchmarking Candidates

Submitted By: Midgard Consulting Incorporated

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1 Introduction

Midgard Consulting Inc. ("Midgard") has been retained by the Ontario Energy Board ("OEB") to complete a Capital / Distribution System Plan ("DSP") Activity and Program Review. The objective of the review is to identify potential benchmarking candidates ("Benchmarking Candidates") to support the OEB as it seeks new ideas, innovations and approaches to ensure local distribution companies ("LDC") in Ontario are delivering cost effective, reliable and responsive services to consumers.

The potential Benchmarking Candidates identified in this report are limited to capital expenditures ("Capex") that fall under an LDC's capital expenditure program. Benchmarking at the asset level seeks to drill down to LDCs' cost performance for specific activities to allow cost comparisons to their peers and assessment of year-over-year continuous improvement. For clarity, the Capex presented in LDC DSPs is generally broken down into a set of "projects" or "programs" which affect assets. While data appears to be available to support benchmarking on a project or program basis, consistency of project and program structure is required between LDCs to make this more viable.

Benchmarking is a useful tool for both regulators and LDCs. From a regulator's perspective, benchmarking can be used for comparing and ranking cost and performance metrics of an LDC against other LDCs or against an LDC's own historic or projected performance in order to assess the reasonableness of costs and to identify areas that require closer scrutiny. From an LDC's perspective, benchmarking can be a useful tool because it enables the LDC to confirm its overall effectiveness relative to other similar LDCs and to its historic performance while also helping to identify areas for improvement.

This report does not cover the benchmarking process or the creation of metrics to facilitate the benchmarking process. Rather, it focuses on the initial stages of the benchmarking process, specifically the identification of Benchmarking Candidates.

1.1 Ideal Benchmarking Candidates

Any proper analytical exercise begins with identifying and sourcing valid, accurate and meaningful data. The "ideal" Benchmarking Candidate is one that is supported by comprehensive information, including cost data, specifications, and other planning, operations and performance information. Table 1 summarizes the criteria established to identify an "ideal" Benchmarking Candidate. Note that Midgard uses the term Benchmarking Candidates and the data which composes the Benchmarking Candidates interchangeably.

Table 1: Ideal Benchmarking Candidate Criteria

Criteria	Criteria Description
Common	The Benchmarking Candidate is one that is common to all or a majority of the LDCs.

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Material	The Benchmarking Candidate should be integral to the proper functioning of the LDC, such as poles or conductors.
Discrete	A discrete Benchmarking Candidate is one that can be specifically defined, such that there is little ambiguity as to what is incorporated within the Benchmarking Candidate, and what is not.
Longevity	A Benchmarking Candidate is unlikely to become obsolete as a functional grouping in the foreseeable future.
Available	Available data is defined as information that is readily available within an industry standard asset management program. Data or information that is included as part of current utility filing practices (e.g., accounting / filing requirements) or referenced within the filing (e.g., Asset Condition Assessment) fall into this category.

The above criteria play an important role in in the selection of the Benchmarking Candidates discussed Section 3 of this report.

1.2 Suitability of DSPs for Benchmarking

Ontario LDCs file DSPs, which among other things, categorize planned Capex under four different investment drivers, or "investment categories" in OEB terminology (detailed further in Section 2.2):

1) System Access
2) System Renewal
3) System Service
4) General Plant

The primary motivation for each investment determines the categorization of a given investment:

- **System Access/Renewal/Service:** Projects or programs that add, modify or remove electric distribution system assets (e.g., poles, transformers, circuit breakers, etc.) will normally fall under one of the three "system" investment categories (System Access, System Renewal, or System Service) depending upon the applicable primary project driver.
- **General Plant:** The fourth investment category, General Plant, encapsulates the investments in non-power assets required to operate, maintain and manage the distribution system (e.g., office space, service trucks, IT, and customer service functions).

The benchmarking criteria discussed in Table 1 will generally be available for an asset, but not necessarily for a project or program listed under one of the four investment categories. Investment categories provide a helpful summary of the Capex investment drivers, particularly when comparing each LDC against its own historical spending performance, and against its peer group. But to benchmark spending on an "apples-to-apples" basis, the items being compared must lend themselves to easy comparison.

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2 Trends Analysis

In support of selecting Benchmarking Candidates, Midgard reviewed the DSPs of recently filed electricity distributor rate applications to identify common themes and trends across the industry.

2.1 DSP and Data Trends

Midgard has been an established vendor of record for the review of DSPs on behalf of the OEB since 2015. In this role, Midgard has completed 13 capital / DSP reviews, ranging from small distributors such as Welland Hydro-Electric System Corp. to large distributors such as Hydro One Networks Inc. Under the current scope of work, Midgard has completed a high-level review of thirty (30) DSPs recently filed by Ontario LDCs.

Based on the above experience, Midgard has observed a number of overall trends across the industry, including two key trends that underpin the decision-making and rationale incorporated into the DSP filings:

1) **Aging Asset Demographics:** The median age of LDC assets is older relative to the median age of similar assets from prior year filings.
2) **Asset Management Program Adoption:** LDCs have globally begun adopting asset management programs, informed by physical asset condition assessments and incorporating risk management methodologies.

The effect of aging asset demographics is increasing pressure on System Renewal Capex budgets compared to historic levels. The adoption of asset management programs increases the repository of each LDC's asset information, including asset age and condition. Both of these trends tie into the OEB benchmarking initiative in that aging asset demographics are putting pressure on LDCs to augment System Renewal Capex, which can be benchmarked to confirm adequate cost controls are in place for LDCs, while asset management programs are improving the availability of asset information which could facilitate establishment of the analytical framework for benchmarking. To be clear, detailed asset information is not consistently made available within the current generation of DSP filings, however the existence of the underlying information is typically acknowledged. Making the data available in future filings in a meaningful and consistent manner should be reasonable and practical for the LDCs.

2.2 Capital Investment Analysis

Per Section 5.1.2 of the OEB's Filing Requirements for Electricity Distribution Rate Applications[1], LDCs are required to group planned Capex into four (4) investment categories:

1) **System Access:** System Access investments are driven primarily by mandatory service obligations, and are therefore largely non-discretionary in nature. These costs may vary widely from one year (or

[1] Ontario Energy Board. Filing Requirements for Electricity Distribution Rate Applications – 2018 Edition for 2019 Rate Applications. Chapter 5 Consolidated Distribution System Plan. Link

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decade) to the next due to factors that are generally outside the LDC's control, and consequently they are less conducive to predictive planning than is the case for discretionary spending.

2) **System Renewal:** System Renewal investments are generally discretionary and involve the replacement or refurbishment of aging, failing or failed distribution assets. Due to the general trend of aging asset demographics (as described in Section 2.1), System Renewal investments typically comprise the largest proportion of planned Capex by the DSPs evaluated in this report.
3) **System Service:** System Service investments are generally targeted at enhancing system performance and addressing safety and reliability goals. Investments under this category are typically a mix of discretionary (e.g., performance) and non-discretionary (e.g., legally mandated safety & environmental) projects.
4) **General Plant:** General Plant differs slightly from the above investment categories since it represents costs allocated towards assets that do not directly make up the LDC's electrical distribution system, but rather support operation and management of the in-field assets. Additionally, General Plant investments are typically tailored to address utility-specific customer service expectations, and utilities apply significant discretion in how they attempt to achieve this goal. For example, the level of technological innovation, automation, IT infrastructure, and frequency of upgrades adopted will vary between LDCs based on their different situations and strategies.

Under each of the four investment categories, investments are typically broken down further into a portfolio of projects and/or programs, which in turn consist of discrete assets. Under the current scope of work, Midgard has completed a high-level analysis of the capital projects and programs under each investment category to determine whether there is consistency across the distributor sector and to identify potential candidates for benchmarking.

The OEB provided a preliminary compilation and summary of capital projects and programs derived from 30 separate cost of service and Custom Incentive Rate-setting ("Custom IR") (multi-year) rebasing applications filed with the OEB over the 2012 to 2017 period ("OEB Spreadsheet"). The compiled capital project and program expenditures, divided into the four investment categories, were further classified into two sub-categories based on commonalities between the investments:

1) **Primary Cost Items**: A Primary Cost Item represents a project or program that is reported by at least 3 LDCs among the set of 30 selected (i.e., ≥ 10% of LDCs).
2) **Secondary Cost Items**: A Secondary Cost Item represents a project or program that is reported by less than 3 LDCs among the set of 30 selected (i.e., < 10% of LDCs). Analyzing Secondary Cost Items yielded limited useful information, largely due to the lack of data points that could be compared with one another.

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The top five (5) Primary Cost Items under each investment category, which represent the five (5) largest cost percentages on a dollar spent basis, were analyzed further to identify common themes between LDCs. Table 2 provides a summary of the common themes observed under each investment category, including driver details, the top cost items (i.e., projects and / or programs) as identified in the OEB Spreadsheet[2], and the major asset classes in which investment was forecast.

Table 2: Capital Investment Analysis Summary

Investment Category / Driver	Common Themes		
	Driver Details	**Top 5 Primary Cost Items (Source: OEB Spreadsheet)**	**Major Asset Classes[3]**
System Access	Common drivers include: • Mandatory Service Obligations (i.e., non-discretionary)	1. New Services 2. Metering 3. Expansions 4. Relocations 5. Embedded Generation	Major Assets include: • Poles • Overhead Conductor • Underground Conductor • Transformers • Switchgear • Voltage Regulators • Meters
System Renewal	Common drivers include: • Aging System & Failure Risk • Functional Obsolescence	1. Underground Line renewal / conversion 2. Line renewal / conversion (not specific about underground or overhead) 3. Pole/ towers & fixtures replacement 4. Renewal at distribution station 5. Overhead Line renewal / conversion	Major Assets include: • Same Major Assets as identified for System Access.
System	Common drivers include:	1. Distribution Automation	Major Assets include:

[2] Source: OEB Spreadsheet entitled "*OEB Staff Preliminary Analysis of Potential LDC Programs for Benchmarking_DRAFT_20180920*".

[3] Note: Although certain Primary Cost Items identified relate to distribution stations and lines, "distribution stations" and "lines" are not listed as major asset classes since they are facility types rather than asset classes (i.e., they comprise multiple constituent assets). Distribution station assets, such as transformers and switchgear, and line assets, such as conductors and poles, are listed since they are asset classes. A key differentiating factor between facility types and asset classes is that asset classes have depreciation curves, whereas facility types do not.

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Investment Category / Driver	Common Themes		
	Driver Details	**Top 5 Primary Cost Items (Source: OEB Spreadsheet)**	**Major Asset Classes[3]**
Service	• Safety or Environment • System Reliability • System Efficiency • Capacity Constraints	2. Smart Grid 3. Distribution Enhancements[4] 4. Line Extension 5. Distribution Equipment Replacement / Upgrades	• Same Major Assets as identified for System Access and System Renewal.
General Plant	Common drivers include: • System Support • Business Efficiency • Regulatory Compliance • Functional Obsolescence • Aging Facilities	1. Facilities 2. Computer Hardware / Software 3. Vehicles / Transportation 4. Equipment and Tools 5. Building Improvement / New Buildings	Major Assets include: • Buildings & Facilities • Computer Hardware & Software • Vehicle Fleet • Equipment / Tools

2.3 Summarizing the Analysis Findings

Midgard analyzed information filed by LDCs in DSPs, classifying expenditures by investment category, by commonalities between the investments, and by aggregate magnitude of expenditures.

The analysis established that the major asset classes that fall within the System Access, System Renewal and System Service investment categories and sub-categories are consistent from one LDC to the next, since these asset classes are integral to the proper functioning of any LDC. LDCs have also begun adopting asset management programs meaning that LDCs have a growing database of asset-specific data such as inventories, age, and condition assessments. Such data is referenced within DSPs, however the level of asset related details and data granularity provided in the DSPs is inconsistent between LDCs. Asset-level benchmarking is recommended because of the consistency of assets between LDCs. However more detailed and consistent asset data is required to facilitate asset-level benchmarking. Consequently, Midgard recommends that the OEB guide utilities to incorporate a higher granularity of asset related data reporting as part of the filing requirements to enable easy extraction of data that is conducive to benchmarking.

[4] Distribution enhancements are modifications to existing distribution systems that help improve operations (e.g., line extensions, system voltage conversions, system reliability enhancements, circuit reconfigurations, etc.).

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One exception to asset-level benchmarking is the benchmarking of General Plant costs. At this stage, Midgard does not see value in benchmarking General Plant cost items at an asset level (e.g., software, fleet, or building upgrades) because general plant investments tend to be less concentrated within specific project or asset categories, and there is little consistency in the allocation of General Plant investments between utilities[5]. Nevertheless, Midgard recommends benchmarking General Plant costs on an aggregated level (e.g., total cost per customer). Total 'capital overhead' required to support the electric distribution system is a metric that contains useful information and allows comparability between utilities while still allowing utilities the flexibility to choose different implementation strategies.

[5] Benchmarking General Plant cost items at an asset or program level is not recommended at this time, however Midgard notes that this recommendation may be revisited in the future.

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3 Recommended Benchmarking Candidates

Midgard's recommended Benchmarking Candidates, listed in Table 3, consist of several specific assets and one aggregated group of assets (i.e., General Plant). Note that distinct categories for distribution stations and lines are not part of the Benchmarking Candidates because of the heterogeneous nature of distribution station and line configurations. Rather, the individual discrete assets within distribution stations (e.g., transformers and breakers) and lines (e.g., conductors and poles) are listed as Benchmarking Candidates.

Table 3 lists the recommended Benchmarking Candidates assessed against the ideal benchmarking criteria (previously defined in Table 1).

Table 3: Recommended Benchmarking Candidates

Asset Categories	Asset Sub-Categories	Ideal Benchmarking Candidates Criteria				
		Common	Material	Discrete	Longevity	Availability
Poles	Wood	X	X	X	X	X
	Concrete		X	X	X	X
	Steel		X	X	X	X
	Composite		X	X	X	X
Conductors	Overhead	X	X	X	X	X
	Underground	X	X	X	X	X
	Submarine		X	X	X	X
Transformers	Pole Top	X	X	X	X	X
	Pad Mounted	X	X	X	X	X
	Vault		X	X	X	X
	Transmission to Distribution Power Transformers (69 kV - 230kV / 13.8 kV - 44 kV)	X	X	X	X	X
	Sub-Distribution Power Transformers (13.8 kV - 69 kV / < 12 kV)	X	X	X	X	X
Switchgear	Circuit Breakers / Reclosers	X	X	X	X	X
	Switches	X	X	X	X	X
	Fuses	X	X	X	X	X
Voltage Regulators	None	X	X	X	X	X
Meters	None	X	X	X	X	X
General Plant	None	X	X		X	X

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Midgard notes that the list of recommended benchmarking candidates presented in Table 3 may not be applicable to all LDCs in Ontario as a result of varying distribution system requirements across the diverse geographical areas served by different utilities. To resolve this issue, benchmarking could either be conducted in such a way that diversity is taken into account, or peer group customization may be considered to enable a comparison between similar LDCs (discussed further in Section 4).

In addition to the asset-specific benchmarking candidates discussed above, Midgard recommends that the OEB track, trend and benchmark investments being made under the four major investment categories: System Access, System Renewal, System Service and General Plant. The requisite data needed to create benchmarking trends for these investment categories is currently provided in LDC cost of service filings and is already being used by the OEB in its evaluation of those applications. Normalization against total historical and planned investments can be done easily and establishing suitable benchmarks among peer groups is expected be a relatively straightforward exercise. Benchmarks based on these investment categories should provide useful context in the OEB's assessment of individual utility cost of service applications, and from a broader perspective will indicate how different utilities, peer groups and the sector are responding to drivers such as evolving asset demographics, population and energy intensity changes, introduction of mandatory programs (e.g.: smart meters), availability of new technologies, etc. In summary, this facilitates an assessment at the broader investments category levels that may also provide insights about the asset-specific candidates.

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4 Summary & Next Steps

The objective of the review undertaken by Midgard was to identify potential Benchmarking Candidates to support the OEB as it seeks new ideas, innovations and approaches to ensure LDCs in Ontario are delivering cost effective, reliable and responsive services to consumers.

Asset-level benchmarking (as set out in Table 3) is recommended for two reasons:

1) **Reason 1:** The major asset classes that fall within the investment categories and projects/programs are defined consistently across LDCs.
2) **Reason 2:** The repository of asset-specific data such as quantity, age, and condition is growing amongst LDCs as a result of ongoing adoption of structured asset management practices.

Midgard also recommends benchmarking General Plant costs on an aggregated level (e.g., total cost per customer) since this is a metric that contains useful information and allows comparability between utilities.

The potential Benchmarking Candidates identified in this report are currently limited to assets that fall under an LDC's capital expenditure program. As the OEB's benchmarking initiative evolves, Midgard recommends benchmarking that incorporates total cost of ownership for different assets classes (or Lifecycle Analysis). The total cost of ownership metric incorporates all aspects of managing those assets which play a key role in determining the operational performance of the utility. The total cost of ownership of an asset includes not only the initial capital cost associated with the acquisition of the asset, but also includes the capital additions and ongoing operation, maintenance and administration ("OM&A") costs invested over the life of the asset, as well as the projected retirement costs. Current DSP filings do not record all these metrics, however it can be derived based on information that should be available to the LDCs and the OEB should consider evolving the filing requirements to include total lifecycle cost of asset ownership for key asset classes.

4.1 Next Steps

Further analysis is required to practically implement benchmarking at an asset level. As part of next steps, the following should be considered:

- **Normalization Factors**: To compare and benchmark asset-level costs between utilities, the available data must be normalized to enable an easy comparison between (similar) distributors on a "per capita" basis. Different normalization factors allow for different levels of comparability: cost per unit installed, cost per asset population, and cost per customer, for example.

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- **Asset Management Program**: Detailed asset management reporting should be integrated into formal filings to facilitate benchmarking. For example, Australian filing requirements[6,7] may be an appropriate model for Ontario to consider.
- **Peer Groups**: Defining appropriate peer groups as part of a benchmarking analysis is important because it allows for an "apples-to-apples" comparison between similar utilities, in consideration of factors such as total customer count, customer type, total km of distribution line, or geographical area, for example.
- **Integration of Capex and OM&A spending (Lifecycle Analysis)**: As a long-term goal, total lifecycle cost of ownership reporting should be integrated into cost of service filings to facilitate benchmarking LDC performance in terms of asset management.
- **Investment Category Trends**: To track, trend, analyze and benchmark historical and planned expenditures under the four major investment categories (System Access, System Renewal, System Service and General Plant), to enable benchmarking of utilities within peer groups, across different peer groups and the sector in response to different internal and external drivers.

[6] AER. Expenditure Forecast Assessment Guideline – Regulatory Information Notices for Category Analysis 2014. Link

[7] AER. Expenditure Forecast Assessment Guideline – Regulatory Information Notices for Economic Benchmarking 2014. Link