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2021 Utility Grid Modernization Survey

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4 **Executive Summary**

5 **Grid Modernization Overview**

- Introduction
- Importance of Grid Modernization Now
- New Investments in Grid Modernization

9 **Survey Introduction**

- Survey Introduction
- Survey Participants

11 **Survey Results**

- Strategy & Planning – Introduction and Benchmark Results
- Resiliency – Introduction and Benchmark Results
- Flexibility – Introduction and Benchmark Results
- IT / OT – Introduction and Benchmark Results
- Workforce of the Future – Introduction and Benchmark Results
- Customer Engagement – Introduction and Benchmark Results

26 **Conclusion**

30 **Appendix**

Executive Summary

The electric distribution grid is undergoing a massive transformation. This is being driven by innumerable factors including, but not limited to: aging infrastructure, extreme weather events, and shifting electricity supply and demand models. Given the extent of the challenge, there are many stakeholder groups involved in the grid transformation process including public agencies, industry, and consumers. However, utilities will be at the forefront of this change. They must lead the charge and guide the actions that need to be taken to reimagine and develop the electric distribution system of the future. Given the complexity of the undertaking and the various operating models and regulations facing utilities, there isn't one clearly defined course of action.

To help utilities understand the current grid modernization maturity landscape, FPL and Accenture developed this benchmark study. We asked our survey respondents to provide us insight into their capabilities surrounding numerous key grid modernization topics. We supplemented those findings with secondary research and further analyses. Through this process, we created a benchmark reference that respondent utilities can use to understand their respective grid modernization maturity and opportunities for growth.

There are four key considerations that utilities can take away from this study:

1. Utilities are recognizing the importance of grid modernization and have well developed grid modernization strategies which are impacting their future investment planning activities.
2. Many respondents' extreme weather response and control center procedures have not seen much growth in the wake of the modernizing grid. Given the successful integration of new operational technology (e.g., OMS, AMI), utilities can leverage analytics to make better use of the data received from these technologies.
3. While most respondents acknowledged the increased deployment and presence of DERs, many of them are still in early developing stages regarding strategizing and enabling capabilities.
4. New workforce technologies (e.g., drones, AI/ML, AR/VR) are rapidly becoming integrated into distribution operations.

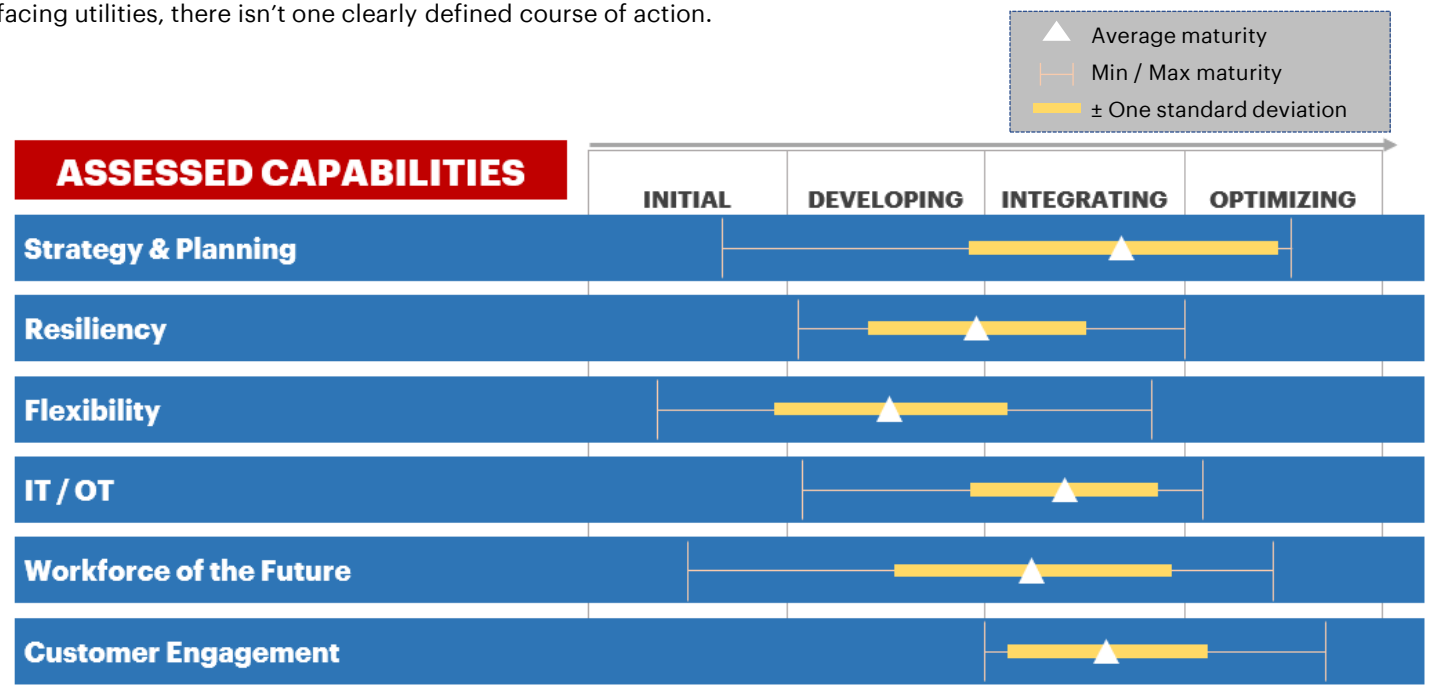

Figure 1. Average maturity per capability

Grid Modernization Overview

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Introduction

The 20th century developed North American grid is showing its age. A significant proportion of many distribution systems were built in the 1960s to 1980s and are nearing the end of their technical lives. One 2015 report from the U.S. Department of Energy concluded that 70% of power transformers are 25 years of age or older[1]. While this serves as a testament to the engineering ingenuity that developed the grid infrastructure, a massive overhaul is still required.

While the most apparent solution may be to just replace the old poles and wires, the reality is not as simple. One 2017 study estimated that the cost to replace the entire U.S. distribution infrastructure could be close to $1.8 trillion[2]. However, even putting aside the cost, the status quo is no longer sustainable.

Extreme weather events that contributed to the 2018 California wildfires and 2021 Texas Power Crisis not only highlighted the vulnerabilities in the existing grid infrastructure but demonstrated the urgency for more resilient systems. The combination of increasing supply of renewable energy resources and increased demand in the form of electrification and electric vehicle proliferation brings new flexibility requirements and a need for a more decentralized grid architecture.

While these challenges appear to be insurmountable obstacles, there are powerful new digital tools that can be leveraged to modernize and develop a “smart grid”. Cutting edge advances in technology, equipment, controls, and communication offer new grid operating capabilities and, more importantly, the ability to transform traditional decision-making mindsets.

$1.8T

Estimated cost to replace the U.S. distribution infrastructure

A modernized grid is long overdue and utilities can use the challenges of today to reimagine the future of the electric distribution system.

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Current day events are highlighting the need for grid modernization and projections on emerging trends point towards a need for prompt action.

Extreme weather events are increasing in number and only expected to become more destructive
Changes in climate patterns have had significant impacts across the grid. The most notable of these are the events that have caused damage to distribution infrastructure or been caused by failing infrastructure. A 2021 report found that there has been a 67% increase in weather-related power outages since 2000 in the United States[3]. Similarly, higher temperatures lead to both increased consumer demand and decreased generation plant efficiencies seen in the increasing number of rolling blackouts across many parts of the US.

Increased proliferation of variable renewable energy sources will create instability if left unaddressed
Global installations of renewable energy are projected to grow at a CAGR of 7.6% between 2021 to reach 3,812 GW by 2026 and DERs are estimated to compose ~10% of the renewable energy mix[4]. 31 US states currently have renewable portfolio standards, further requiring utility responses. While many utilities have been responding with utility scale storage and renewable generation, this shift also has impact on distribution systems. Renewables can create unforeseen impacts on voltage profiles, reverse power flows, and create difficulties in determining the source of network problems.

Exponential growth in electric vehicles adoption and electrification are increasing demand requirements
In North America, electric vehicles are expected to grow at a CAGR of 31% between 2021 – 2026[5]. This rapid increase has the potential to cause significant strain on the grid during peak load periods with one study projecting a 38% in US electricity demand solely due to EVs[6]. Increasing electrification trends in other industries is also contributing to an increase in demand requirements.

Recent cyberattacks on critical infrastructure are only part of a growing trend
The 2015 Ukraine power grid cyberattack is the first known successful cyberattack on the power grid. Not only did hackers compromise and damage information technology systems, but they also seized control of SCADA systems and were able to remotely shutoff substations. The 2021 Colonial Pipeline ransomware cyberattack prompted a pipeline shutoffs that created fuel shortage incidents. The utility industry is recognizing that these are not isolated incidents and that malign actors are increasing their focus on the power grid. A recent survey of global utility professionals found that 54% expect a cyberattack on critical infrastructure in the next 12 months[7].

67%

increase in weather-related power outages since 2000 in the United States

31%

projected growth in CAGR between 2021-2026 in the North American EV market

54%

of global utility professionals expect a cyberattack on critical infrastructure in the next 12 months

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Massive investments are needed to maintain a resilient and efficient grid that can deliver low-carbon electricity and meet customer demands. North American public agencies have recognized this imminent need and have taken actions at both federal and local jurisdiction levels.

Dec. 2020 – Energy Act

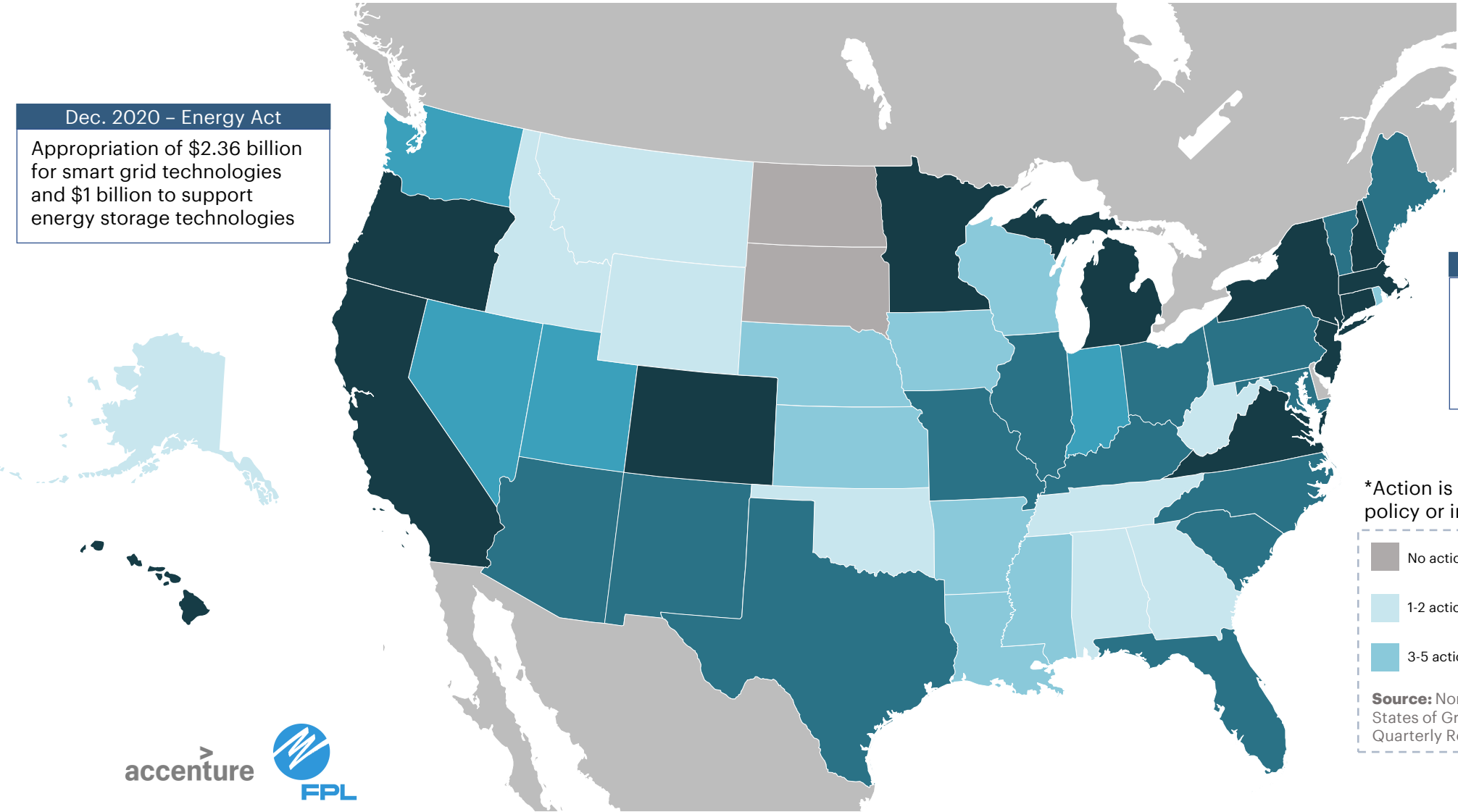
Appropriation of $2.36 billion for smart grid technologies and $1 billion to support energy storage technologies

Jun. 2021 - SREP Program

$964M program announced by Canadian government to support smart renewable energy and grid modernization

American Jobs Proposal

Biden administration's American Job proposal earmarks $100B to invest in America's power infrastructure



*Action is defined as any relevant jurisdictional level policy or investment decisions

- No action in 2020
- 1-2 actions in 2020
- 3-5 actions in 2020
- 6-9 actions in 2020
- 10-19 actions in 2020
- 20 or more actions in 2020

Source: North Carolina Clean Energy Technology Center, The 50 States of Grid Modernization: 2020 Review and Q4 2020 Quarterly Report, February 2021

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Survey Introduction

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Survey Introduction

Given the difficulties in even defining the term "grid modernization", it has proven even more challenging to assess the progress distribution utilities have been making in transforming the grid and incorporating new best practices. There is no standard, broadly accepted definition or scope of grid modernization. Different operating companies are subject to different regulations and operating situations, affecting their capabilities and priorities in grid innovations. However, in order for utilities to identify performance gaps and learn from each others' successes, there needs to be a mutual understanding of the key capabilities that will drive change in the industry.

The 2021 grid modernization benchmarking survey consists of 57 questions and assesses electric distribution utilities' maturities across a series of grid and utility modernization topics. Figure 2 denotes the six capabilities of grid modernization which directed the benchmark's survey. It is important to note that the survey is specifically targeted towards distribution utilities and does not ask any questions related to their transmission infrastructure or any generation capabilities. While these are very important areas of discussion, the distribution specific analysis was conducted for a more targeted discussion.

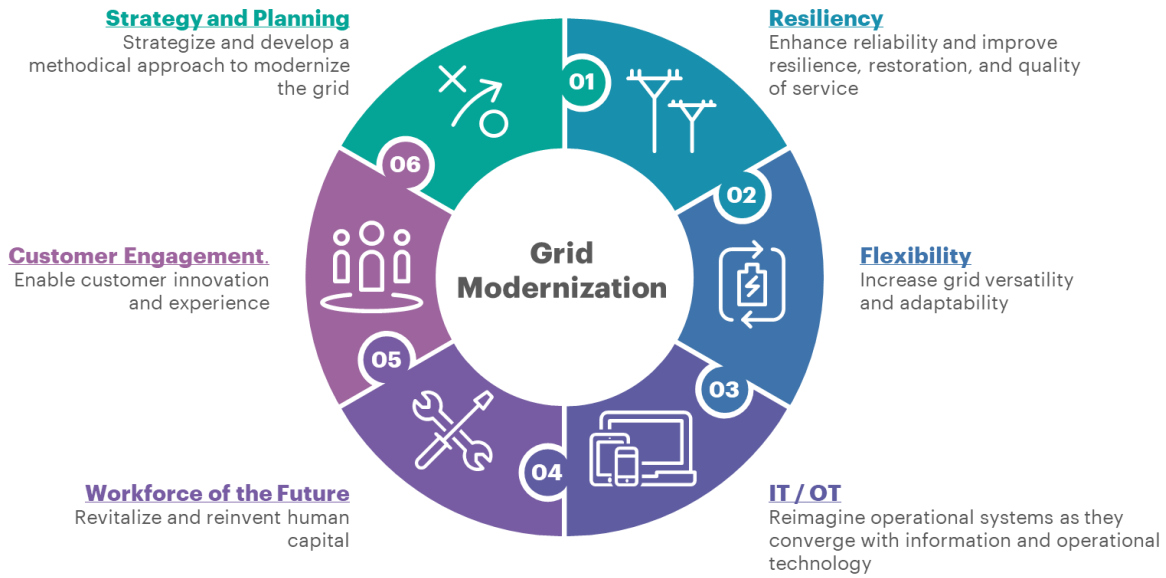
Key drivers behind the survey include:

1. How mature are utilities in key grid modernization capabilities?
2. Where have there already been significant recent transformations?
3. What are the key areas of growth and performance improvement?

For each question, survey respondents were asked to select from a multiple-choice list the descriptor which best described their maturity or abilities regarding a certain topic. Response options were compiled by industry experts and aimed at capturing the wide spectrum of grid capabilities. Respondents with multiple sub-entities were asked to either fill out separate responses per operating company or select the option that best described the average capabilities across the different entities. Similarly, entities with both North American and international operating companies were asked to describe the capabilities of their North American entities.

Each question was weighted equally towards the total results and were predicated solely on the direct responses from participants. The questions and response options were geared to be as agnostic as possible to regulatory jurisdictions; however, it should be noted that survey responses may be tied directly to jurisdictional restrictions or requirements outside of the utility's control.

Figure 2. Grid Mod Capabilities



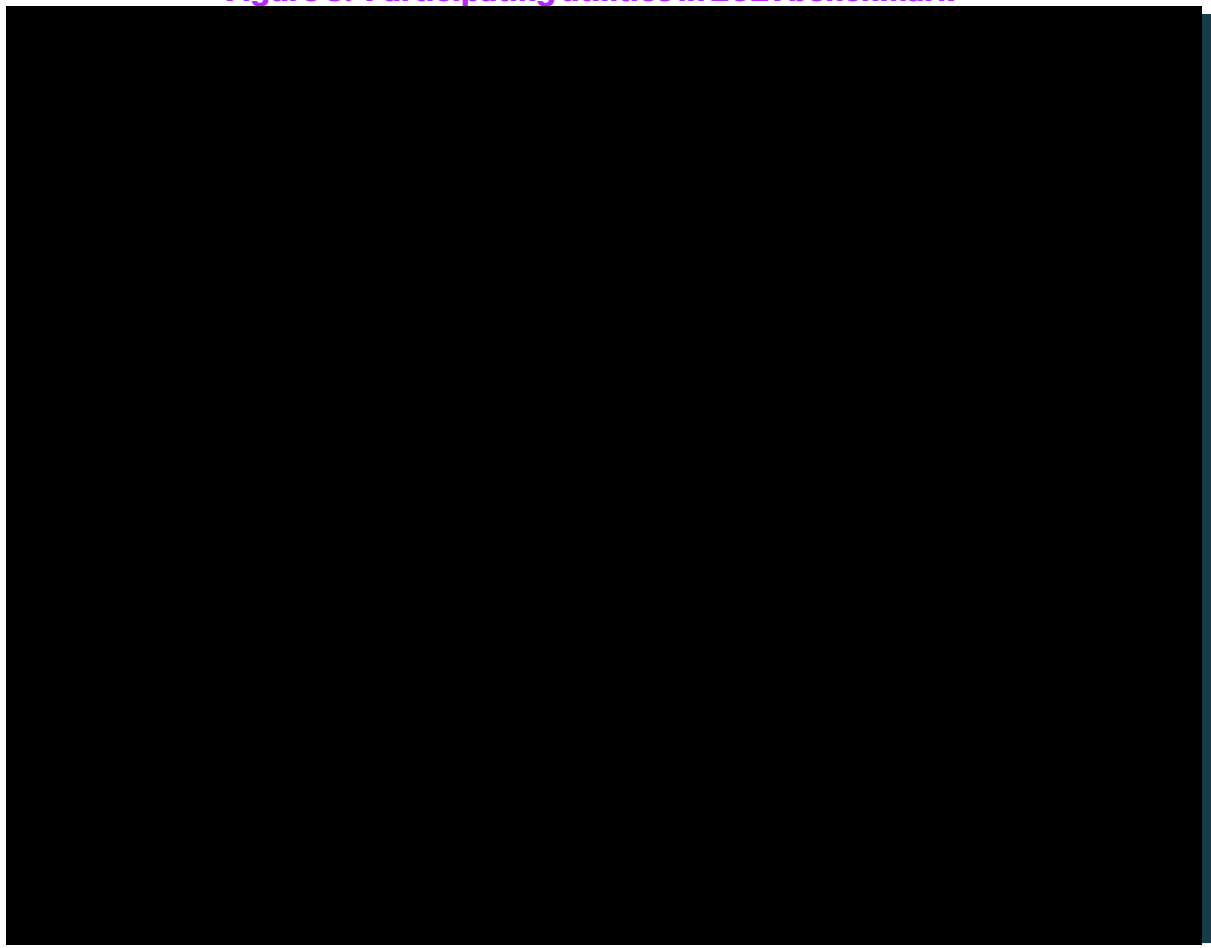
The six capability categories are the following:

- Strategy and Planning
- Resiliency
- Flexibility
- IT / OT
- Workforce of the Future
- Customer Engagement

Survey Participants

21 North American utilities participated in the 2021 survey spanning the United States and Canada. The respondents, largely consisting of large investor-owned utilities, covered 23 jurisdictions and represented over 50 million customers. Figure 3 contains the full list of surveyed utilities.

Figure 3. Participating utilities in 2021 benchmark



> 50M CUSTOMERS SERVED

23 JURISDICTIONS

> 1.4M ELECTRIC DISTRIBUTION MILES

>1.1M SQUARE MILES

Survey Results

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Strategy & Planning – Introduction

The concept of making improvements to the power grid is not a new one. Distribution utilities have always worked to continuously enhance their grid infrastructure. However, this has historically taken place in the form of disparate and disjointed initiatives. Grid modernization is elevating that concept to drastic new levels but with these increased challenges comes the importance of increased strategy and planning. The drivers behind grid modernization are too wide-spread, from increased variable generation to extreme weather, to be dealt with individually and require dedicated strategies and planning in order to arrive at success.

Arguably, the greatest strategic driver behind grid modernization is the increased penetration of distributed energy resources (DERs), largely in the form of renewables. Since 2008, local and state commitments have led to a near-doubling of renewable energy generation in the United States[8]. For utilities, these regulatory requirements translate to faster than usual investment timelines and accommodation of more distributed resources. However, in the face of these new requirements, regulators are still looking for utilities to demonstrate value from grid modernization investments, apart from societal benefits, to make sure that their ratepayers are being treated fairly.

Doing so will require the formation of new markets and models to properly obtain the value from these new assets—a massive shift from the transactional nature of the current distribution utility business model. Examples of such new models include using non-wires solutions (e.g. energy storage) as T&D investment deferral and grid service providers, DER aggregation for virtual power plants (VPPs), and renewables integration.

One of the most innovative models is the transformation from a purely asset driven business model to one that incorporates the increasing responsibilities of a distribution system operator (DSO). The expansion of the DSO role to include market-based procurement and operation of DERs creates a wide slew of opportunities for utilities, many of which are already playing key DSO roles. The incorporation of new functionalities as distribution grid operators, market operators, or DER operations represent a significant transformation for utilities would be an evolutionary leap.

The regulator will play a pivotal role in that journey and any type of DSO vision will require a strong supporting regulatory model that incentivizes the new investments. While the DSO model will not be appropriate for all types of distribution utilities, there are applicable aspects, irrespective of industry structure or regulatory model, that can be leveraged to optimize the value of DERs.

Strategy & Planning – Benchmark Results

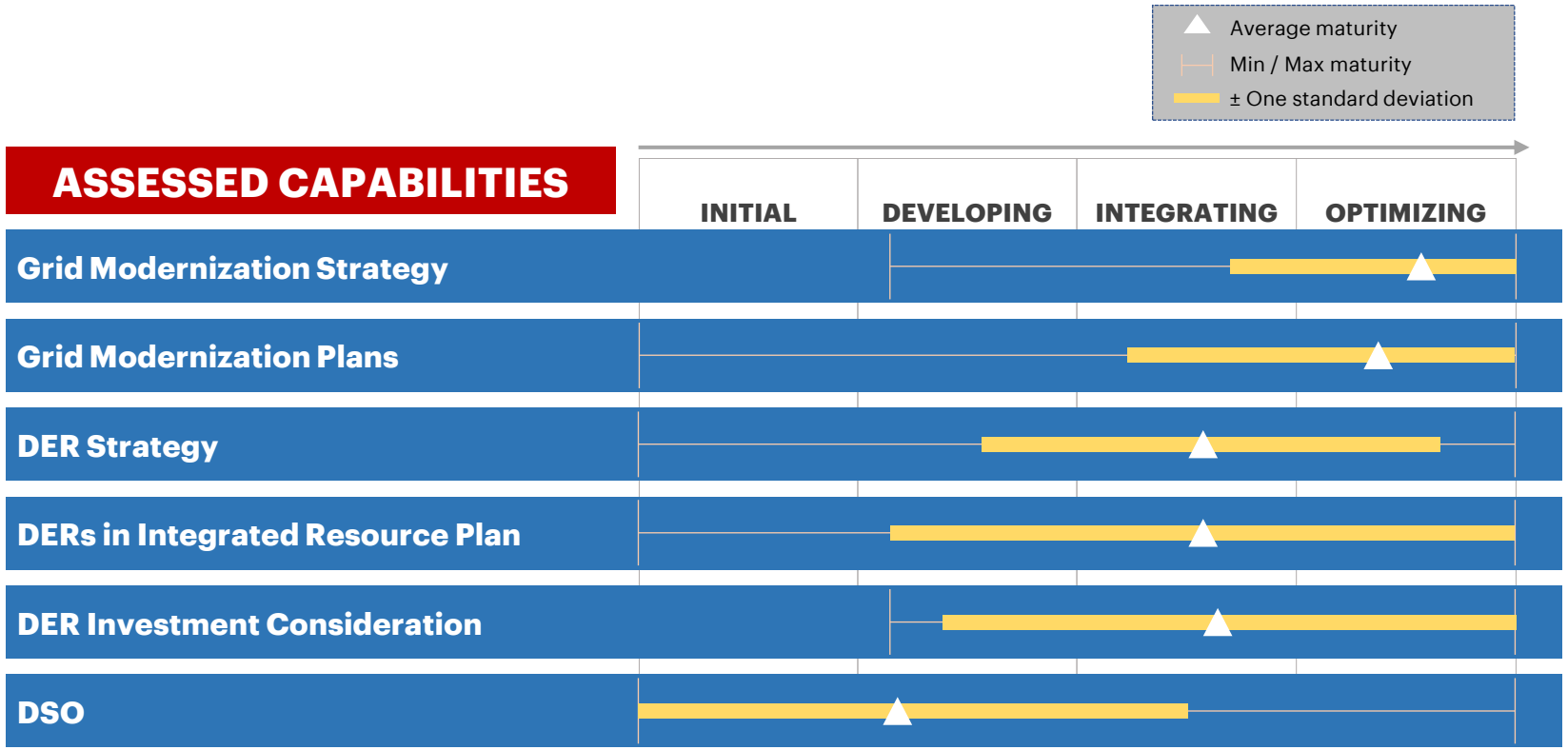

Figure 4. Strategy & Planning capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- Grid modernization strategies and plans have been largely defined and are being executed upon. These plans, projects, and associated investment figures are also being included in discussions with regulators.
    - **86% of surveyed utilities** have developed grid modernization strategies and begun implementation
- Utilities are developing strategies to tackle the increased penetration of DERs; however, there is a wide maturity spread in both strategy integration and execution capabilities
    - **33% of surveyed utilities are in early stages of DER strategy development** and do not have a formal strategy in place
- DER forecasts are becoming increasingly included into integrated resource plans either through jurisdictional requirements or utility initiatives
- Utilities are more regularly considering DERs as replacements or deferral opportunities for traditional grid investments. This presents an opportunities for new DER vendors who may be more incentivized to pursue grid facing services compared to current solely customer centric business models.
- There has been minimal interest and few conversations had with regulators on a potential DSO model thus very little actions have been taken. This observation warrants a further examination into the current gaps and obstacles that are impeding utilities' interests or abilities in assuming DSO responsibilities.

**Refer to Appendix for full breakdown of responses*

Resiliency – Introduction

Reliability, the ability to bounce back from individual system failure events, has been measured and managed throughout the decades. However, resilience and the ability to manage high-impact events, has yet to reach that level of maturity especially in the face of extreme weather events. A recent survey of North American utility executives showed that ~87% of respondents stated that extreme weather events severity and duration has increased in their locations over the past 10 years and 92% of respondents expected these type of events to increase or worsen over the next 10 years[9].

Currently, there is no standardized nor broadly accepted definition of resilience in the utility industry. Utilities don't have one; neither do regulators. Thus, the responsibilities will fall on utilities to take the lead and develop a roadmap to resilience that encompasses other key stakeholders (i.e., regulators, customers).

This overall shift from tactical to strategic will require a rebuilding of scenario planning and ensuring risk mitigation is a valued capability that is integrated across the enterprise. This occurs from assessing current risk capabilities, modeling possible scenarios, and then translating those scenarios into risk mitigation plans. The objective, of course, being an optimally hardened network that delivers the appropriate value to customers who will inevitably see increased costs from resilience initiatives.

These high–impact complex scenarios will also require an accelerated approach to digital solution adoption in order to deliver on resilience strategies. One of the key opportunities for digital solutions is damage assessment. Damage assessment drives the recovery process after any disaster and dictates the resources required, where you put them, and where to focus these efforts. Increased asset visibility and analytical tools such as Artificial Intelligence (AI) and Machine Learning (ML) can transform the foundation of how utilities view, manage, and maintain their system. Technology is not limited to pro-active decision making and can be used to inform restoration strategies using real-time geographic and weather data to inform priorities and improve communications with customers.

The shift towards digital comes with increased risk of cyber threats. The 2021 Colonial Pipeline cyberattack that halted all of the pipeline's operations demonstrated the extreme events facing the grid are not limited to natural forces. With a 160% year-on-year increase in ransomware events in 2020, there is an increased focus on mitigating potential cyber risks across both IT and OT environments[10]. These challenges facing utilities aren't going away anytime soon and a range of solutions and will be needed for a resilient future.

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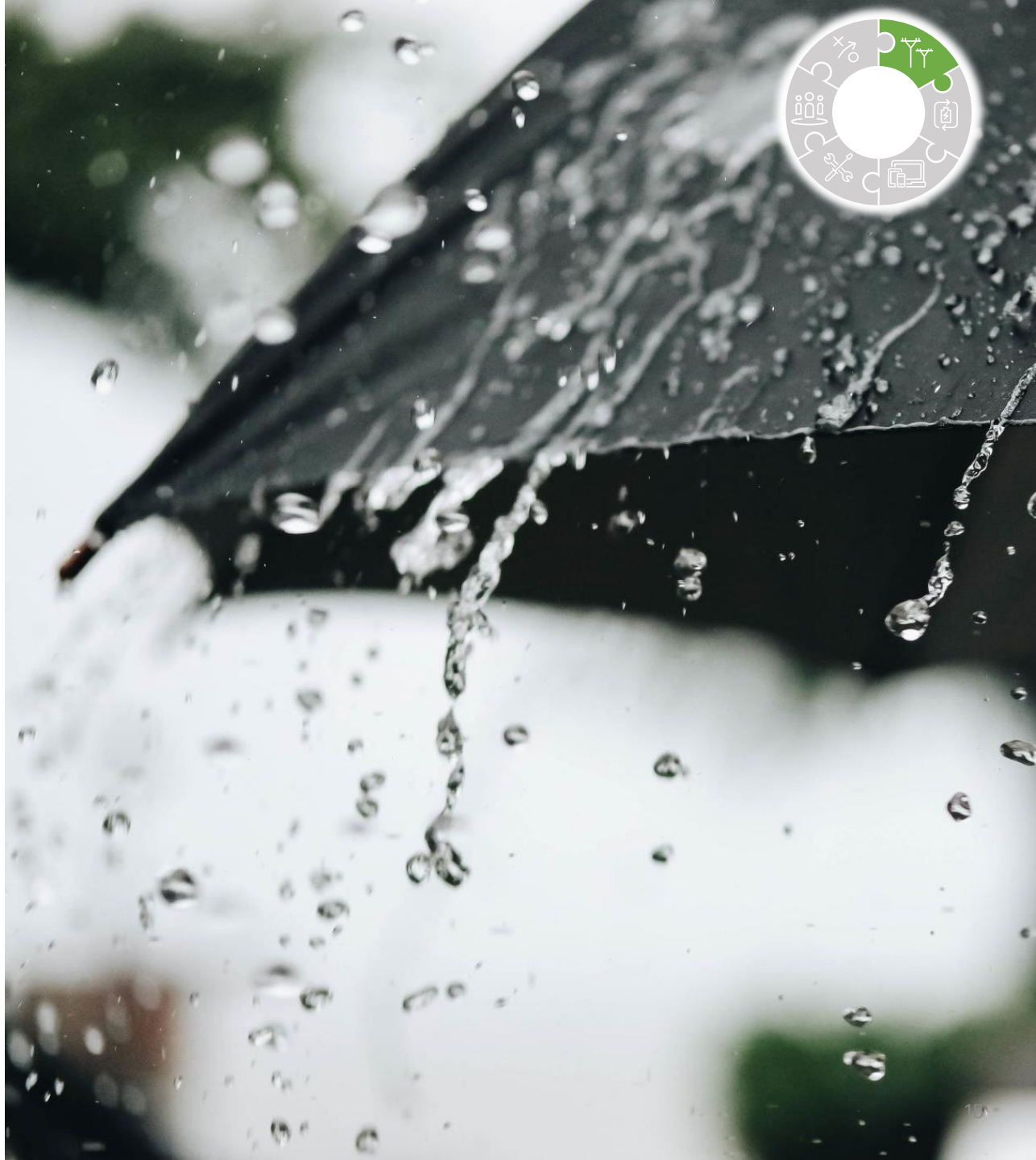


Resiliency – Benchmark Results

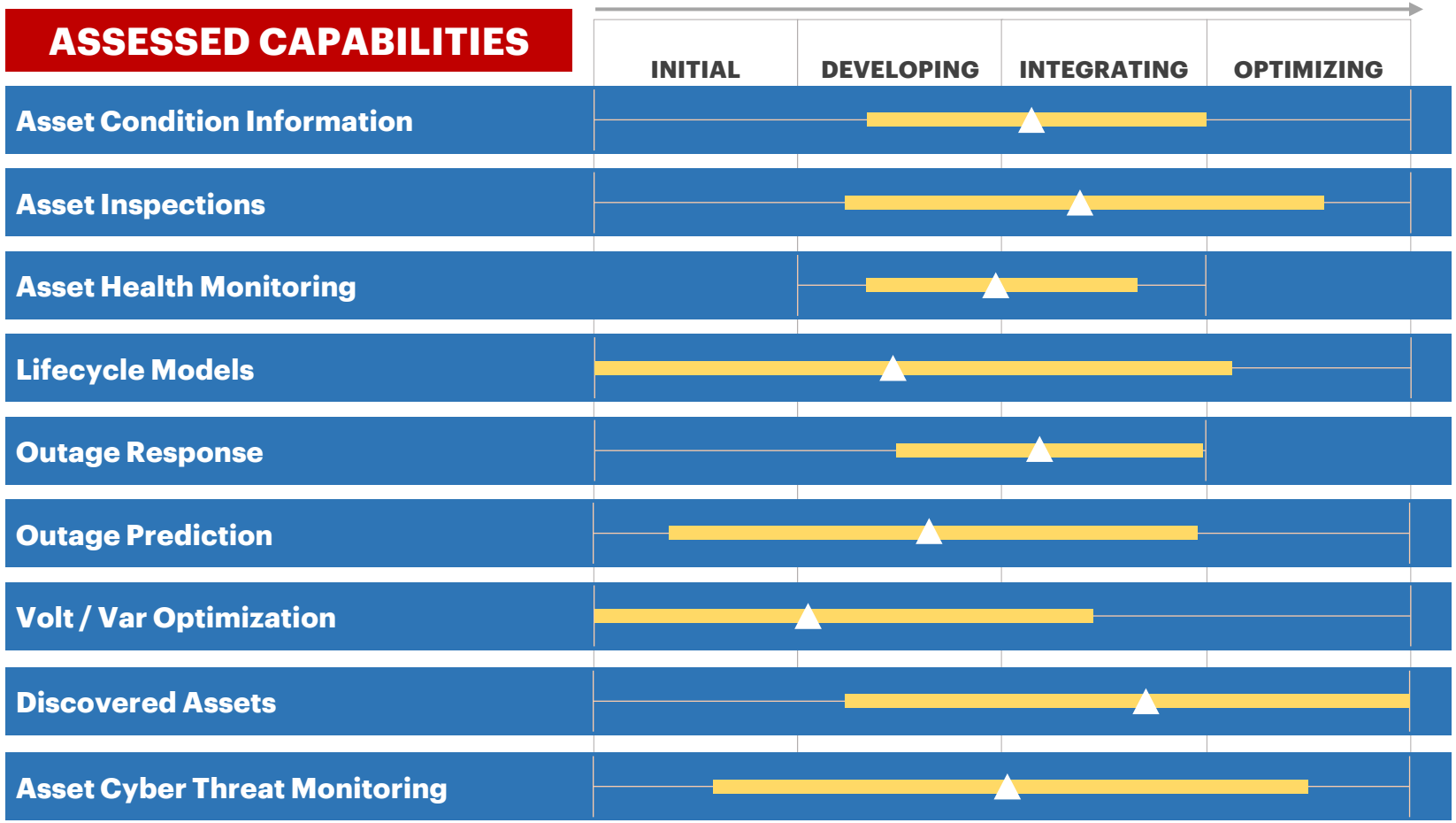


Figure 5. Resiliency capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- Asset health analytics, while still heavily subject-matter-expertise influenced, are trending towards increased use of company and industry data.
- While the majority of respondents stated that they used traditional run-to-failure or field inputs to make asset repairs or replacements, many utilities also employ data-driven lifecycle models.
  - **19% of utilities stated using predictive lifecycle models that use real-time data to proactively call for action**
- There was a **wide variance in maturity regarding outage prediction,** from respondents stating that they are not pursuing any outage prediction to those with systems in place, including predictive modeling, to detect disturbances correlated to outages.
- Volt / Var Optimization (VVO) deployment, while still in initial stages at many utilities, has gained noteworthy traction as 33% of respondents stated having the technology on over half of their distribution feeders.
- There was a **wide variance in maturity demonstrated regarding asset cyber threat monitoring** from respondents stating that they lacked any OT threat monitoring capabilities to those having real-time centralized monitoring via a security operations center (SOC).

**Refer to Appendix for full breakdown of responses*

Flexibility – Introduction

Flexibility is generally defined as the grid's ability to manage variability and volatility to balance electricity supply and demand. The increased penetration from renewable variable energy sources such as solar and wind have led to increasing grid instability and is aggravated further by distributed energy resources, especially rooftop solar PV. Developing greater system flexibility is not only required to manage these new supply and demand patterns but is also one of the most cost-effective approaches to build resilience.

There are several points along the electricity supply chain where distribution utilities can take action to inject flexibility. At the point of demand, tools such as behind-the-meter energy storage, demand response, and smart charging can be leveraged to smooth the variability from distributed generation and electric vehicle (EV) charging. At a larger distribution system level, self-islanding solutions can be used to reduce demand and grid dependency. Microgrid solutions are an example of tools utilities can use to develop both flexibility and resilience in the face of extreme events. A recent survey of utility executives found that 93% of respondents agreed that self-islanding solutions will be a major contributor to improved resilience. Lastly, at a large point of supply are utility-scale renewable generation, grid-scale storage, and vehicle-to-grid (V2G) solution options.

Energy storage, largely in the form of batteries, is one of the solution options that appears across multiple points of scale. While there is continued debate on the efficacy of grid-scale versus distributed energy system solutions, storage assets provide a unique level of versatility that allow them to pull from multiple value pools. Storage assets can be used to increase renewable penetration while also being deployed as T&D system assets to address grid inefficiencies or localized pockets of congestion that would otherwise require costly infrastructure investments.

Similarly, electric vehicles and related assets are having a transformative effect on the network of the future. Current projections expect a CAGR of 31% for the North American EV market during the forecast period of 2021 – 2026. A recent Accenture report estimates the total U.S. eMobility market to have a $700 billion worth by 2040, with $100 billion being attributed to the value of home and public charging stations[11]. Leading utilities will not only be able to develop commercial partnerships to address home and public charging investments but also leverage EVs to deliver grid flexibility. The Accenture report estimates that the value potential of this grid flexibility in the U.S to be $30 billion.

Flexibility – Benchmark Results

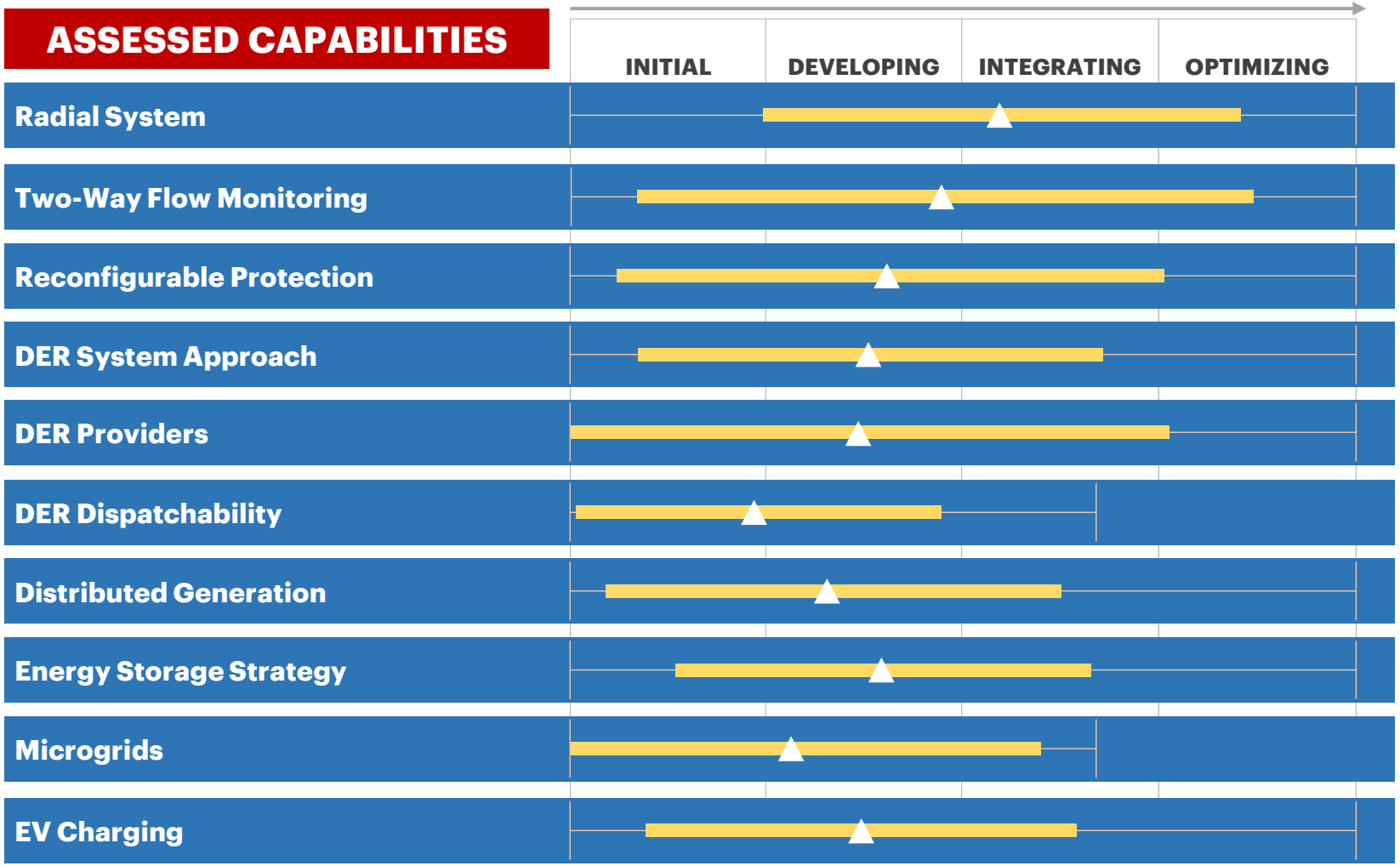


Figure 6. Flexibility capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- **Two-way flow monitoring**, a key component of monitoring distributed generation, has been enabled at 66% of surveyed utilities; however, only **33% of respondents have the ability to see real-time asset status.**
- Approximately 50% of respondents are in an early developing stage regarding system capacity/system protection strategies for increased DER penetrating, while 28% have operationalized their approach and implemented alternate protection schemes.
- Reconfigurable protection research has begun at many utilities but only **33% of respondents have implemented the capability either partially or throughout their service territory .**
- Distribution Management Systems (DMS) for DER dispatchability is in early consideration as **only 14% of respondents have begun any capability piloting.**
- While half of the respondents stated having no operationalized microgrids, 38% responded having microgrids that can be islanded and operated without centralized generation in pilot environments.
- The majority of respondents stated owning EV charging stations or having organizational provider partnerships; however, there was notable variance in the utilities' abilities to monitor or manage the charging station's usage.

**Refer to Appendix for full breakdown of responses*

IT / OT – Introduction

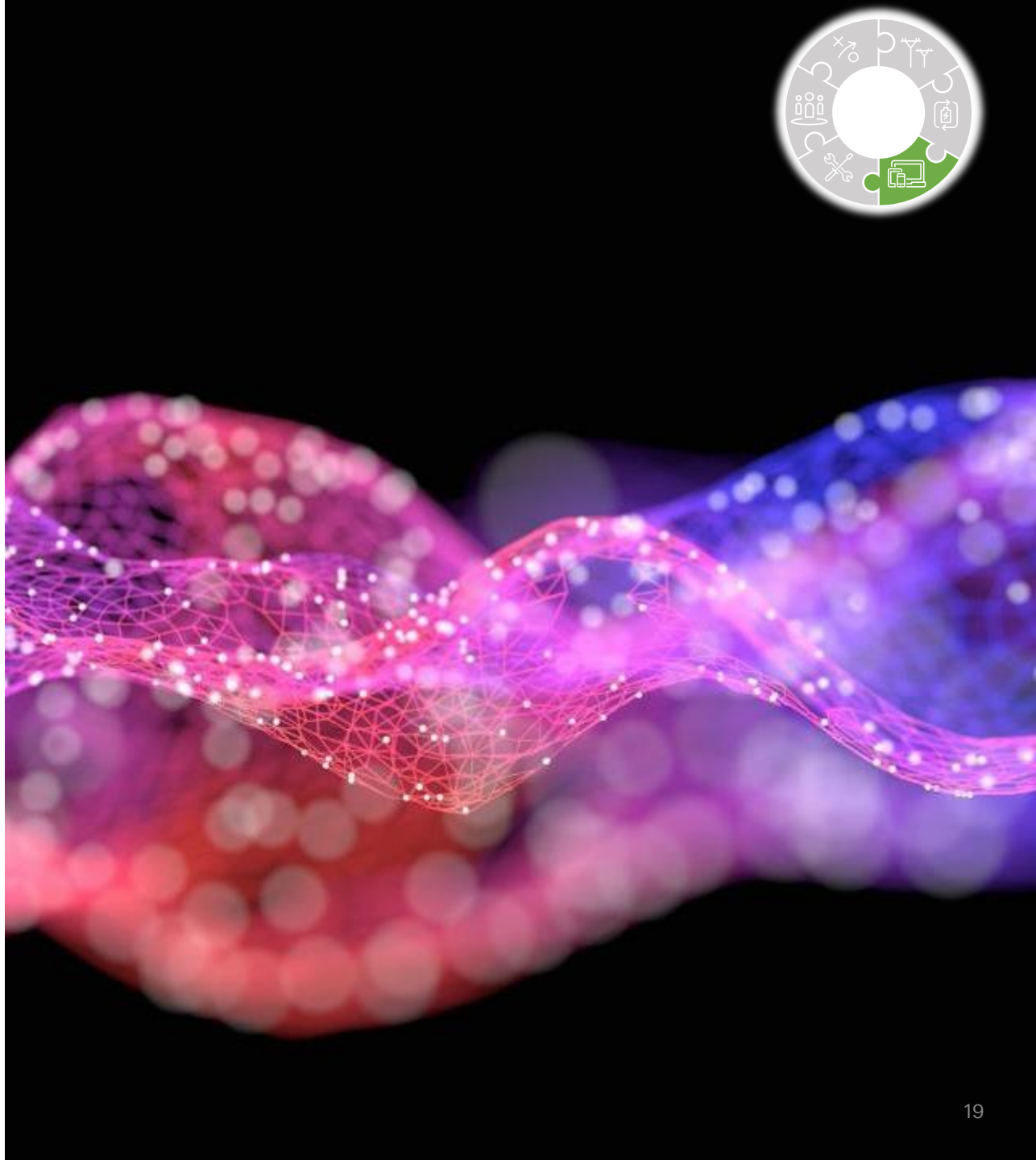
Arguably, the greatest driver of the modernized grid is the introduction and influx of digital grid solutions. Solutions include new cloud capabilities, 5G, edge computing, IOT, and automated sectionalizing devices to name a few. These solutions have applications across multiple utility ecosystems and will serve as enablers of other grid resilience and flexibility transformations.

Traditionally, most utilities have had their information technology (IT) and operational technology (OT) operate in completely different domains. IT capabilities were primarily focused on customer services (e.g. billing, desktop support) and internal functions (e.g. HR, communications). OT solutions were limited in scope to software systems that operated, managed, and reported grid technologies (e.g. SCADA, DMS, GIS).

However, with new technology solutions comes increased data and the increased needs for an integrated technology infrastructure that can scale with these new demands. Advanced Metering Infrastructure (AMI), the combination of smart meters, communication protocols and data management systems, is a prime example of a technology solution demanding this transformation. While smart meters were originally deployed for ease of billing capabilities, progressive utilities began are realizing that they could use the granular data from smart meters can be used with other data systems for advanced use cases such as outage isolation and voltage monitoring. This advanced use case of disparate databases and advanced analytics requires the integration of IT and OT capabilities to provide a solid and reliable foundation.

One of the key opportunities for advanced IT/OT is in the control room. Many utility control centers continue to be heavily dependent on human operators looking at multiple screens of data and reactively solving real-time problems with little to no context. However, the new challenges from extreme weather events, variable generation, and cyber attacks have introduced significant complexity and a magnitude of threat that may not be addressable by a reactive approach. Integrated data systems and automated task flows are examples of tools that both improve operators' abilities to address issues and decrease the risks from manual errors.

Evolving IT and OT systems enable the breakdown of generational siloes and the decision-making capabilities required to bring enhanced reliability and flexibility to the grid.



IT / OT – Benchmark Results (1/2)

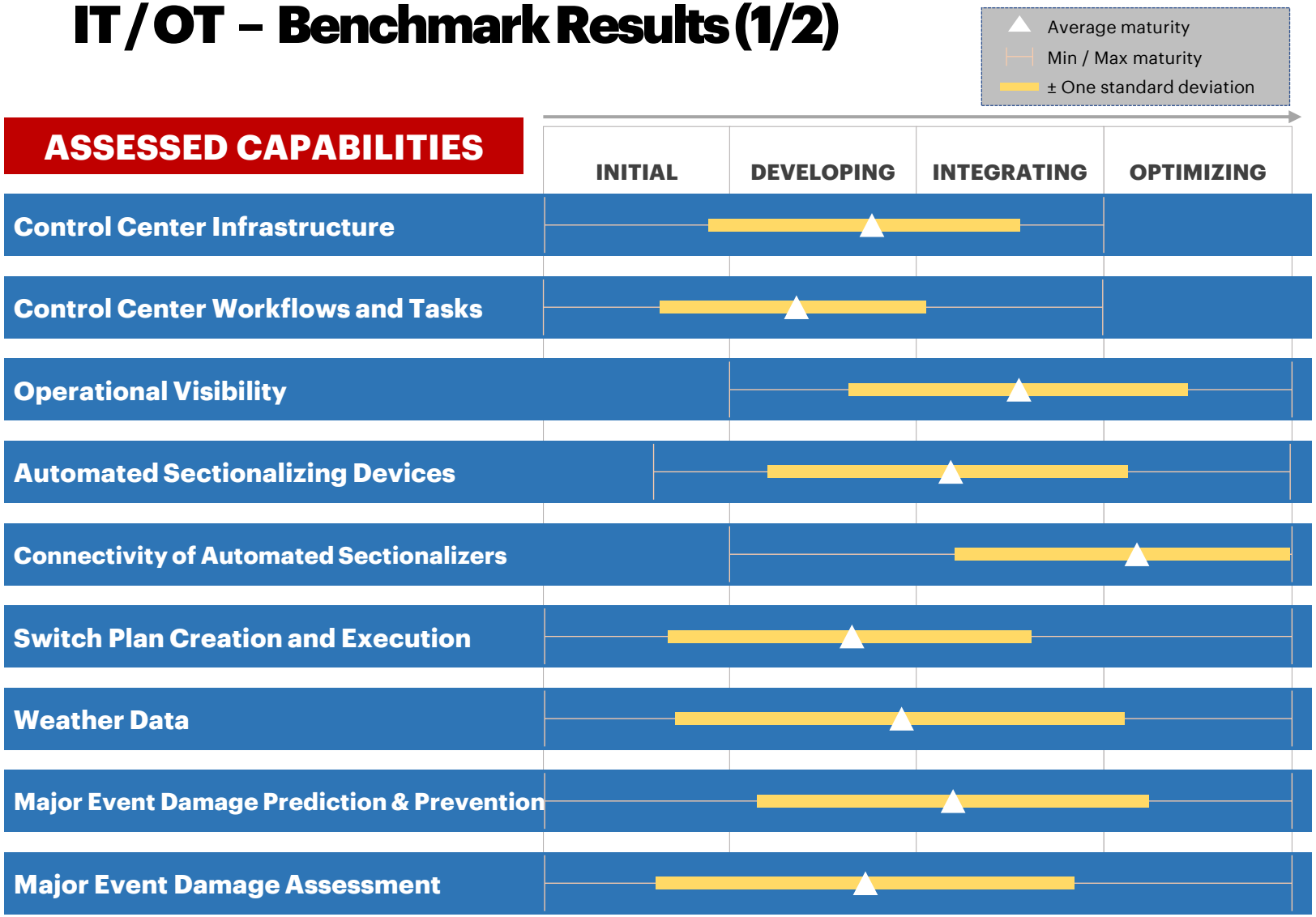


Figure 7. IT / OT capabilities benchmark results (1/2)

OVERALL ANALYSIS – KEY CONSIDERATIONS

- The majority of utility control centers have integrated data sources but workflows are still largely dictated by long-standing processes and are primarily focused on approval s and handoffs. Some utilities are beginning to look towards new technologies as **38% have started to experiment with using AI / ML in control center applications.**
- Automated sectionalizing devices have been well integrated in many utilities with a majority stating over 50% of their feeders had such operational technology.
- Many utilities, 52% of respondents, have recognized the potential of sectionalizers beyond reclosing activities and have devices provide telemetry and integrate data into operational models(e.g. ADMS)
- With the increased threats from extreme weather, many utilities are recognizing the importance of weather data. **43% of respondents stated using meteorology teams to perform sophisticated analyses (e.g. predictive modeling)** and a smaller portion stating that they had integrated real-time weather data into operations
- There are notable opportunities to integrate analytics into major event damage prediction and assessments with **71% of utilities responding that their damage prediction activities were limited to manual exercises.**
- Similarly, while the vast majority of utilities, 66%, stated that they used a combination of manual and digital tools post- major event to upload information into systems, the subsequent actions are driven by operator decision making. However a small portion, ~10%, stated using digital tools to feed systems that automatically recommend a course of action.

**Refer to Appendix for full breakdown of responses*

IT / OT – Benchmark Results (2/2)

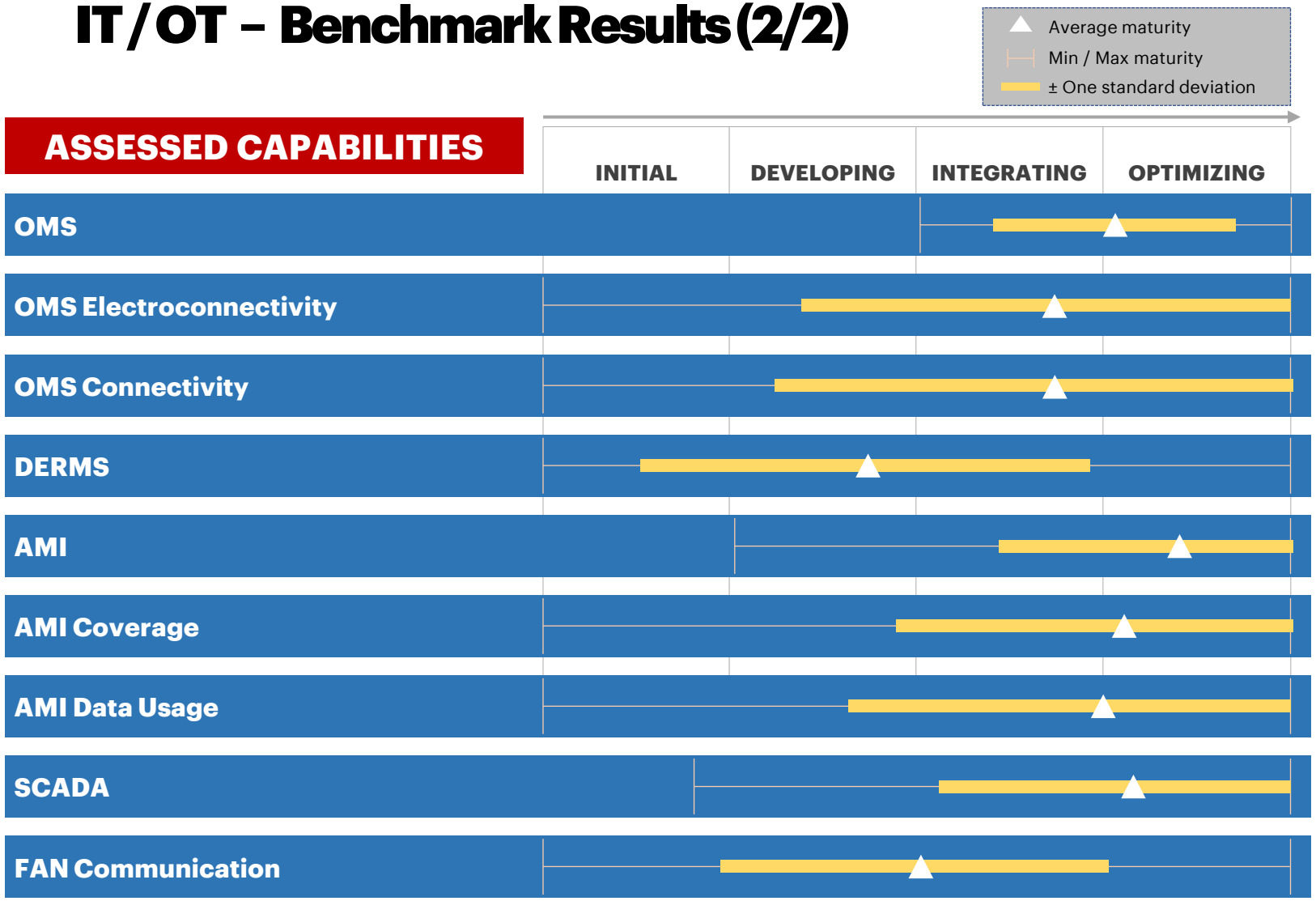


Figure 8. IT / OT capabilities benchmark results (2/2)

OVERALL ANALYSIS – KEY CONSIDERATIONS

- While all utilities stated having an outage management system (OMS), there is a wide variance within system maturity. The majority of utilities stated having elements of integration with other OT systems (e.g. GIS, ADMS), **only 24% could state that their systems were well integrated in that changes in integrated systems would be reflected real-time in OMS**. Similarly, the majority of respondent OMSs have electroconnectivity models but only **50% of models reflect dynamic, real-time status while the remaining are either static or had to be updated manually.**
- Utilities approaches and maturities regarding DERMS is quite varied. While **33% of utilities are only still having initial conversation on incorporating DERMS**, the remaining are evenly spread out the spectrum between having no DERMS initiative to fully operational systems.
- The vast majority of utilities have integrated AMI systems. While there is some variability in system maturity, **many utilities, 76% of respondents, are using AMI beyond standard customer operations** and leverage advanced intelligence capabilities such as outage management.
- While the majority of utilities continue to use the industry standard of 900 MHz Radio Mesh in their Field Area Network (FAN) communications, a small portion of utilities are leveraging more advanced communication networks such as high-speed wireless (14%) or fiber optic networks / LTE solutions (10%) that can better support new smart grid technologies.

**Refer to Appendix for full breakdown of responses*

Workforce of the Future - Introduction

The COVID – 19 pandemic has highlighted the importance of utilities having a resilient workforce that can endure any type of event. However, utilities are currently facing an aging and retiring workforce with the US Department of Labor projecting that 50% of current energy utility workers will retire within the next ten years. Grid modernization has also introduced a need for a digital-savvy workforce that can develop and manage the technologies required for a future state smart grid.

One of the core approaches for creating a resilient workforce that can handle these challenges is the use of innovative technology to drive flexible plans and procedures. A digital organization can help capture the deep existing expertise of current employees and allow employees to focus on mission-critical tasks. A recent survey of utility employees found that only half of non-managerial employees believed that they were being utilized at their full potential.

Many activities within the industry require manual tasks and outdated tools that can now be automated with new technologies. Automated field work dispatch is an example of a technology that can allow dispatchers to automatically create and assign routine work thus allowing them to focus their efforts on the more challenging scenarios. More general technologies such as robotic process automation (RPA) can further reduce employees' busy work and allow them to concentrate on the challenges in evolving the grid rather than only do damage control on the status quo.

While operational efficiencies do allow employees to better use their time, new field technologies (e.g. drones, Augmented Reality (AR) / Virtual Reality (VR)) should be leveraged to better manage the grid. For example, drones can support overhead mileage inspections, maintenance jobs, and post major event damage assessments. Augmented reality solutions have been used to superimpose digital information on the real world, providing utility workers dynamic access to data and back-office systems. As grid infrastructure becomes more complicated with the introduction of smart devices, employees will need to instantly access more information in order to properly assess and maintain field assets.

Lastly, Artificial Intelligence (AI) and Machine Learning (ML), are some of the most disruptive new technologies that have seen proven success in many, if not all, grid modernization topics. However, successful use of AI and ML not only requires the right data science skills, but also the fostering of a digital savvy organization that can identify potential use cases and translate the results into appropriate actions.

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Workforce of the Future – Benchmark Results

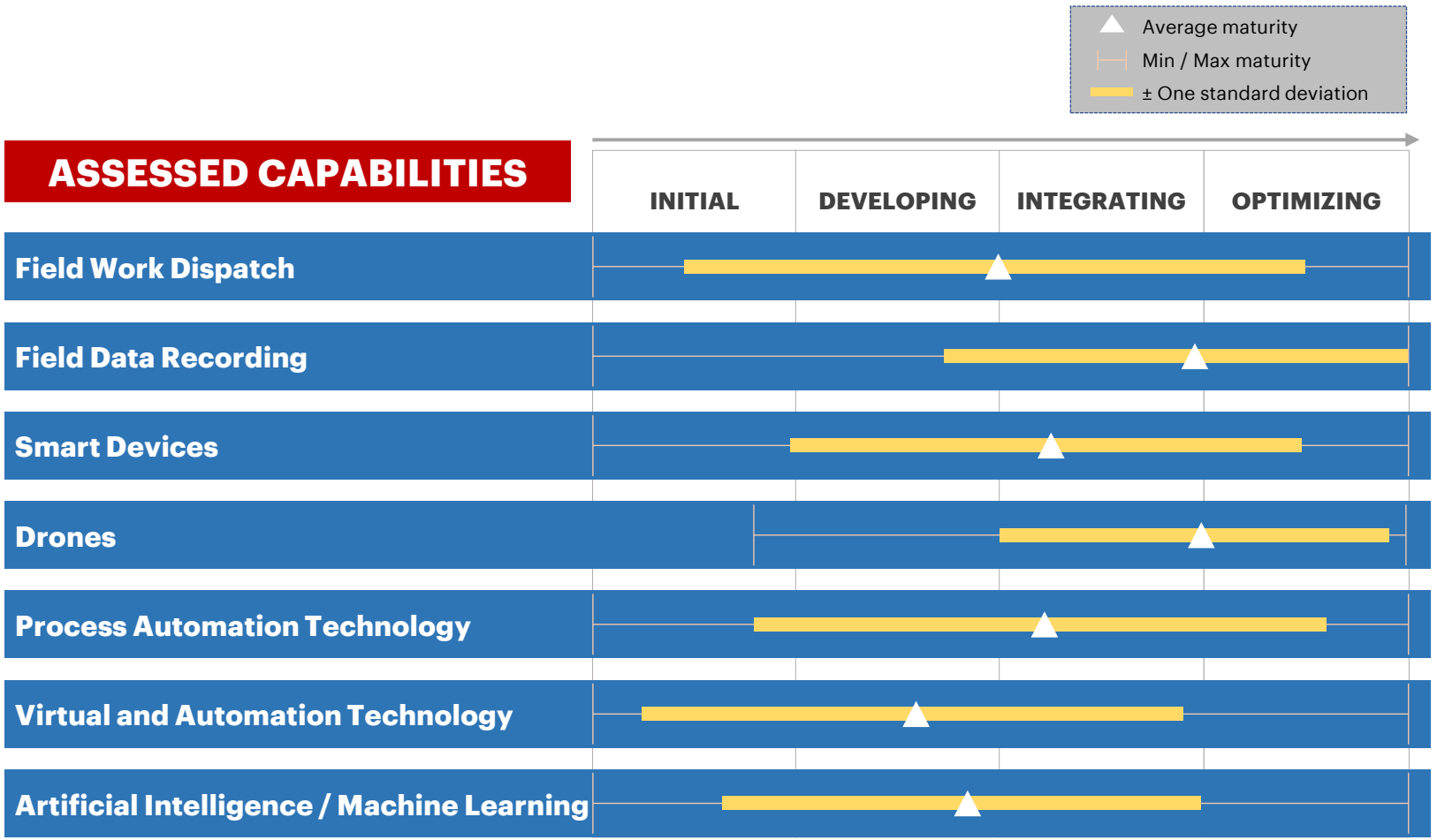

Figure 9. Workforce of the future capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- Despite the predominant usage of centralized digital systems of records for initial work dispatch, not all respondents are able to accommodate real-time emergent work and require at least some degree of manual intervention
- Field devices have been widely integrated into most utilities' field operations with **~50% respondents stating that their devices were connected to their system of records and can be updated in real time**
- While not common in most surveyed utilities, smart devices have either been lightly integrated or piloted into field operations across many utilities
- **Over 70% of respondents** have begun conducting **feasibility studies or pilots for drones' usage**
- While most respondents stated having only an initial or developing approach to integrating VR / AR, **nearly 30%** have begun or fully completed at least one form of operational implementation
- A majority of respondents have integrated AI/ML within distribution operations, with **33% stating that they have employed data scientist resources or capabilities to implement AI/ML in identified use cases**

**Refer to Appendix for full breakdown of responses*

Customer Engagement – Introduction

Customer engagement has traditionally not been associated with grid design or modernization as the relationship is primarily transactional. However, while customers are playing a significant role in the current challenges facing utilities, they may also prove to be a solution driver.

Many customers are becoming more scrutinous of their relationship with their electricity providers as major grid events disrupt their normal lives. The 2018 California wildfires are a prime example of a significant incident that caused customers to pay attention to their utilities' infrastructure capabilities and re-evaluate their utility relationship. Though most of North America is served by regulated utilities, the public can have major influences on regulators favorability to utility decisions.

Customers have been a driving force behind many of the flexibility challenges facing the grid. DER penetration, which has caused concern for grid instability, is continuing to grow at steady rates. The more significant driver through is the rapid increase in electric vehicles. Though slightly hindered by the COVID-19 pandemic, the North American EV market is estimated to grow at a CAGR of 31% between 2021 and 2026. The subsequent increase in load will lead to massive instability if left unchecked.

However, customer engagement may also prove to be a solution to many of the aforementioned issues. In 2020 and 2021, customer responses to utility and grid operators' requests to reduce peak load during supply shortages prevented severe blackout scenarios. Behind the meter systems including microgrids, solar-plus-storage systems- and dispatchable energy loads provided much needed capacity during these incidents. While DER resource deployment is largely customer driven, the utility can play significant roles in enabling and encouraging customers to install these assets. Similarly, while EVs can pose potential threats to stability if left unchecked, utilities can engage customers to manage load profiles and use EVs as flexibility assets.

Utilities can also take more direct roles through demand response and energy efficiency programs. In a recent survey, more than half of customers indicated that they are interested in time-of-use tariffs, flexible tariffs, and demand response options post-COVID 19 pandemic to increase cost savings.

Customers are now more willing than ever to accept innovation and utilities can leverage this to bring them along in the grid modernization journey.

Customer Engagement – Benchmark Results

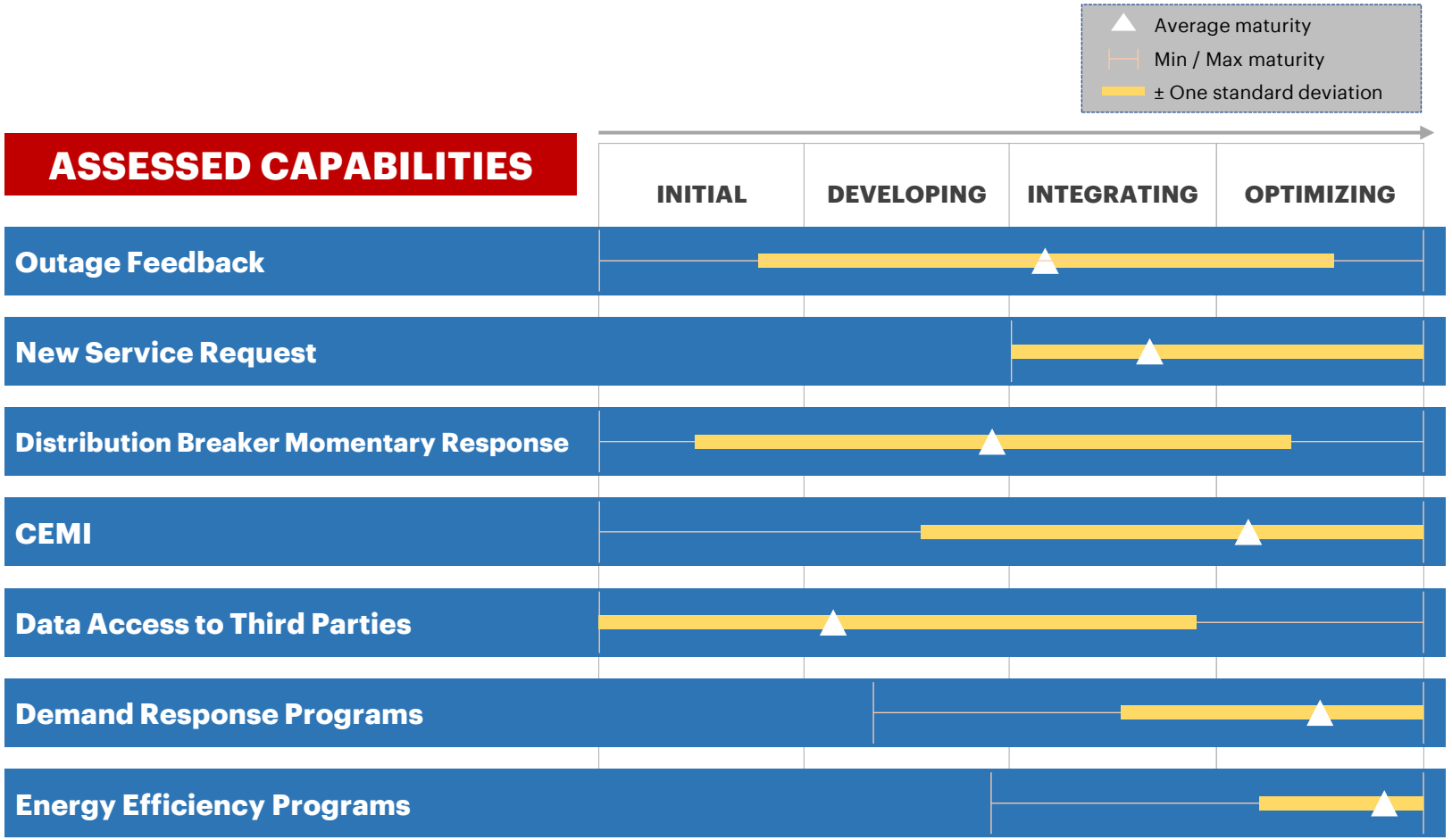

Figure 10. Customer engagement capabilities benchmark results

OVERALL ANALYSIS – KEY CONSIDERATIONS

- 57% of utilities stated that they leverage information from systems such as OMS or AMI to provide customers with an estimated time of restoration (ETR) with 24% reporting that they were able to provide additional real-time information (e.g. outage cause)
- The majority of utilities, ~90%, currently measure CEMI (customers experiencing multiple interruptions), with 66% of respondents reporting that they have required action thresholds and plans in place. Similarly, 76% of utilities currently measure MAIFI, with 24% reporting that they have required action thresholds.
- The vast majority of utilities stated having both behavioral and controlled demand response programs as well as energy efficiency programs.

**Refer to Appendix for full breakdown of responses*

Conclusion

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Conclusion

Our benchmark has shown that there has been a wide degree of maturity throughout the industry, but more and more utilities are recognizing the need for a transforming grid and the key role their sector will play in facilitating this change.

86% of the surveyed utilities have both developed and begun implementation of grid modernization strategies. This strategic acceptance of grid modernization is the first step to enabling change; however, execution progress must not be overlooked. Many utilities have completed key programs such as AMI but effectively using the results and data gathered from these new systems will be the more notable differentiator.

One of the promising results from the benchmark has been the maturity displayed in customer engagement programs. While these activities may not directly lead to a modernized grid, consumers will ultimately shape the future requirements for the grid and the importance of maintaining a healthy relationship cannot be overlooked.

The greatest growth opportunities found were with regards to flexibility. While certain regions may not face the urgency of addressing DERs due to current low penetration rates, utilities must develop the grid for future energy supply and demand patterns and look towards the shifting landscape of EVs and increasing electrification.

There has been notable maturity shown throughout the benchmark, but the survey has also indicated that there is much that utilities can learn from each other. Many respondents displayed high maturities in comparison to their peers in certain categories but then in other topics, would be significant less mature against those same peers. The electric distribution grid is one of the most complex feats of engineering ever undertaken. Successful reimagining of the grid will require knowledge-sharing and cooperation to develop a holistic vision that can be tailored to each utility's needs and desires.

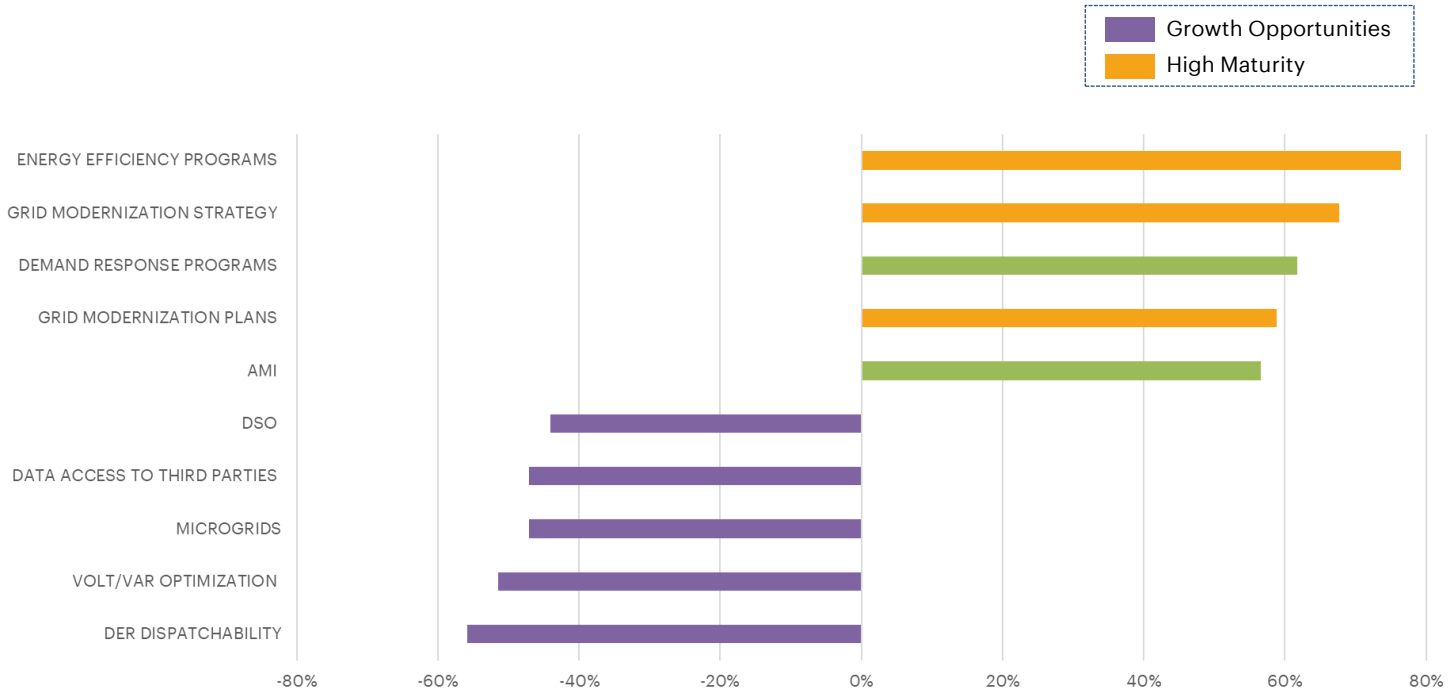

Figure 11. High maturity and growth opportunities compared to median results

Utilities are embracing the need for grid modernization but still have significant growth opportunities in critical execution

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Appendix

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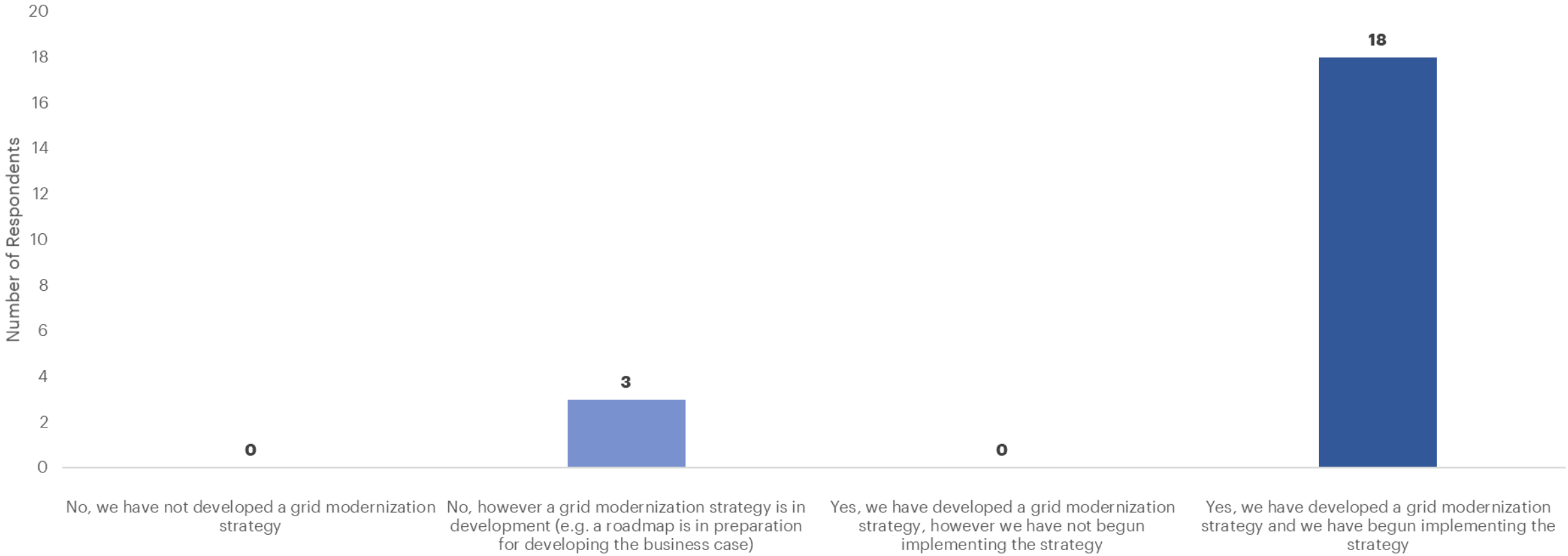
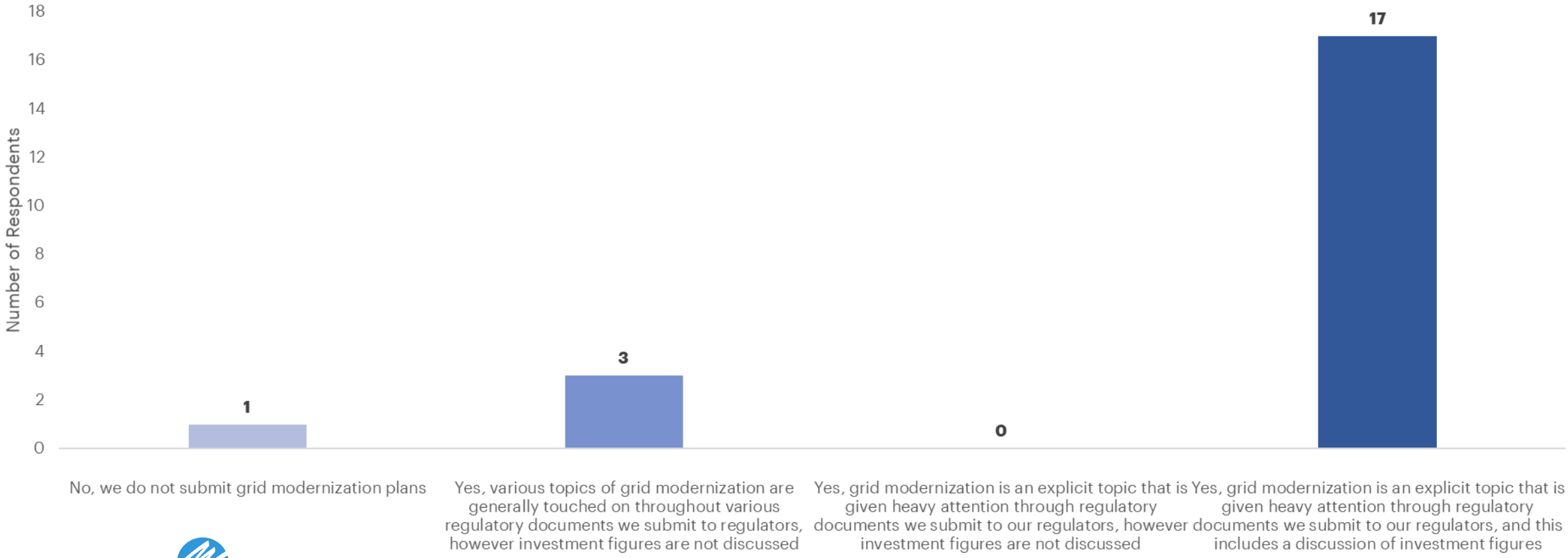
1.1) Grid Modernization Strategy

Question:	Have you developed a grid modernization strategy? NOTE: A grid modernization strategy would include items such as business objectives, a multi-year roadmap, budget, etc. dealing with a utility's plan to modernize its grid.



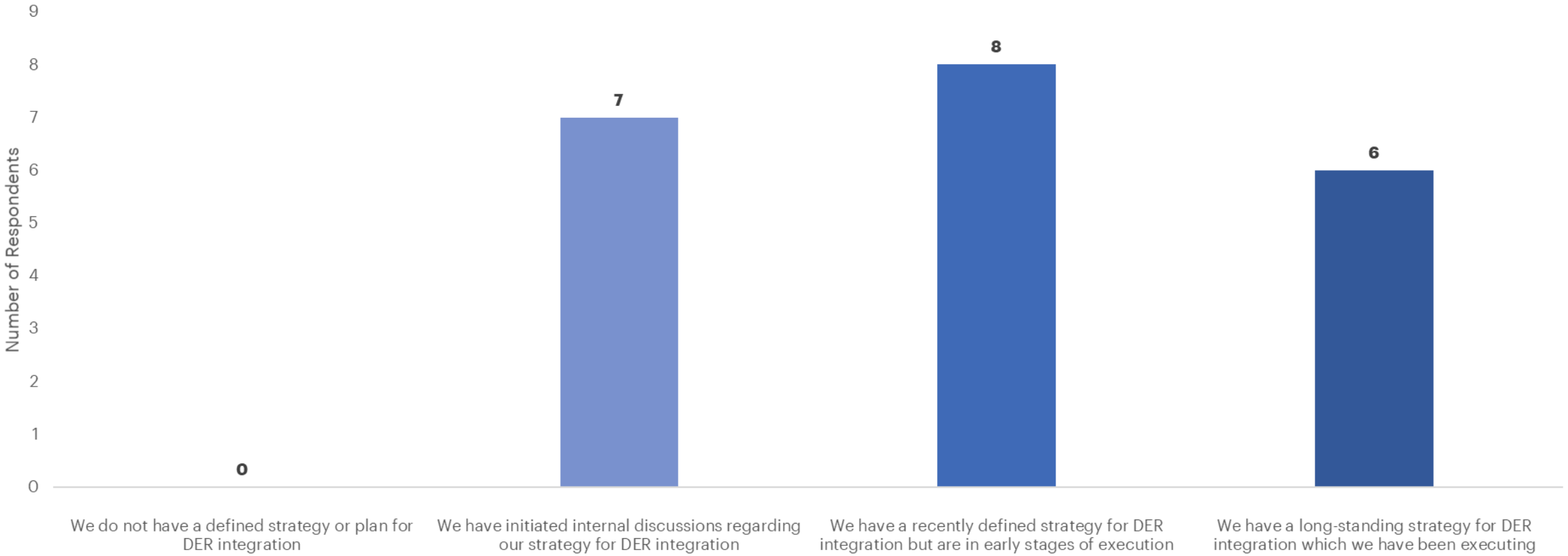
1.2) Grid Modernization Plans

Question:	Do you submit grid modernization plans to your state's public utilities regulator (despite whether such plans are required or not), and do those plans specify levels of investment for grid modernization programs? NOTE: Grid modernization plans can take the form of a resiliency plan, storm protection plan, or any such plan dedicated to outlining the advancement of the grid's modernization.



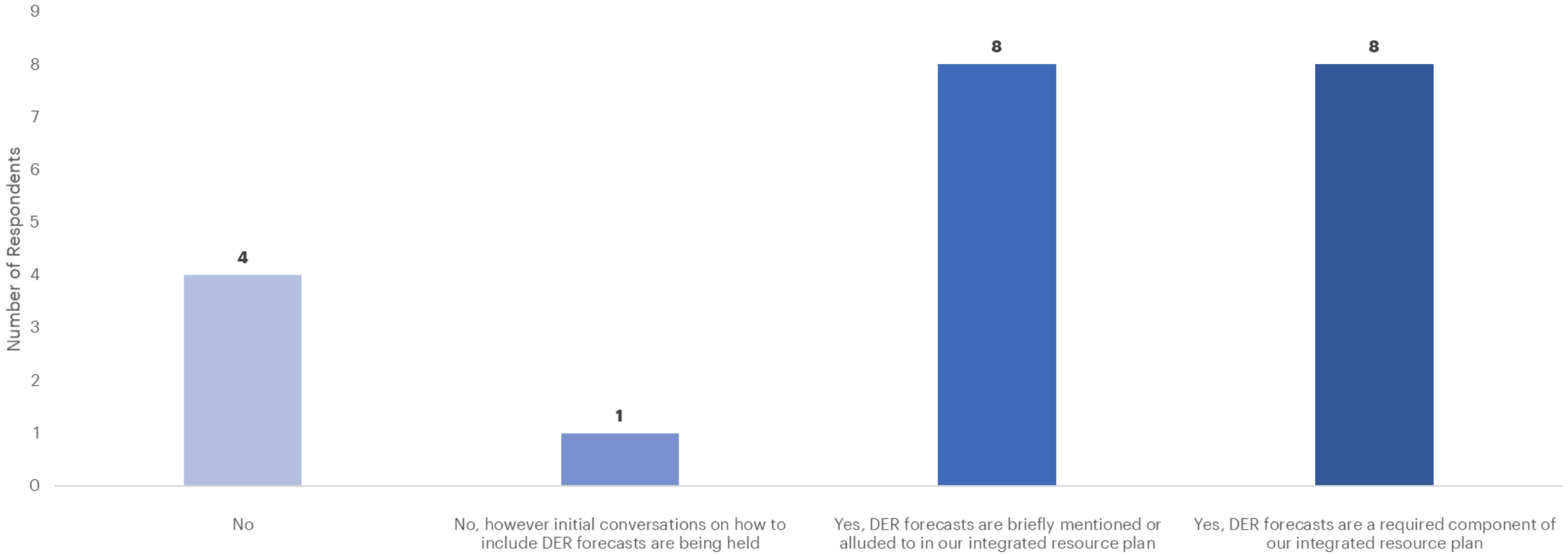
1.3) DER Strategy

Question:	Which of the following best describes the maturity of your strategy for integrating distributed energy resources (DERs)? NOTE: A DER is an electricity-producing/storing resource or controllable load device that is connected to the local distribution system, such as a solar panel or battery.



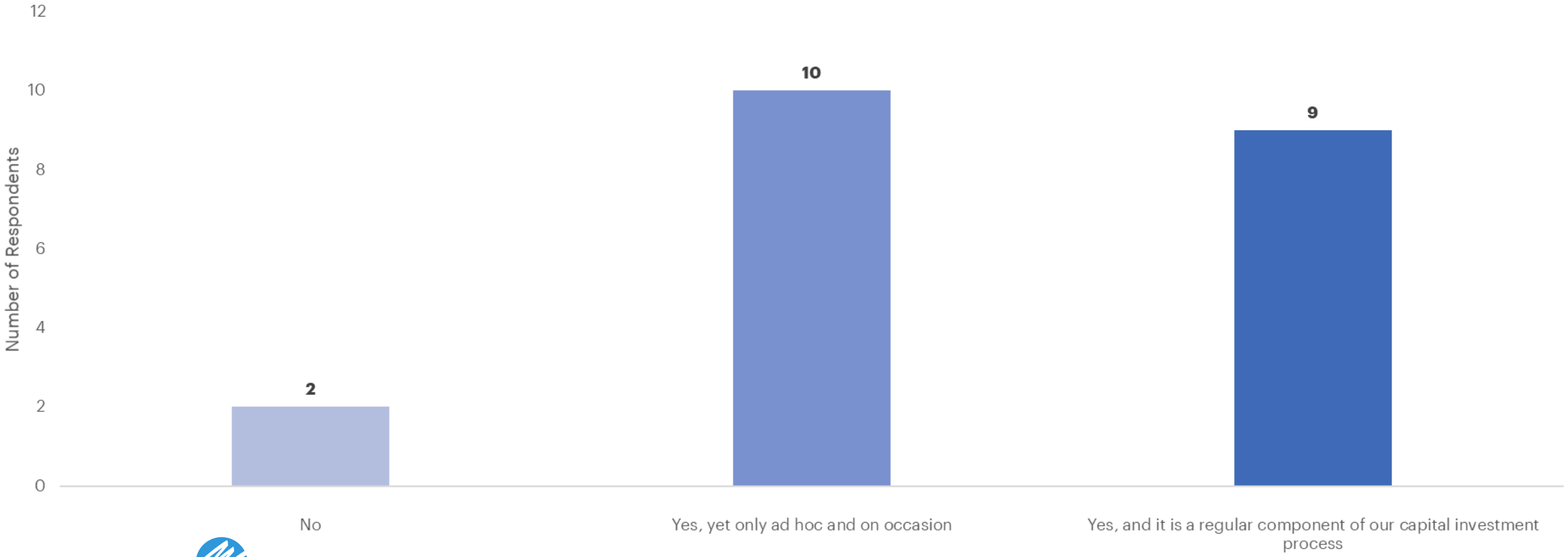
1.4) DERs In Integrated Resource Plan

Question:	Does your integrated resource plan include forecasts for anticipated DER penetration? NOTE: As a reminder, this question (along with the rest of the survey) is focused on distribution



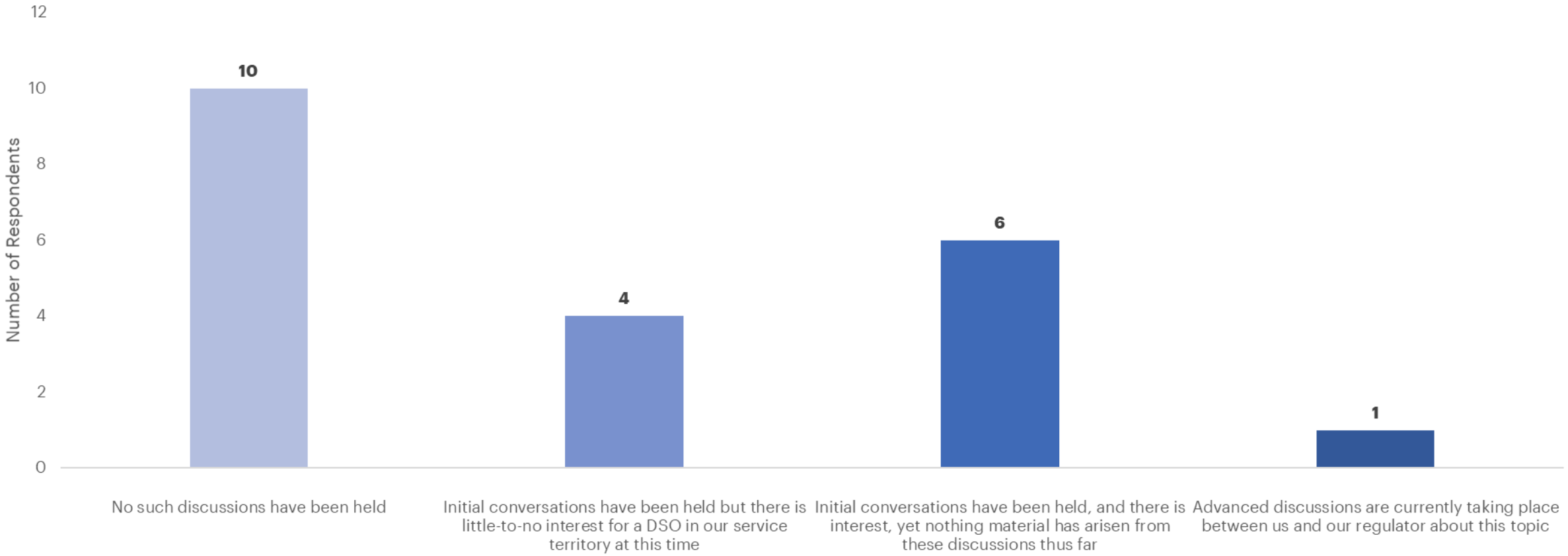
1.5) DER Investment Consideration

Question:	Does your capital investment process consider the deferral or replacement of traditional grid investments for the sake of distributed or other alternative investments? NOTE: An example of this would be assessing a location's load growth and considering DERs / energy storage / microgrids or other non-wires alternatives as an option alongside traditional distribution load growth projects



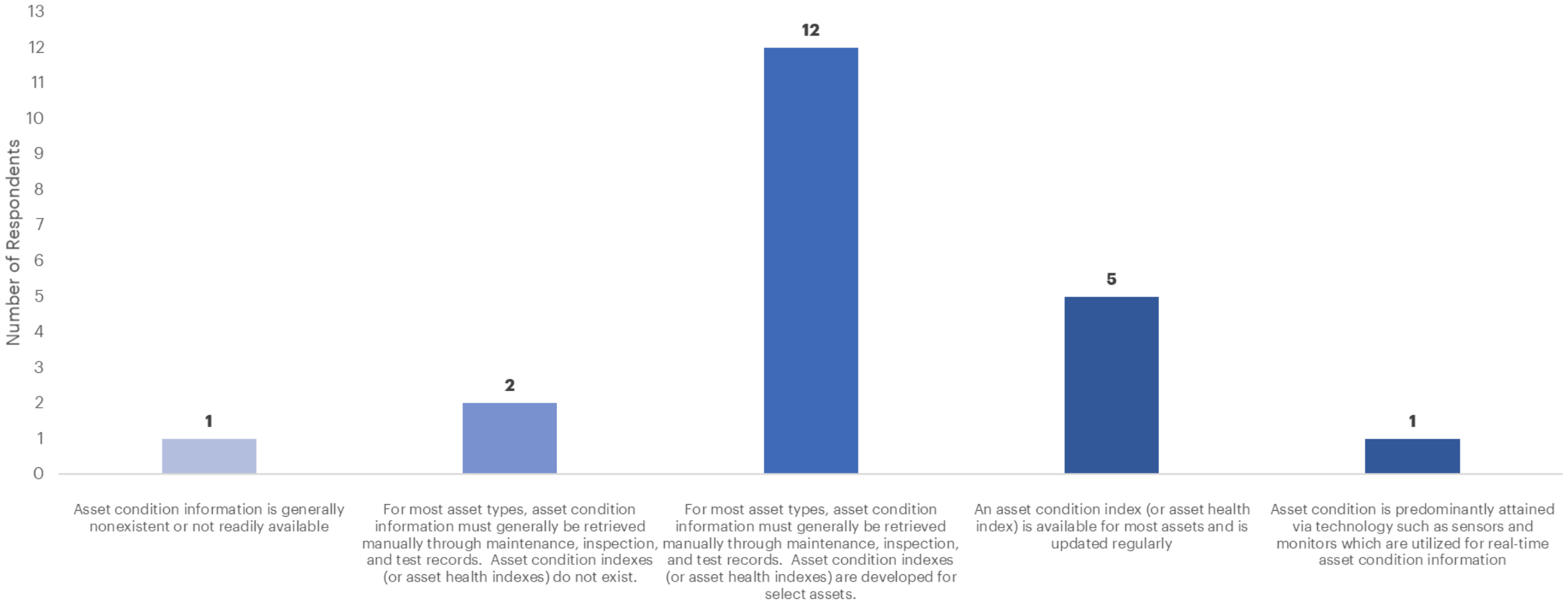
1.6) DSO

Question:	Have discussions been held between you and your regulator regarding the topic of transitioning your distribution line of business into the role of a Distribution System Operator (DSO) that facilitates the coordination of energy delivery similar to that of a Regional Transmission Operator (RTO)?



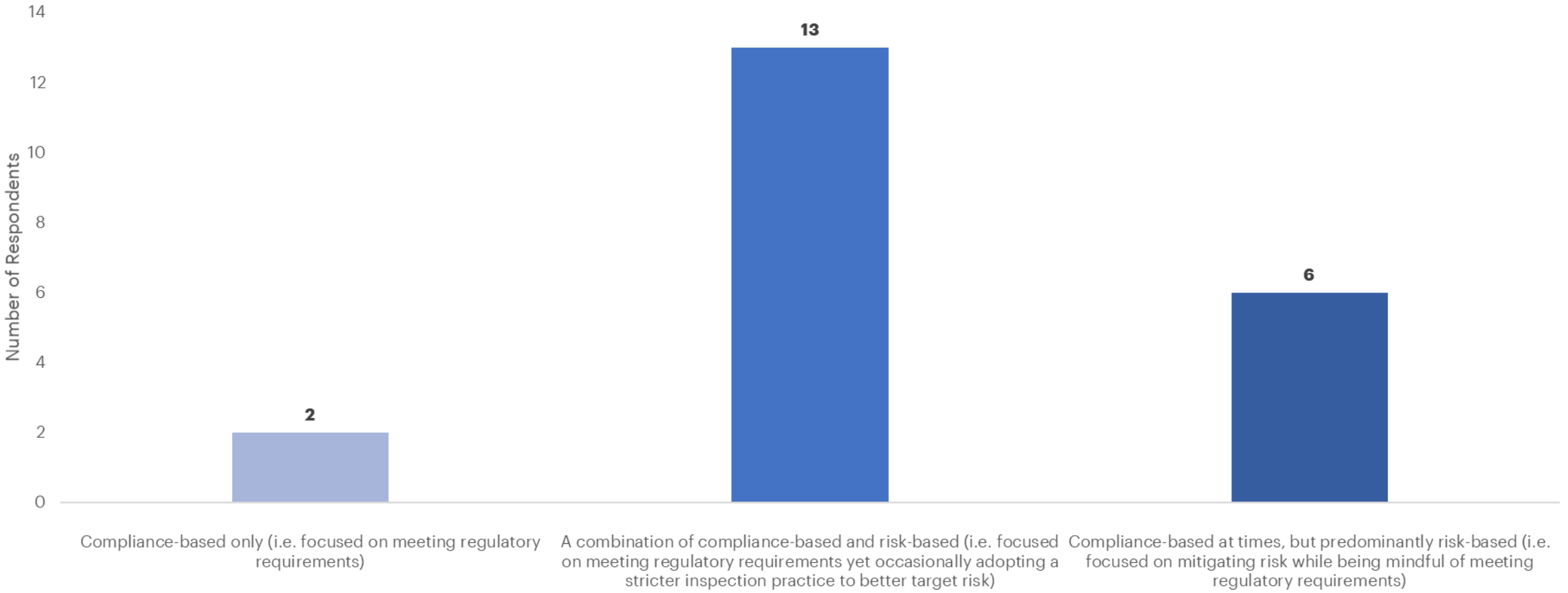
2.1) Asset Condition Information

Question:	Which of the following best describes your asset condition information? NOTE: This question is in reference to physical system assets.



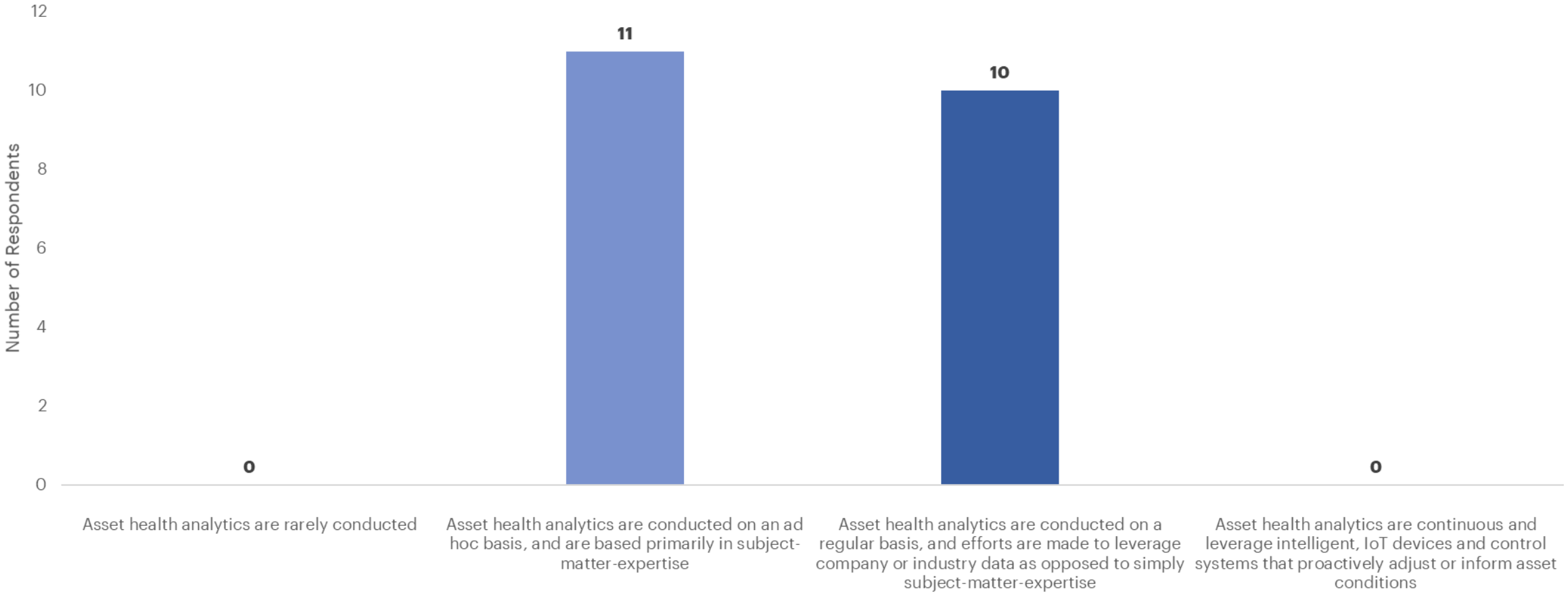
2.2) Asset Inspections

Question:	Which of the following best describes the inspection practices of your assets?



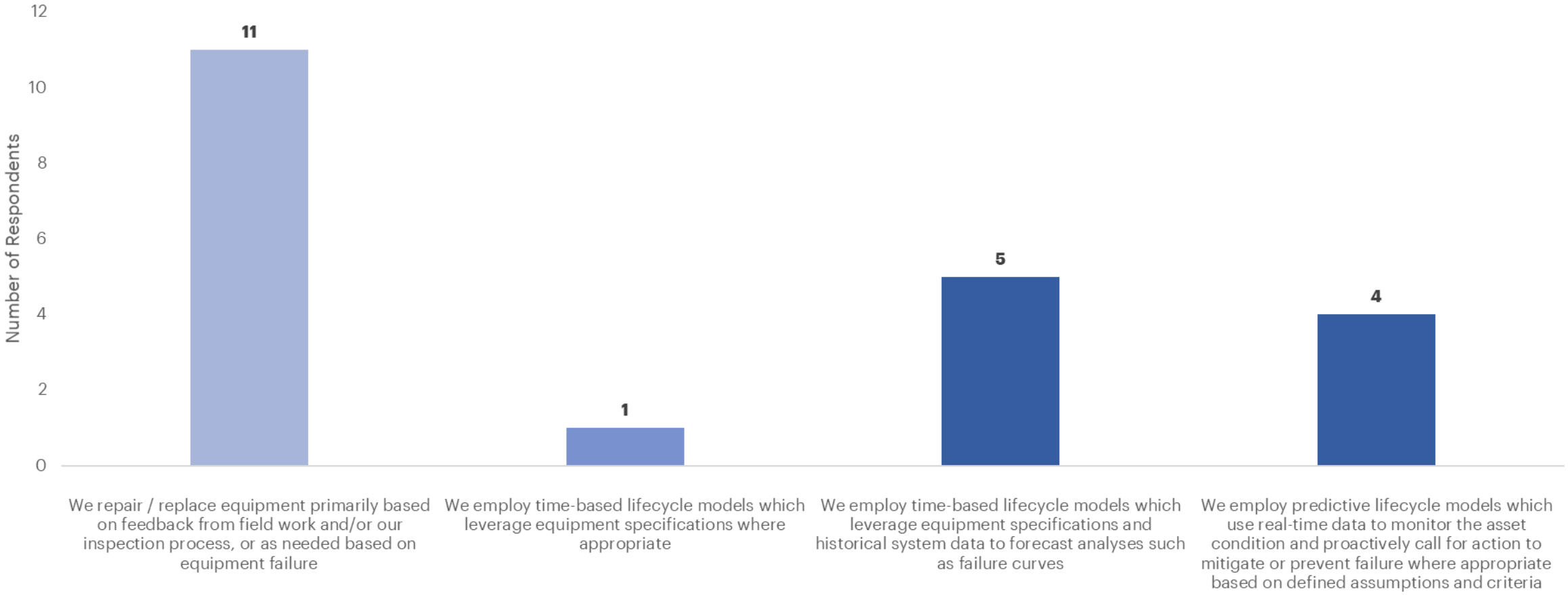
2.3) Asset Health Monitoring

Question:	Which of the following best describes your asset health monitoring?



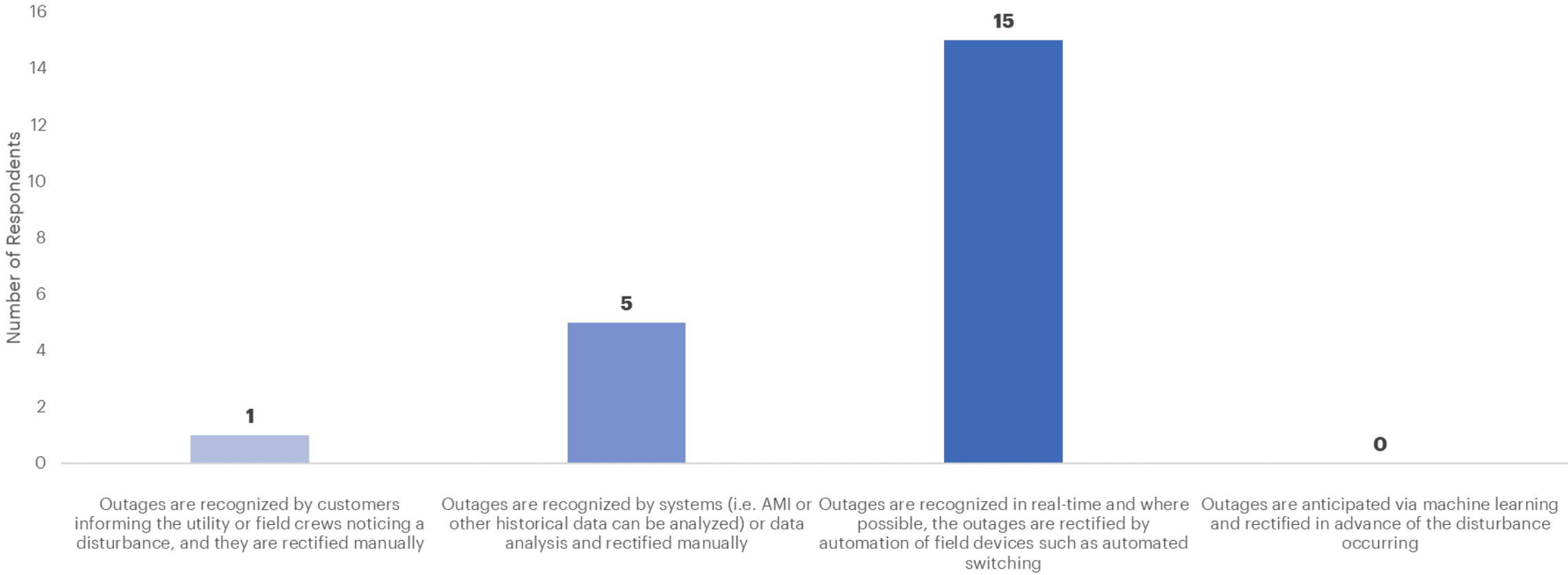
2.4) Lifecycle Models

Question:	Which of the following best describes how do you make repair / replace / run-to-failure decisions?



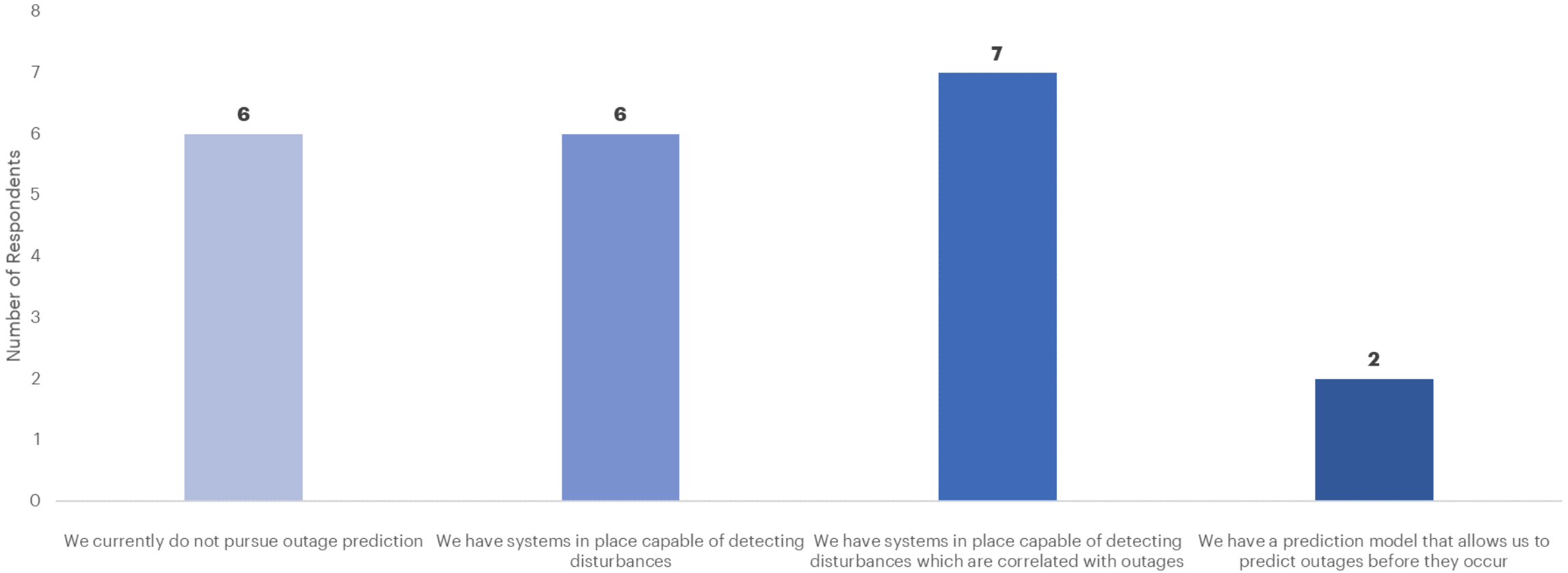
2.5) Outage Response

Question:	How is an outage recognized and rectified? Please select the option that best describes the highest level of practice at your utility. NOTE: Here, an "outage" is defined as a sustained system fault (not a momentary).



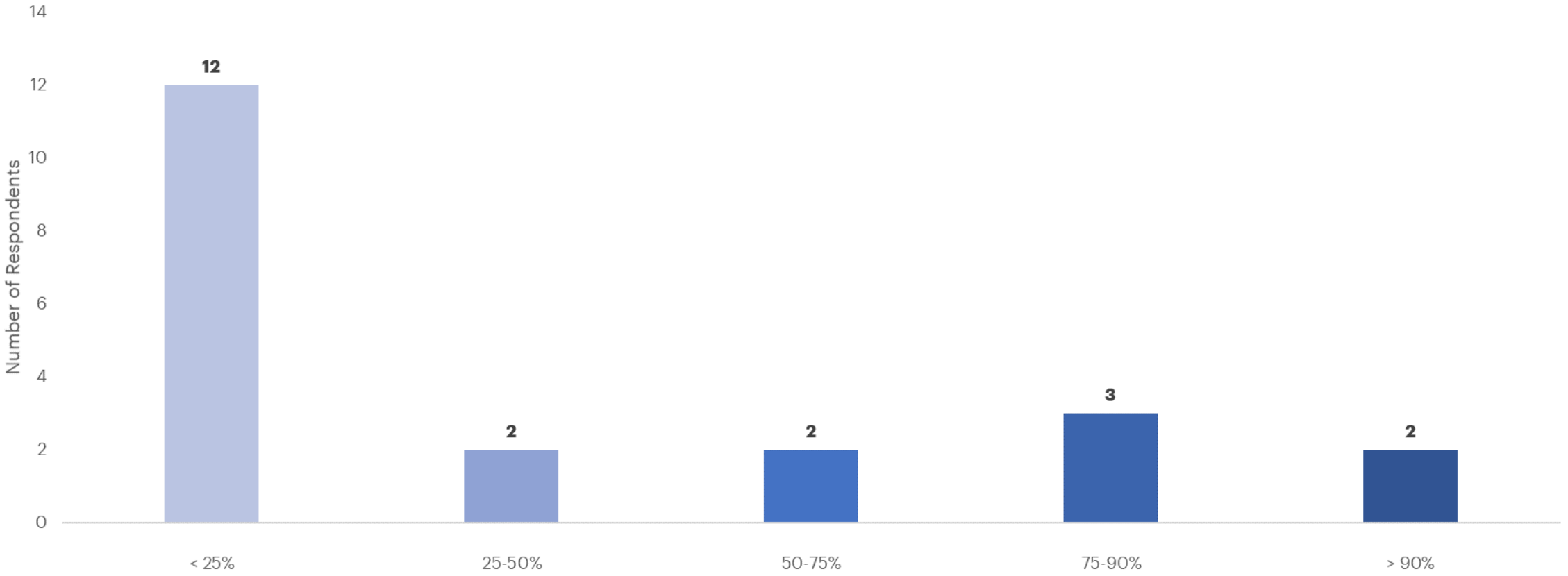
2.6) Outage Prediction

Question:	Which of the following best describes your capabilities regarding outage prediction? NOTE: Here, a “disturbance” is defined as an operational anomaly which does not trigger a protective device.



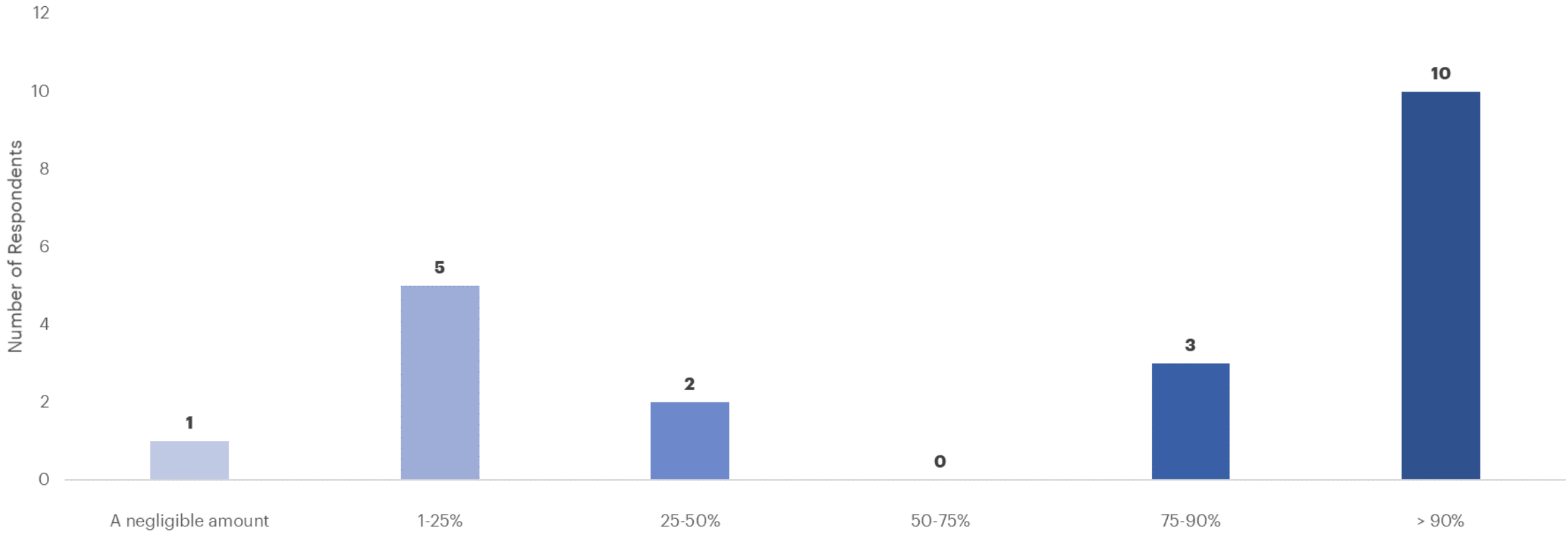
2.7) Volt / Var Optimization

Question:	What percentage of your feeders have integrated volt/var optimization (VVO) solutions? NOTE: Here, “integrated VVO” refers to a solution that optimizes both voltage and reactive power simultaneously using real time data.



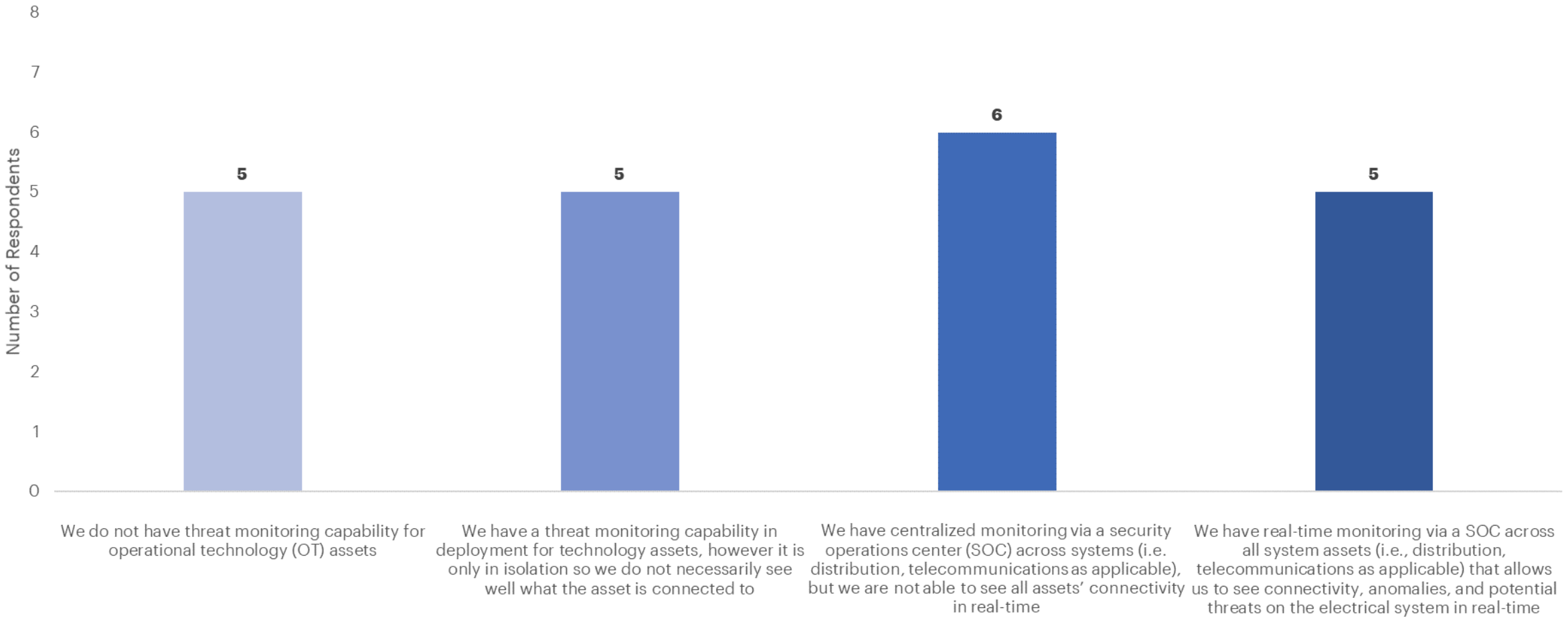
2.8) Discovered Assets

Question:	What percentage of your field technology assets are discovered? NOTE: Here, "discovered" implies that you have visibility into the asset from a threat intelligence perspective. As in, you have awareness of what the asset is and where it is.



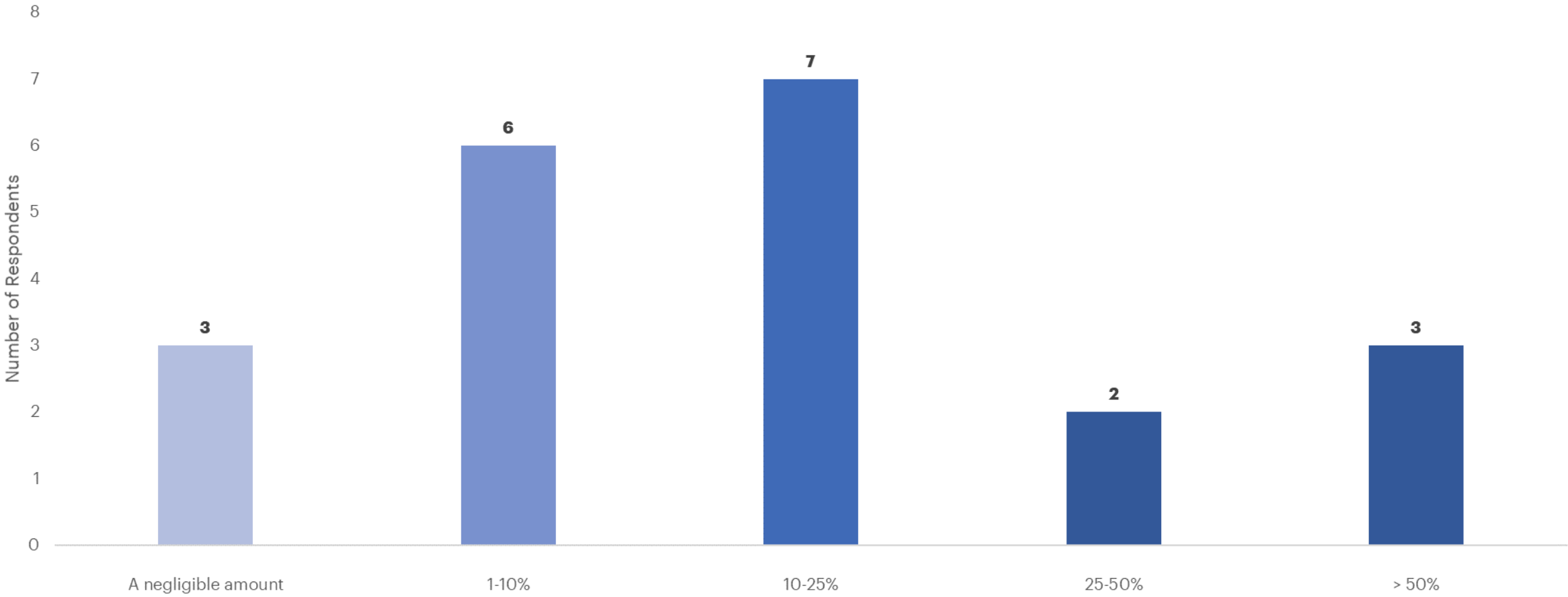
2.9) Asset Cyber Threat Monitoring

Question:	Which of the following best describes your capabilities regarding cyber threat monitoring of assets?



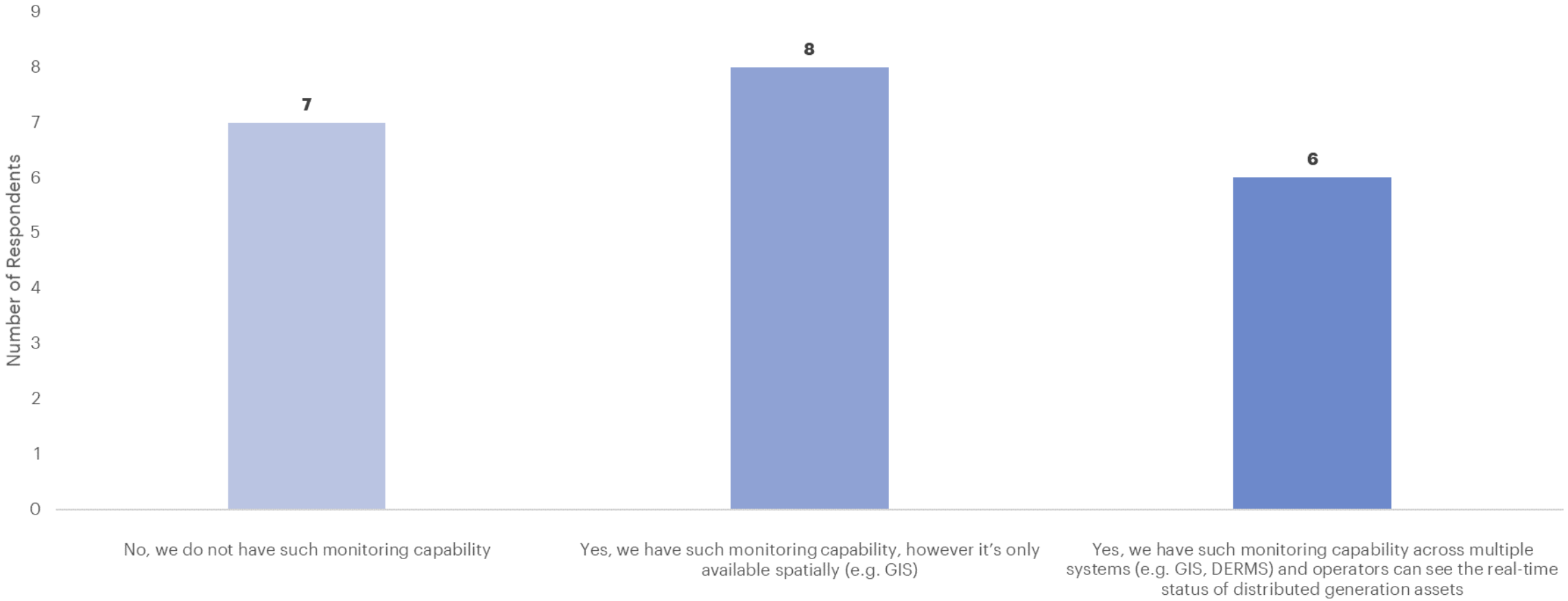
3.1) Radial System

Question:	What percentage of your customers are served by distribution backbone system that is radial (i.e., without capability of alternate feed)?



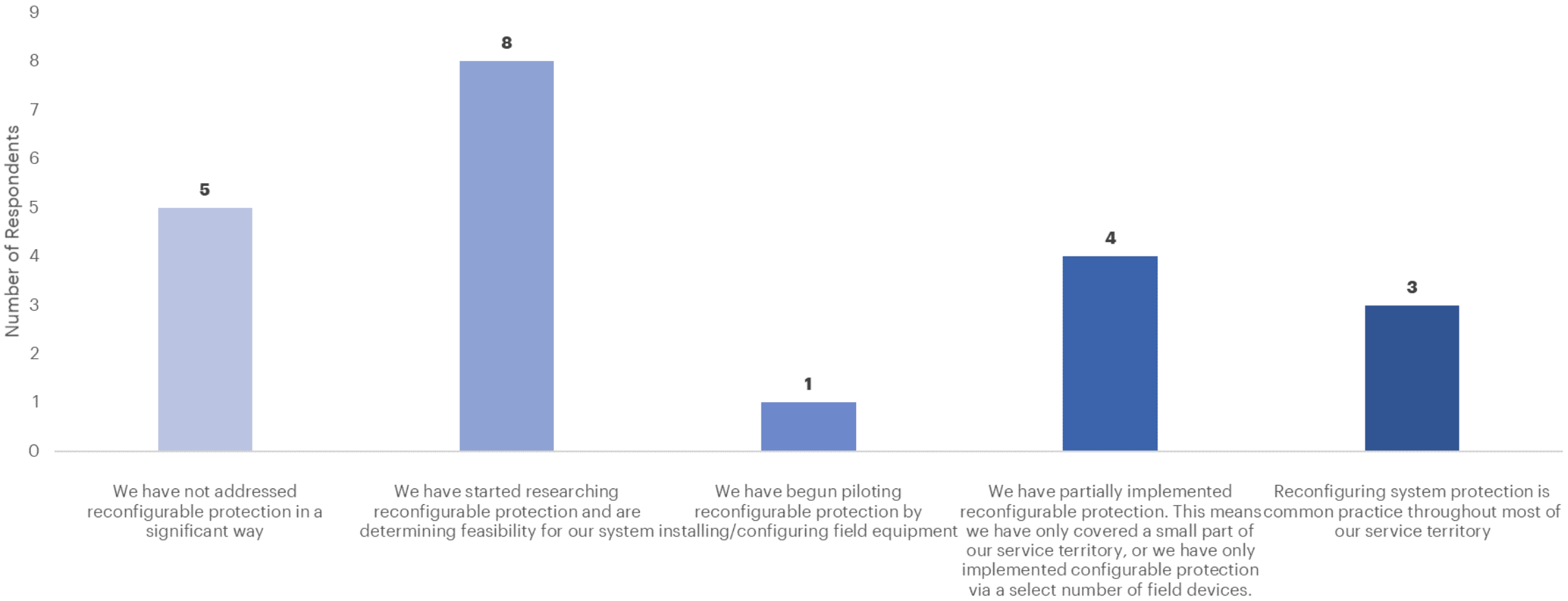
3.2) Two – Way Flow Monitoring

Question:	Do you have the monitoring capabilities that allow you to see distributed generation assets on your system?



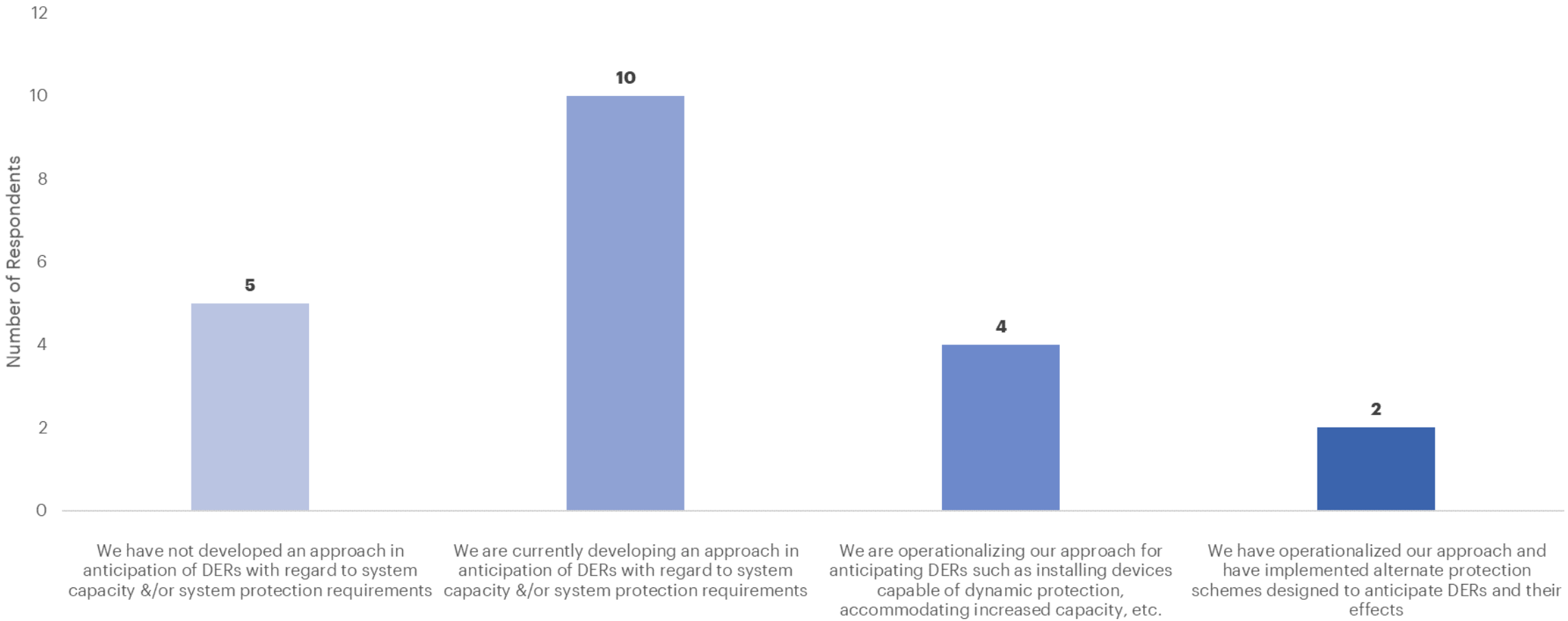
3.3) Reconfigurable Protection

Question:	Which of the following best describes your ability to reconfigure system protection as required given system dynamics?



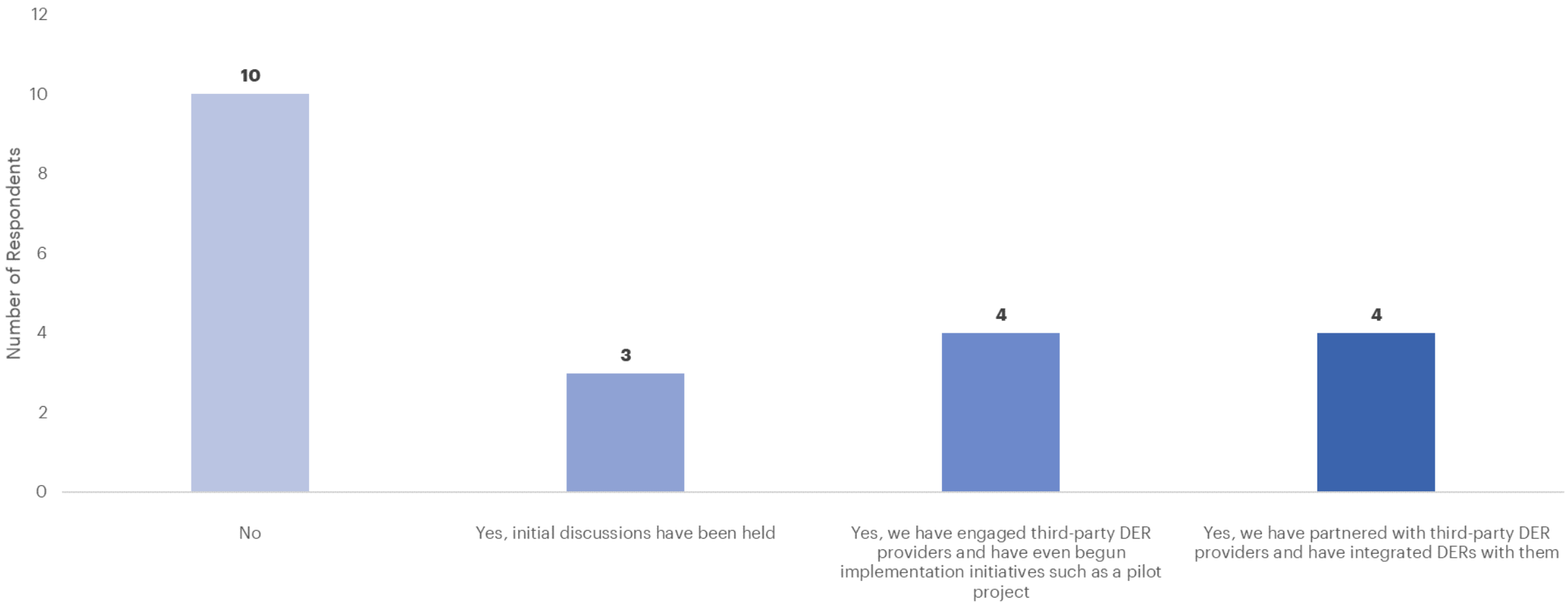
3.4) DER System Approach

Question:	Which of the following best describes your approach for anticipating changes to system capacity &/or system protection requirements due to increased DERs in your service territory?



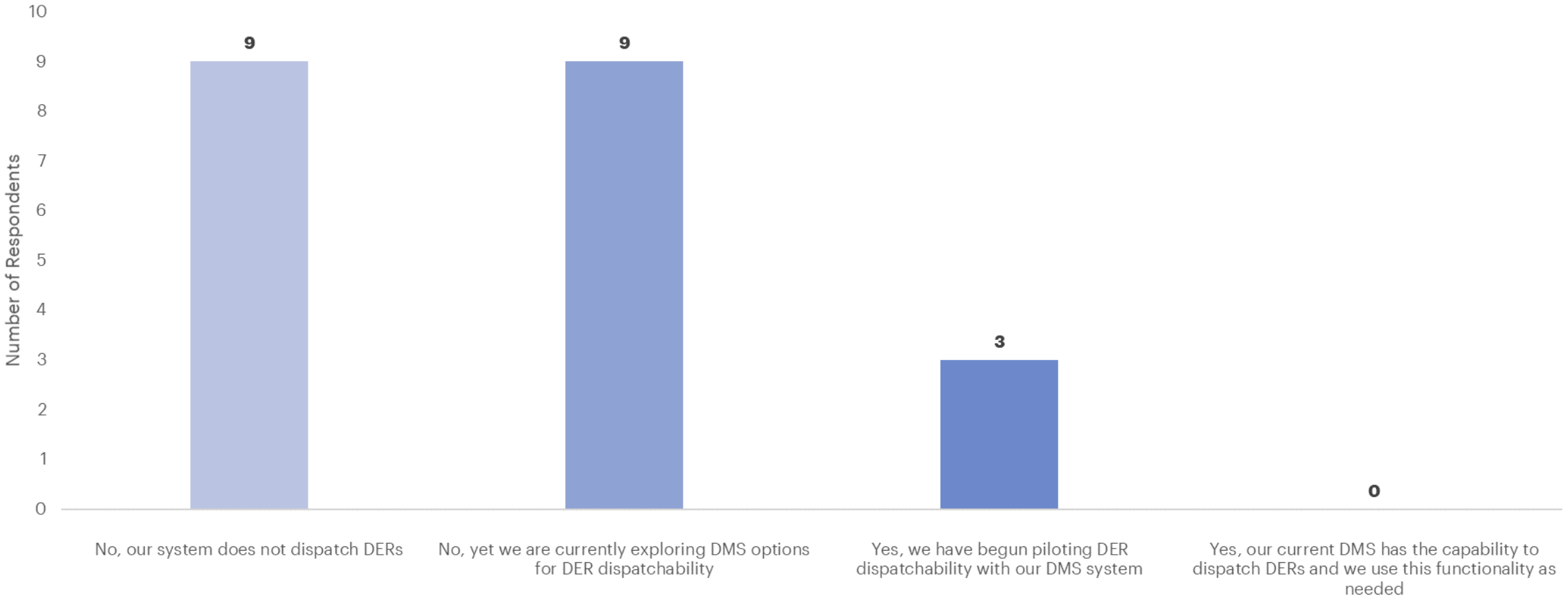
3.5) DER Providers

Question:	Are you partnering with third-party DER providers to integrate DERs in your distribution system?



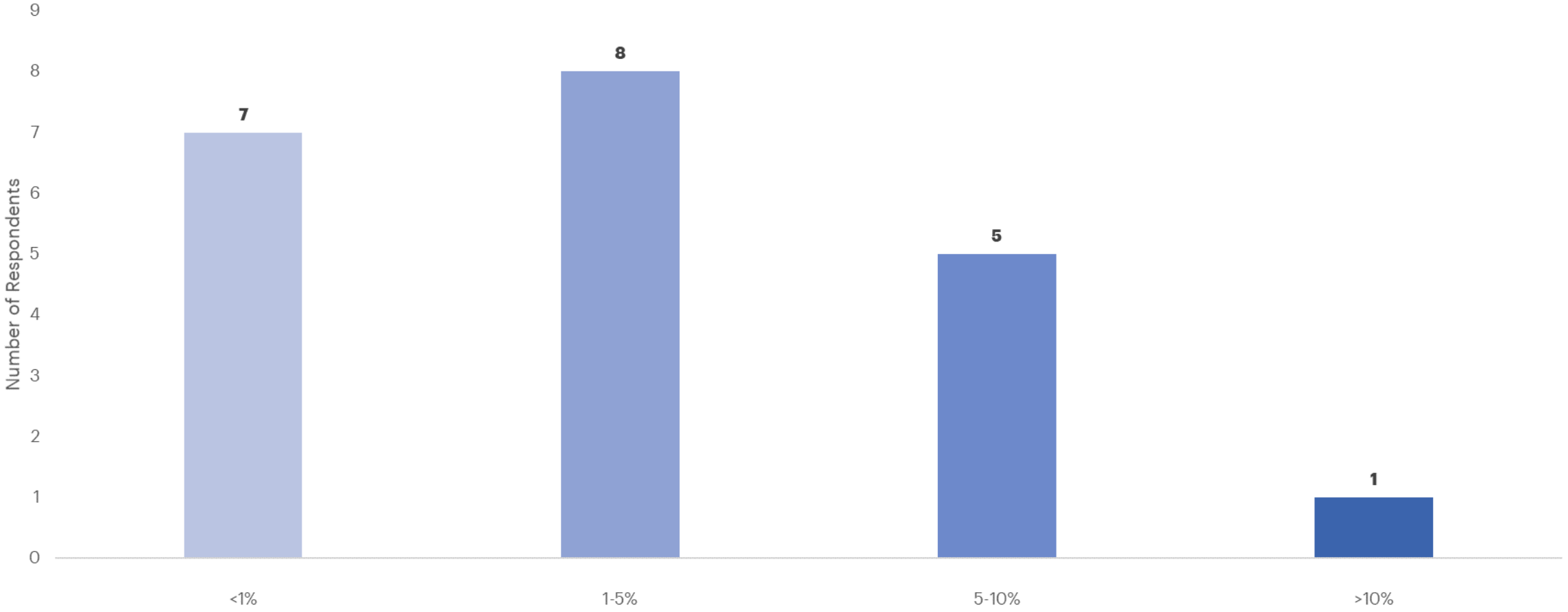
3.6) DER Dispatchability

Question:	Do you have a distribution management system (DMS) that allows for DER dispatchability?



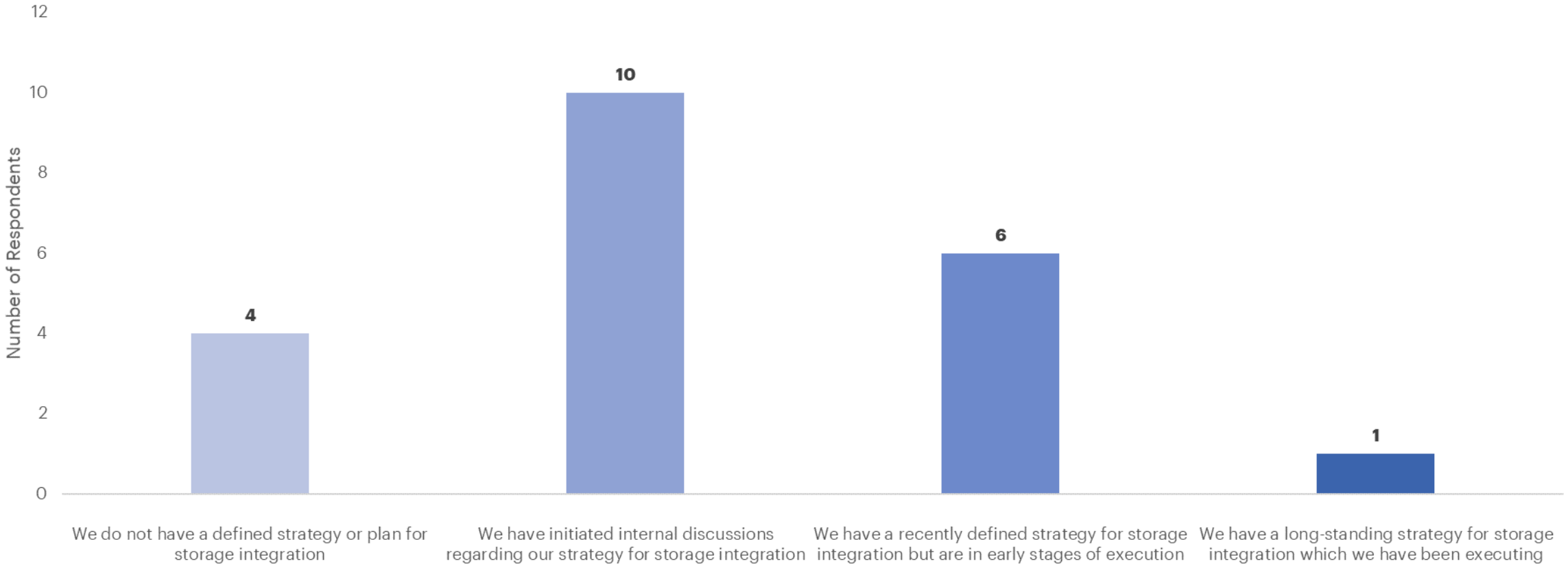
3.7) Distributed Generation

Question:	What % of your customers have customer-sited or directly connected distributed generation (e.g. solar, wind, fuel cells, etc.)?



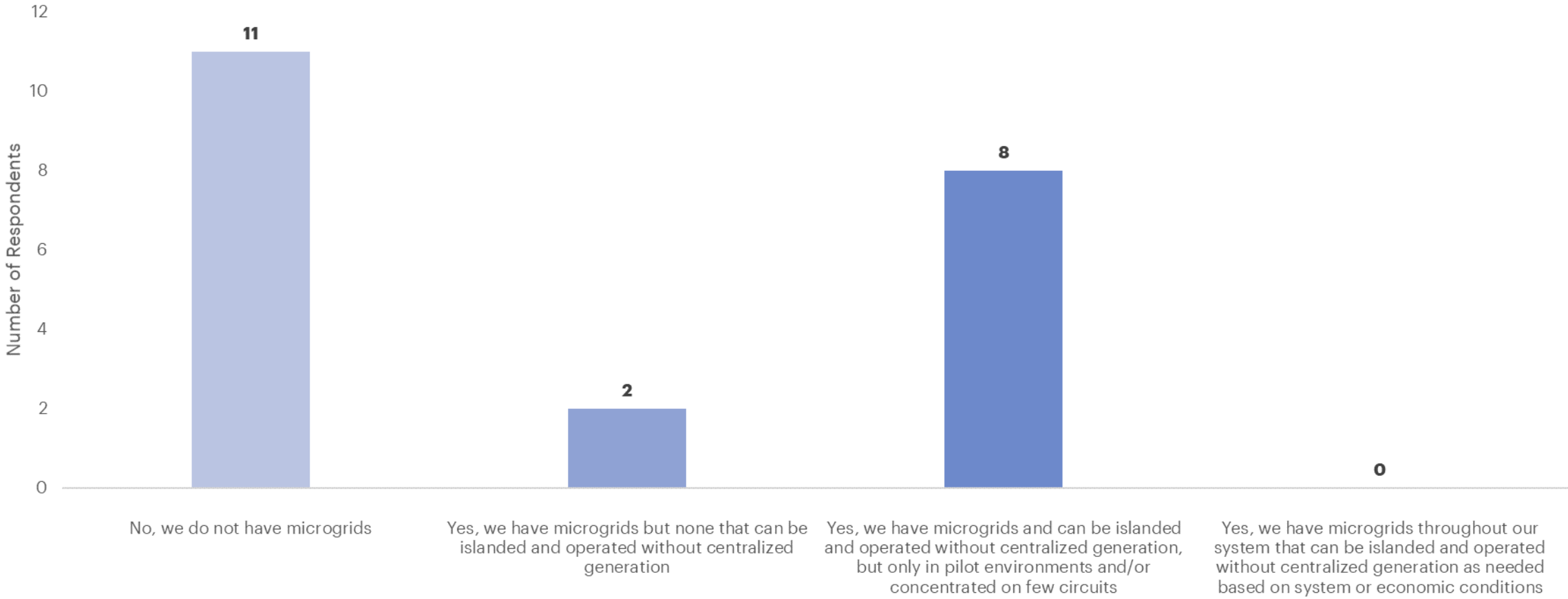
3.8) Energy Storage Strategy

Question:	Which of the following best describes the maturity of your utility's distribution level energy storage strategy? NOTE: This question refers to energy storage of your utility (not that of your customers). Examples of energy storage would include batteries (lithium ion or otherwise), fuel cells, etc.



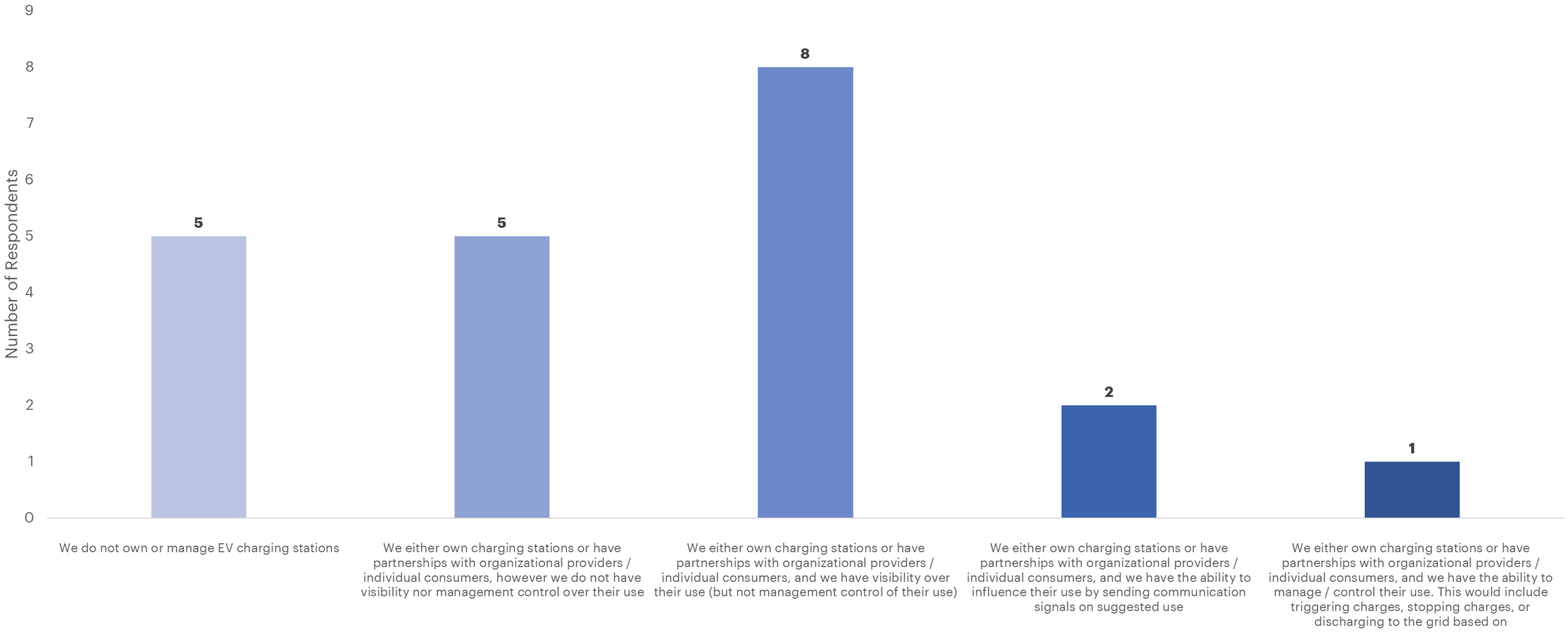
3.9) Microgrids

Question:	Do you have microgrids that can be islanded and operated without centralized generation? NOTE: This refers to microgrids which the utility controls, either by direct ownership or contract.



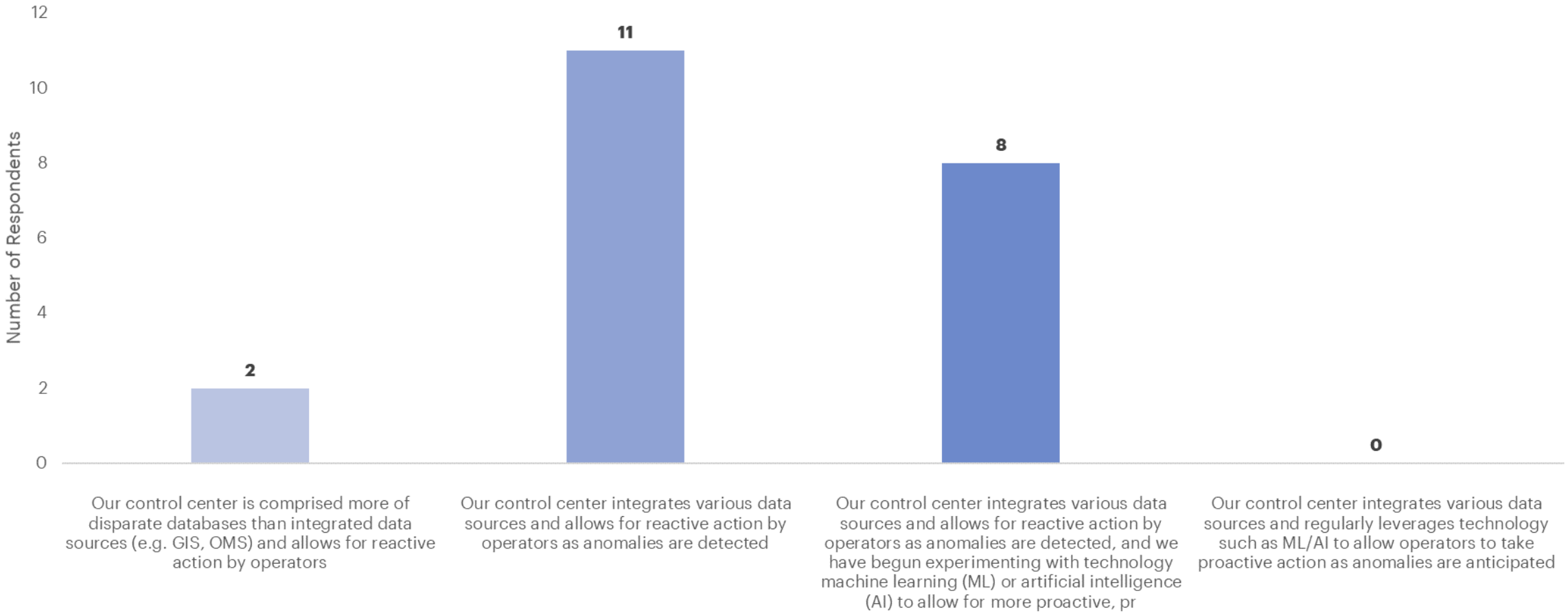
3.10) EV Charging

Question:	Which of the following best describes your electric vehicle (EV) charging capabilities?



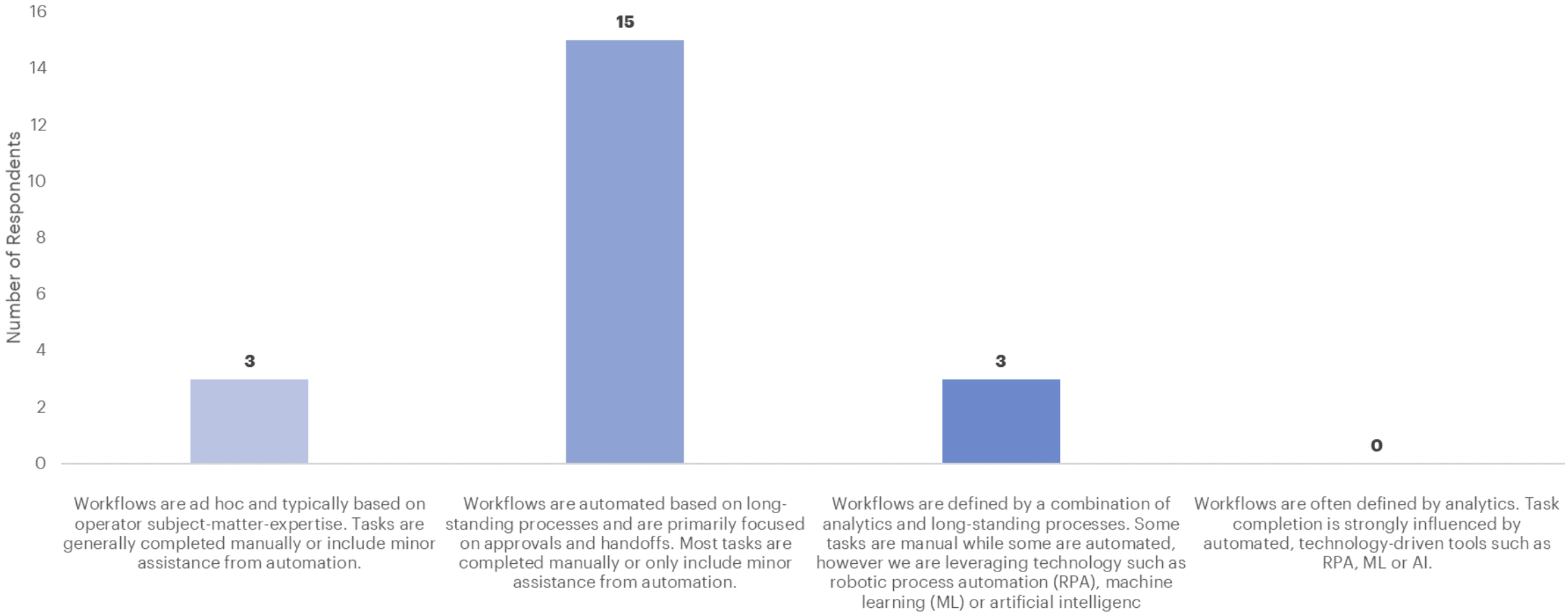
4.1) Control Center Infrastructure

Question:	Which of the following best describes the underlying infrastructure of your control center?



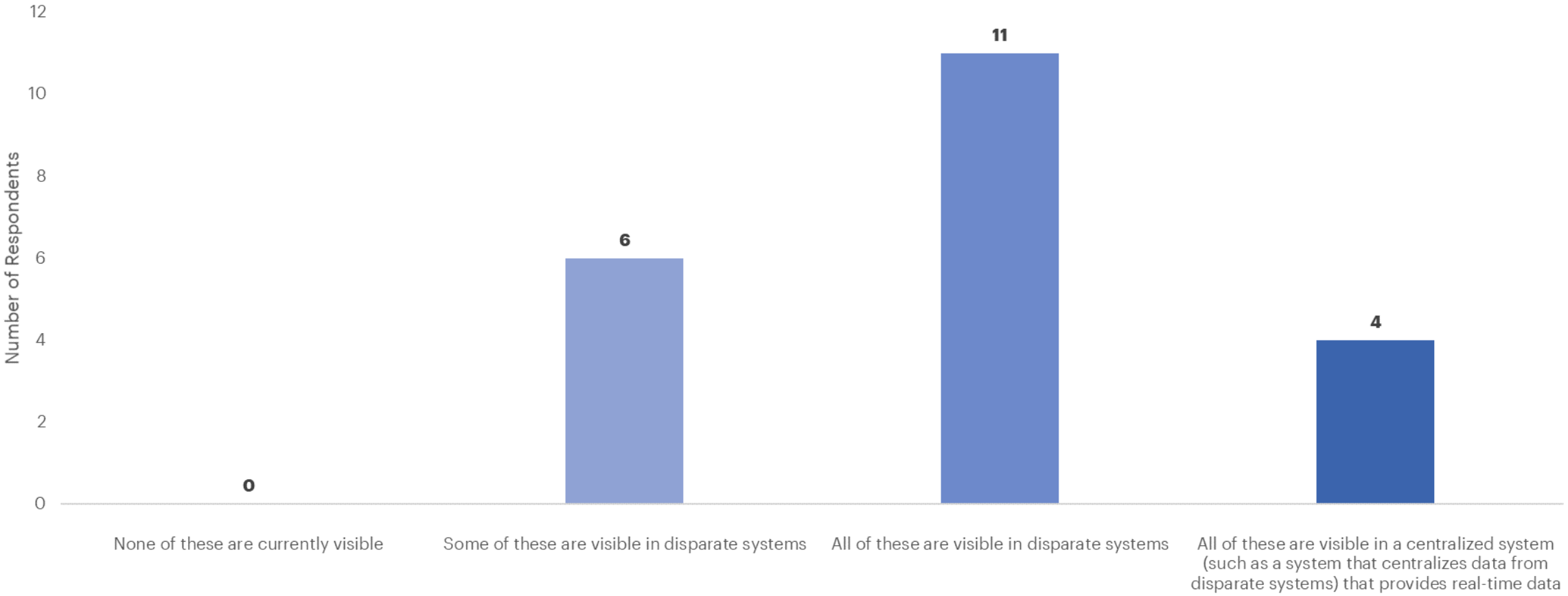
4.2) Control Center Workflows and Tasks

Question:	Which of the following best describes the workflows and tasks conducted in your control center?



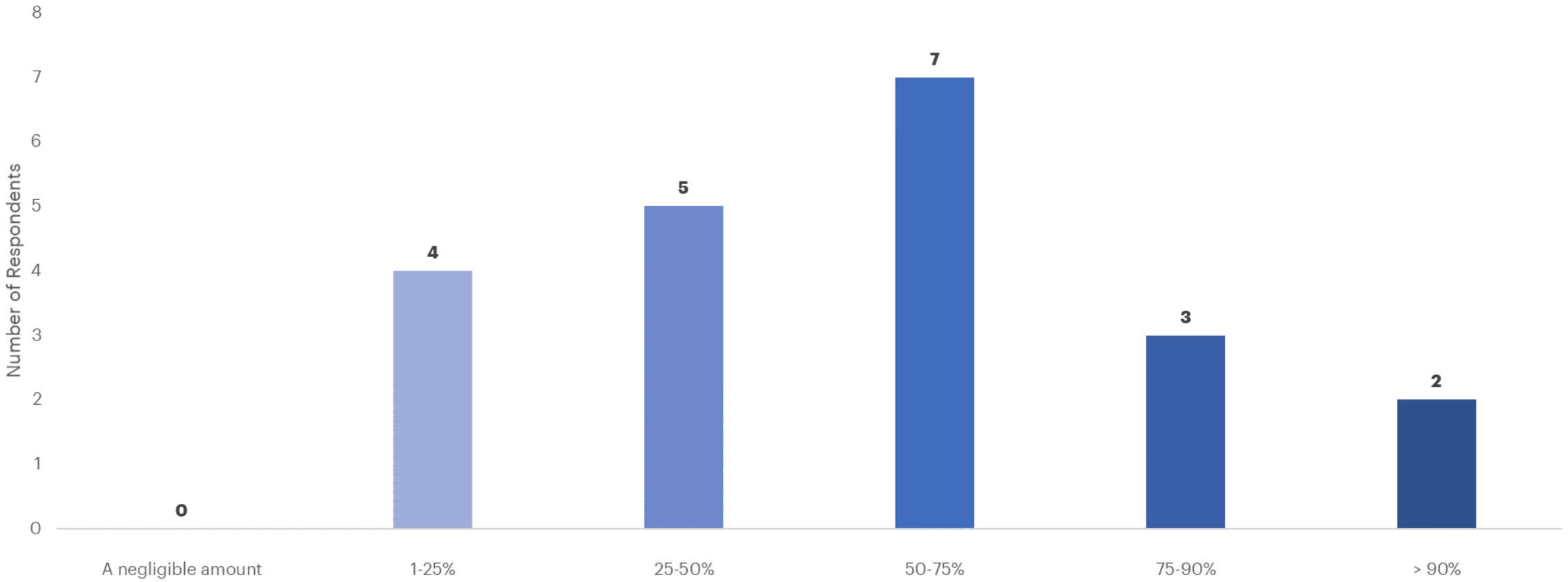
4.3) Operational Visibility

Question:	Which of the following best describes your visibility into operational activity such as customer energy usage, power flows, outages, and faults?



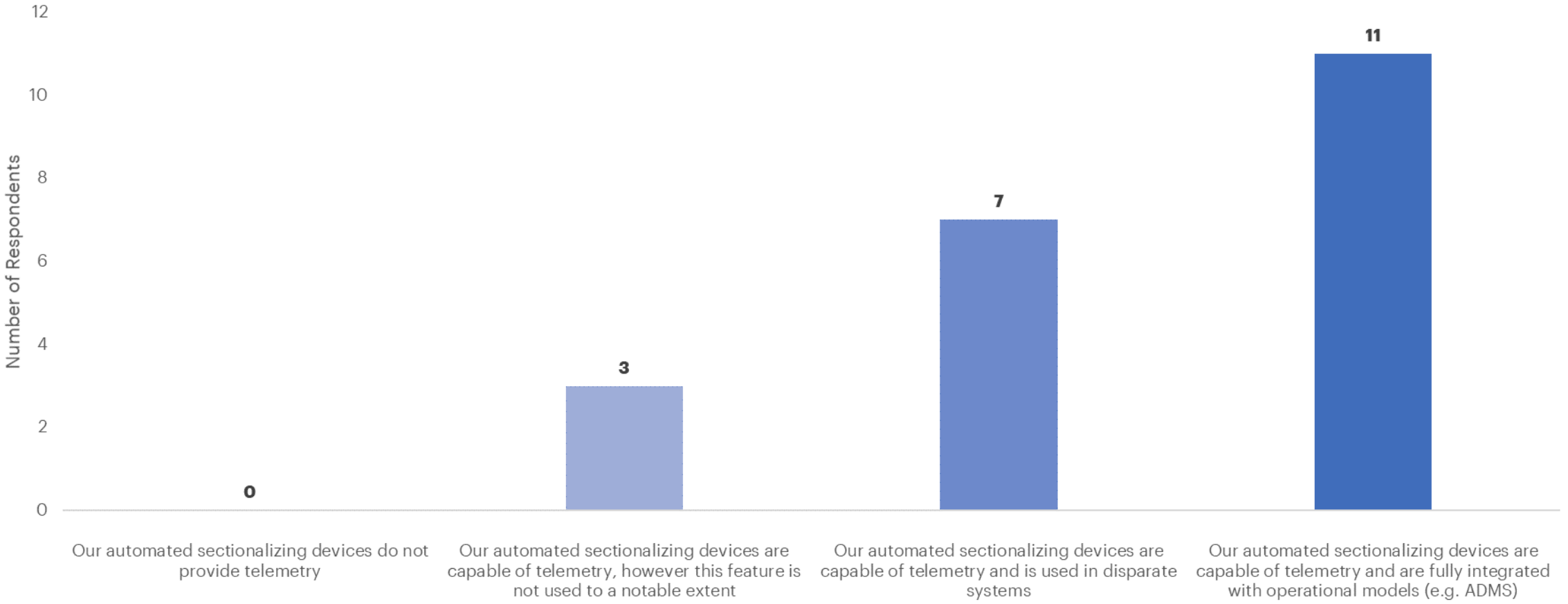
4.4) Automated Sectionalizing Devices

Question:	What percentage of your feeders have automated sectionalizing devices? NOTE: The entire feeder does not need to contain automated sectionalizing devices—partial coverage with automated sectionalizing devices suffices for this question.



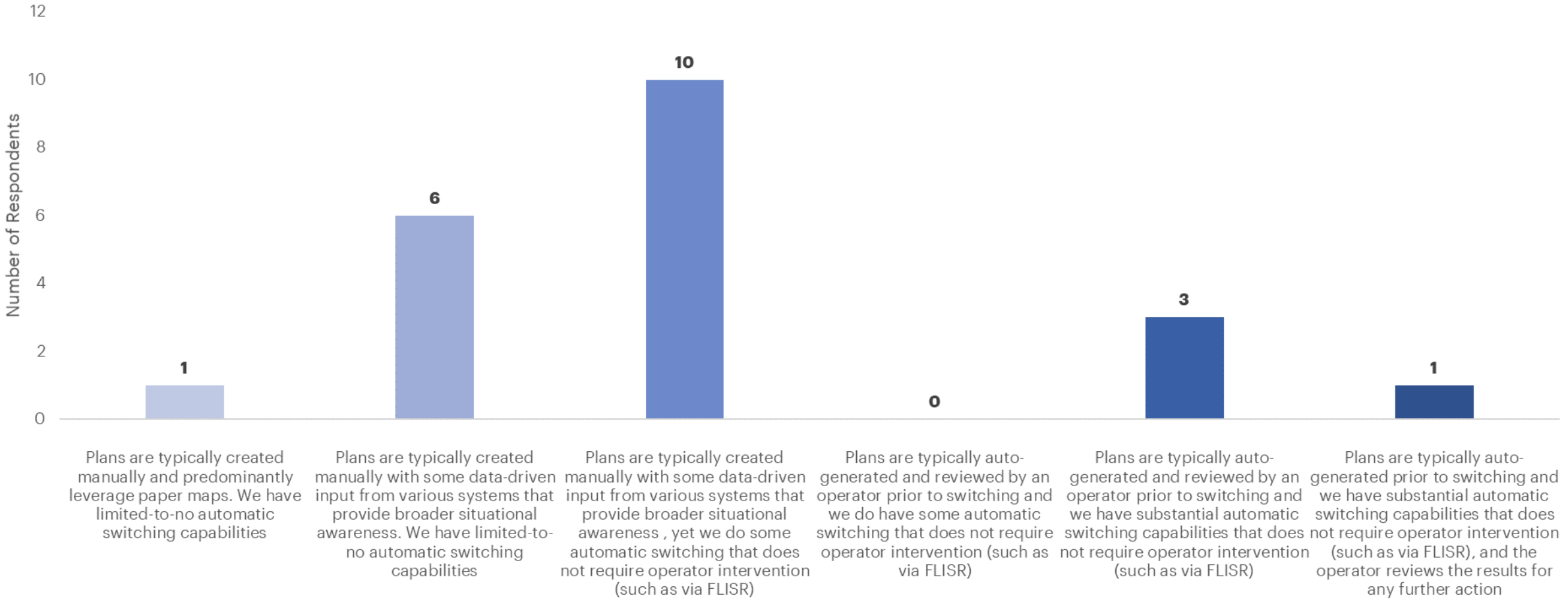
4.5) Connectivity of Automated Sectionalizing Devices

Question:	Which of the following best describes the connectivity and use of automated sectionalizing devices? NOTE: Below, “telemetry” refers to any measurement or status information gathered from the automated sectionalizing device.



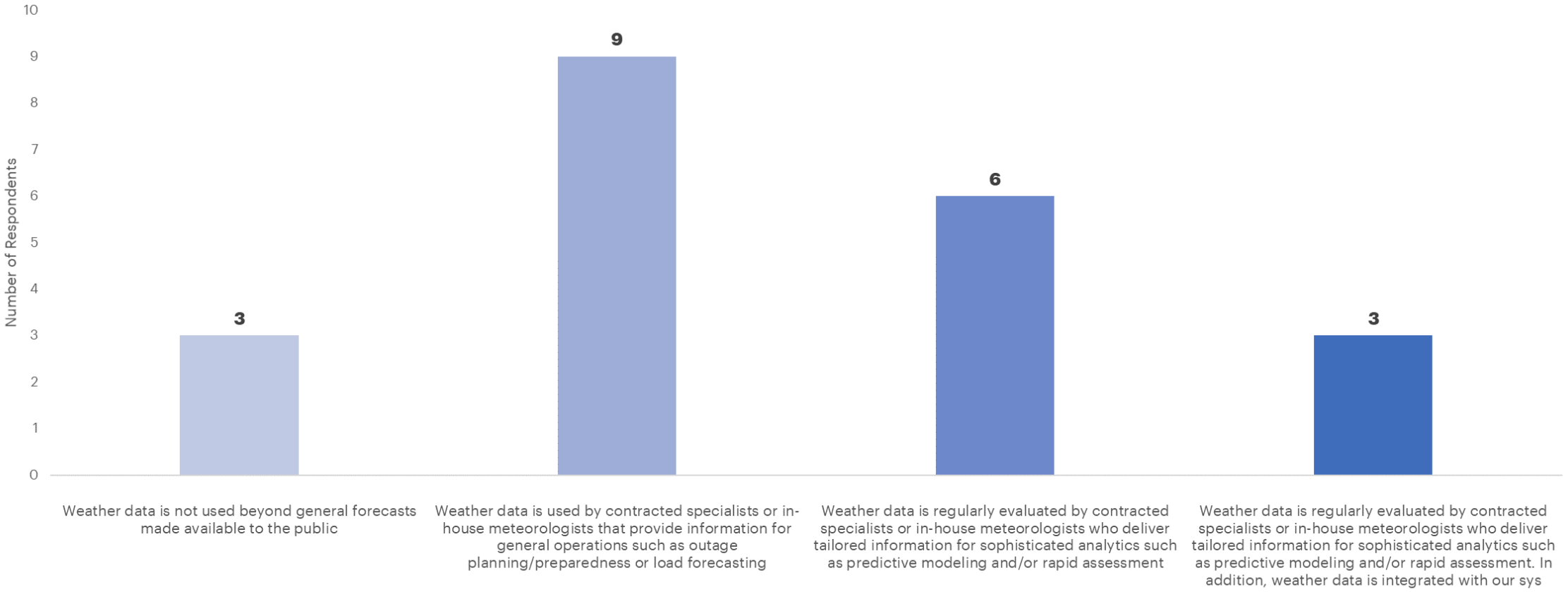
4.6) Switch Plan Creation & Execution

Question:	How are your switch plans created and executed for outage restoration?



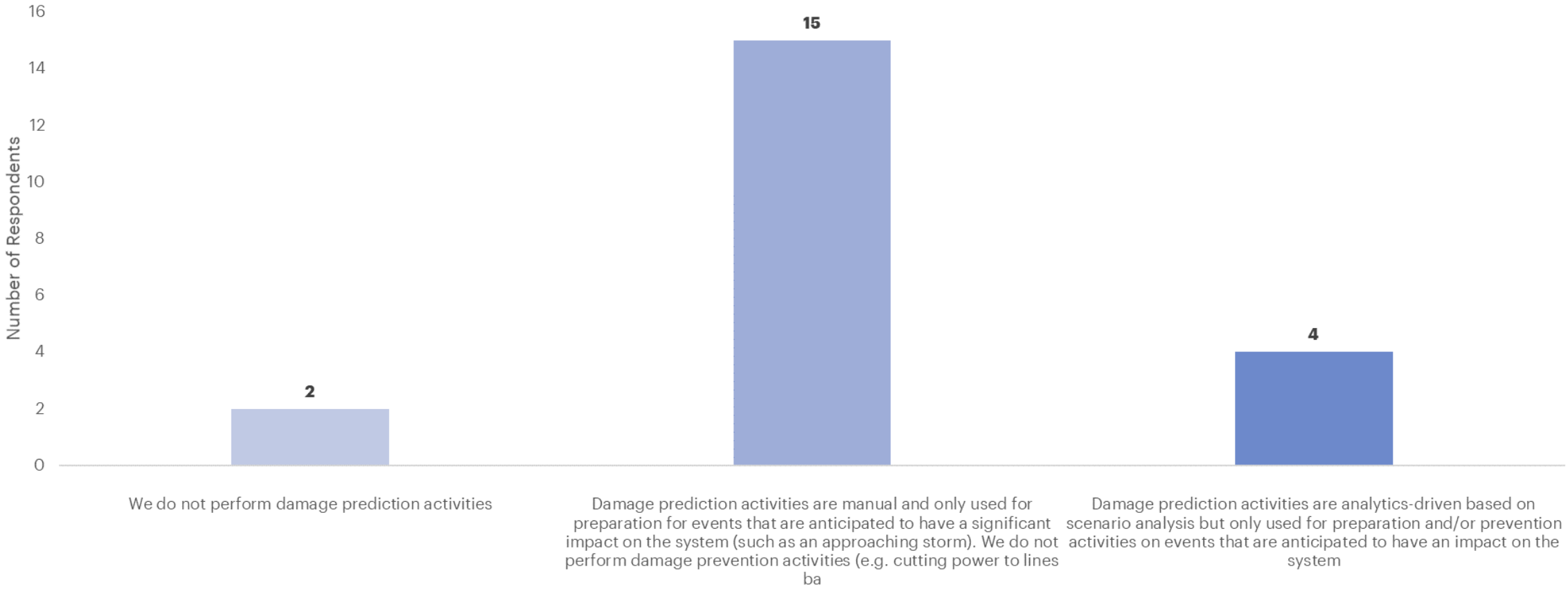
4.7) Weather Data

Question:	To what degree is weather data integrated into your operations (such as storm/wildfire preparations, damage prediction or damage assessment)?



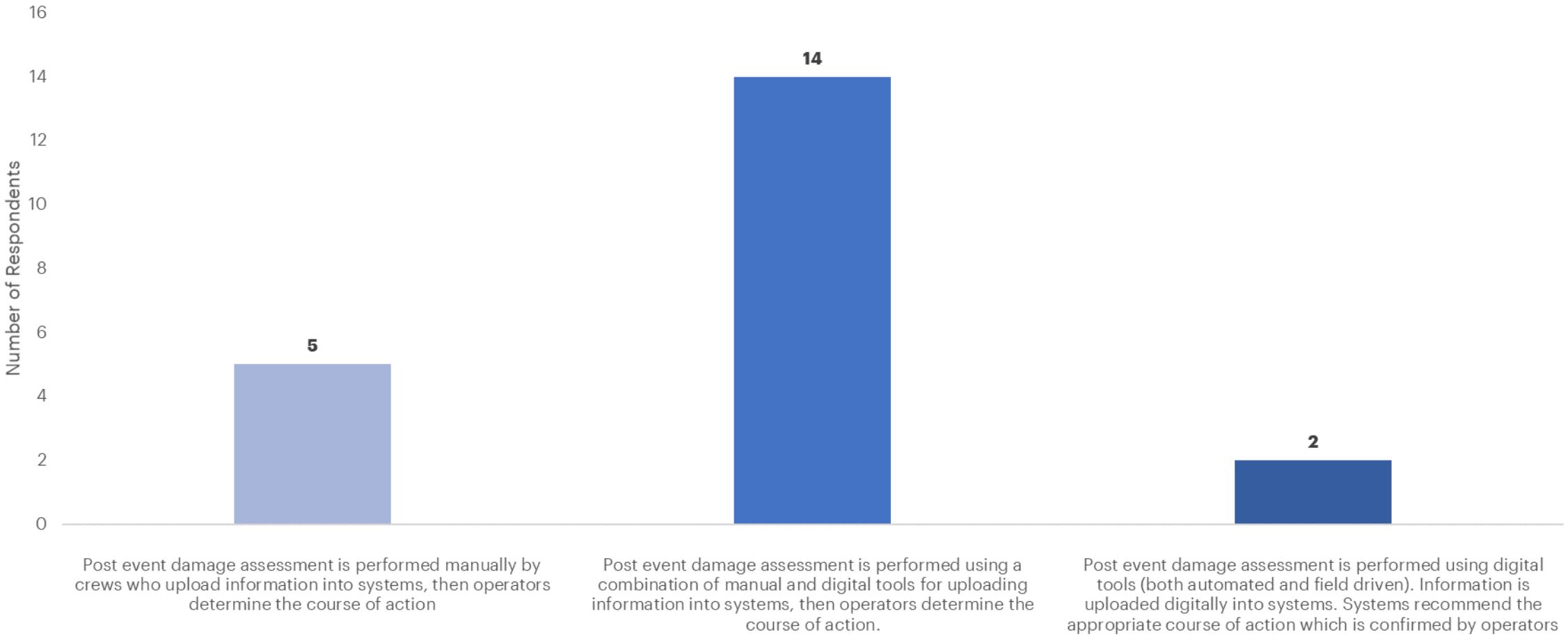
4.8) Major Event Damage Prediction and Prevention

Question:	Which of the following best describes your approach to damage prediction and prevention for major events?



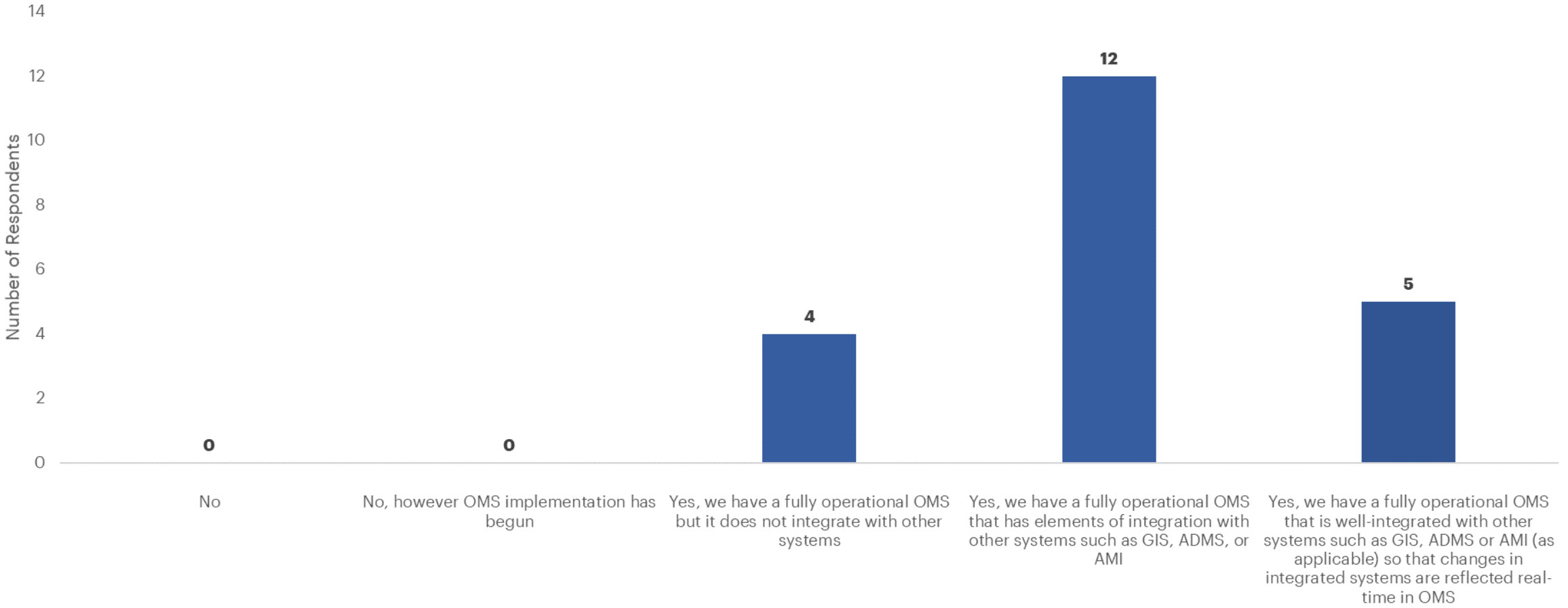
4.9) Major Event Damage Assessment

Question:	Which of the following best describes your damage assessment methods for major events?



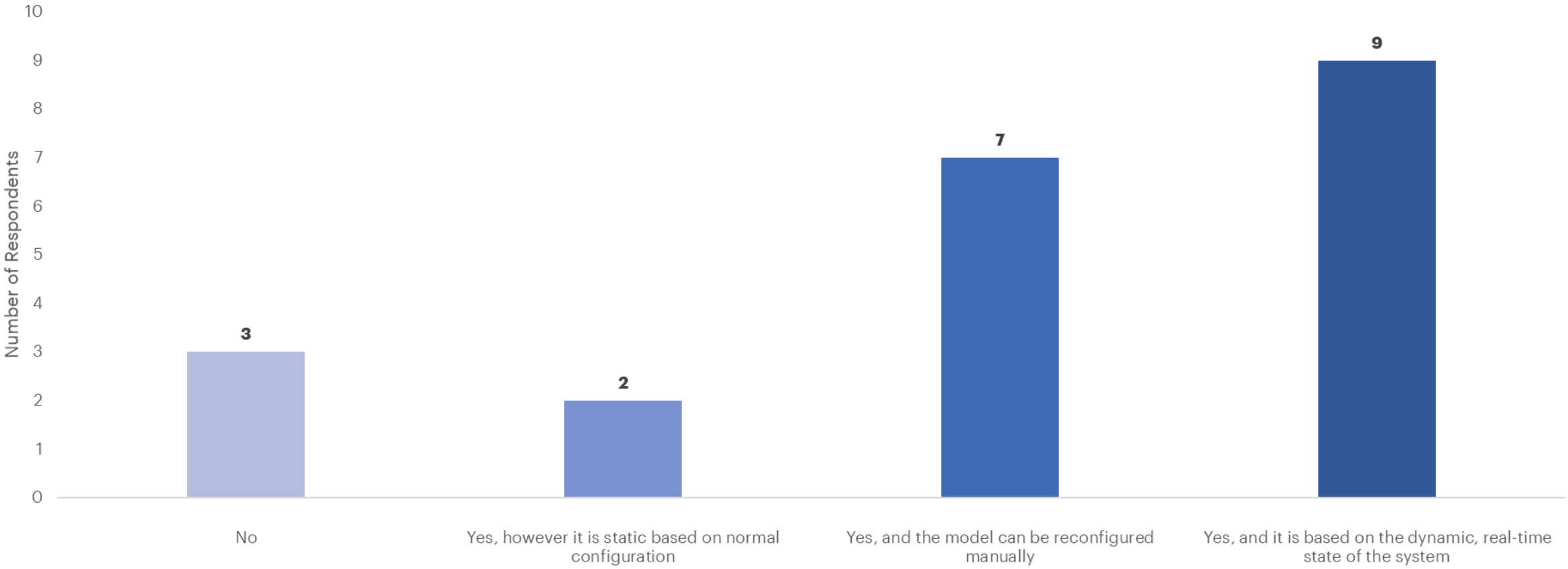
4.10) OMS

Question:	Do you have an outage management system (OMS)?



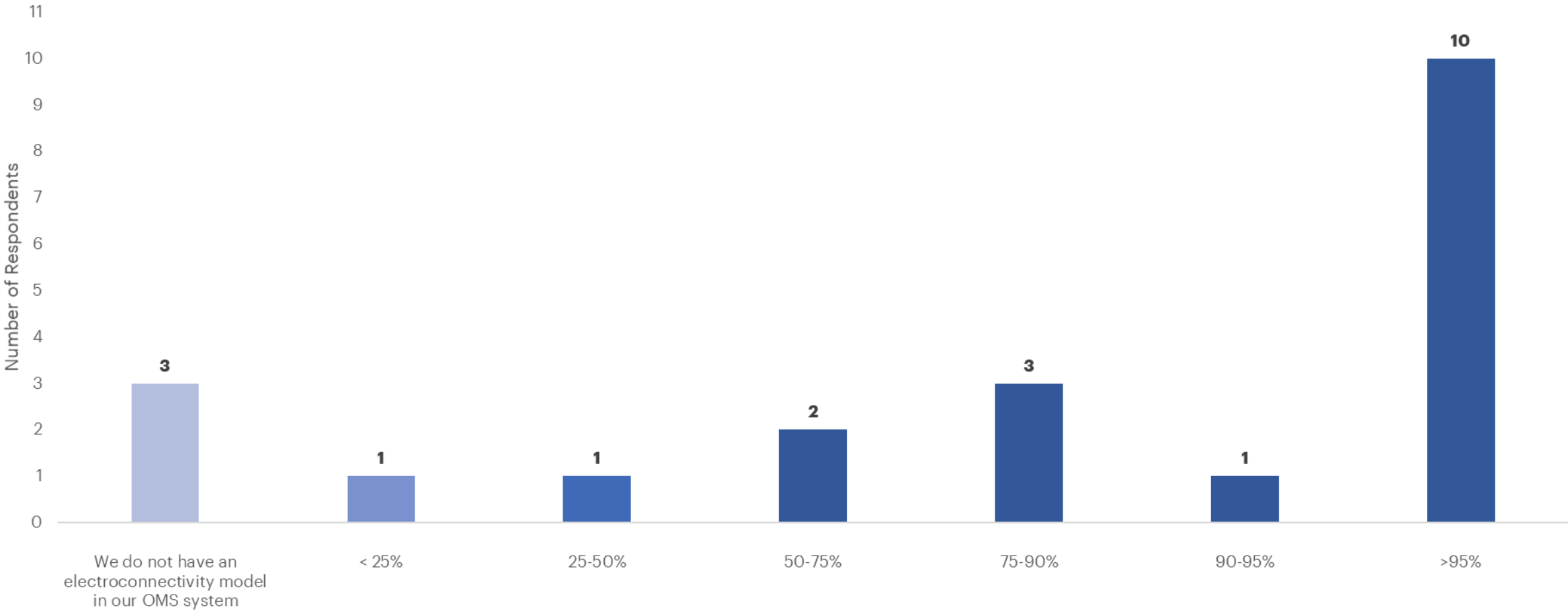
4.11) OMS Electroconnectivity

Question:	Does your OMS have an electroconnectivity model?



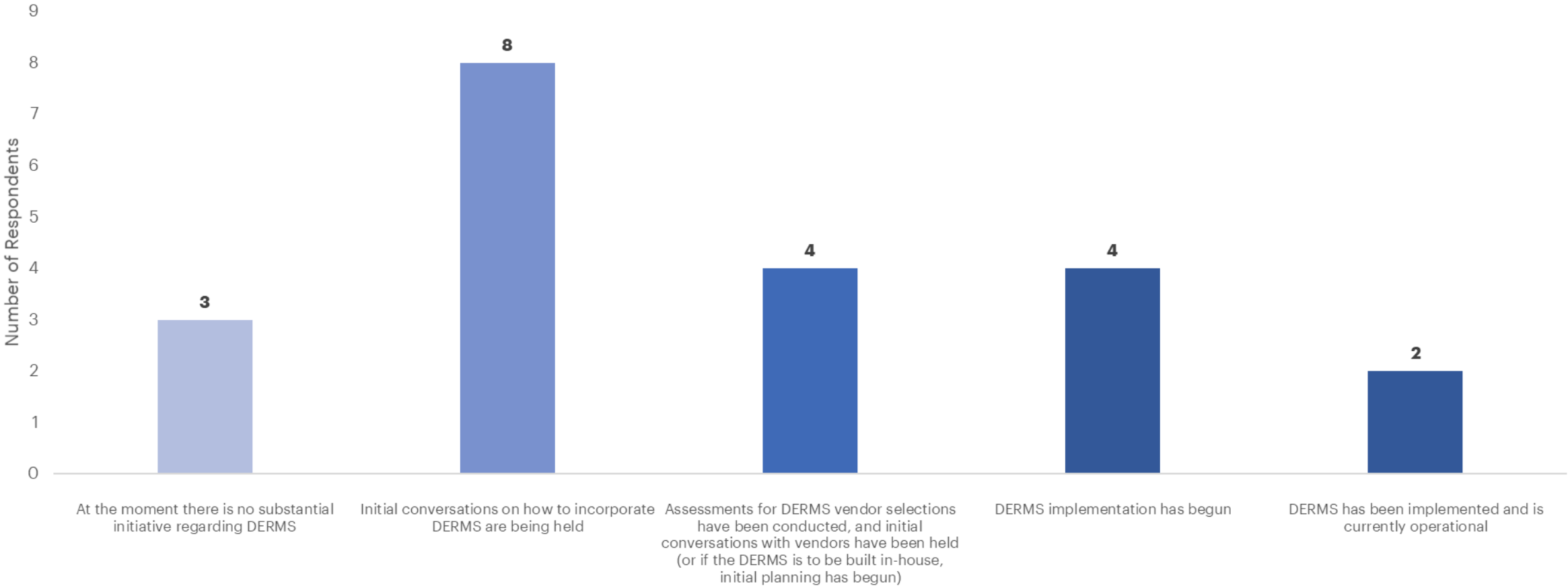
4.12) OMS Connectivity

Question:	How much of your system is modeled in your electroconnectivity model in your OMS system?



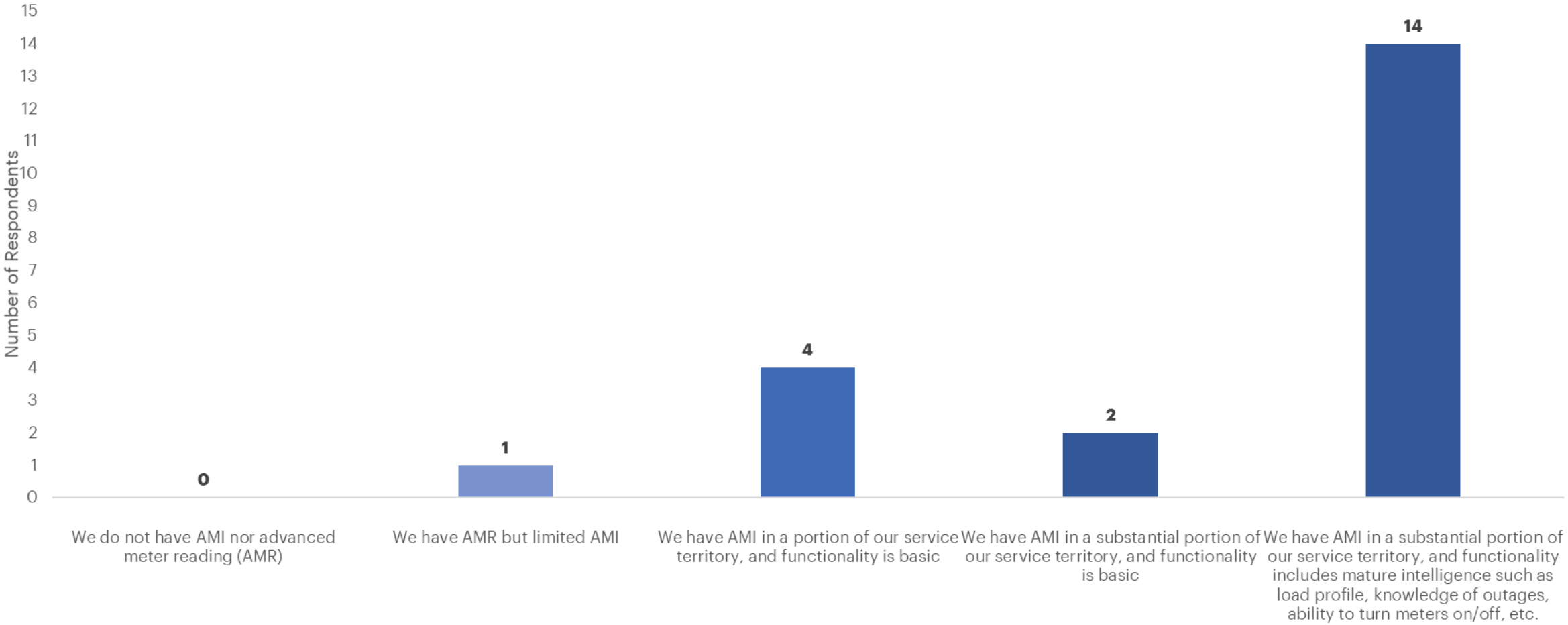
4.13) DERMS

Question:	Which of the following best describes your current state regarding a distributed energy resource management system (DERMS)? NOTE: This question does not necessarily refer to a unique DER management system, as some advanced distribution management systems (ADMSs) have features which address DER integration.



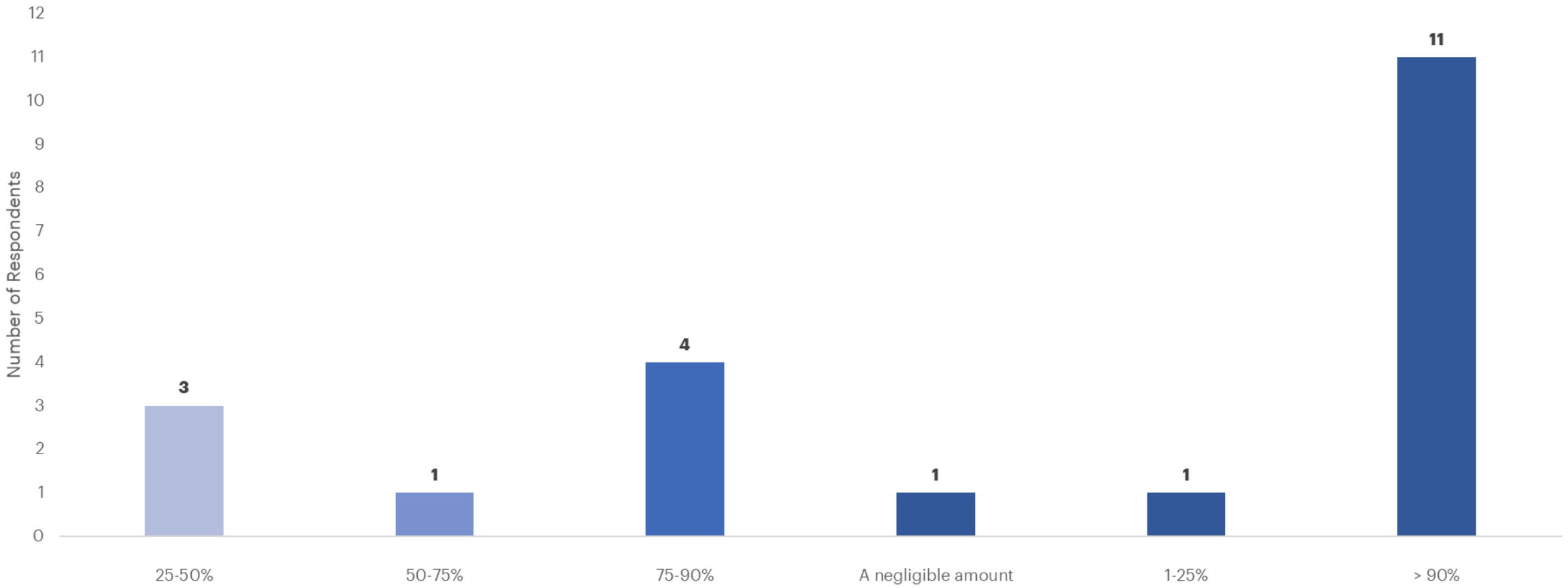
4.14) AMI

Question:	Which of the following best describes your advanced metering infrastructure (AMI)?



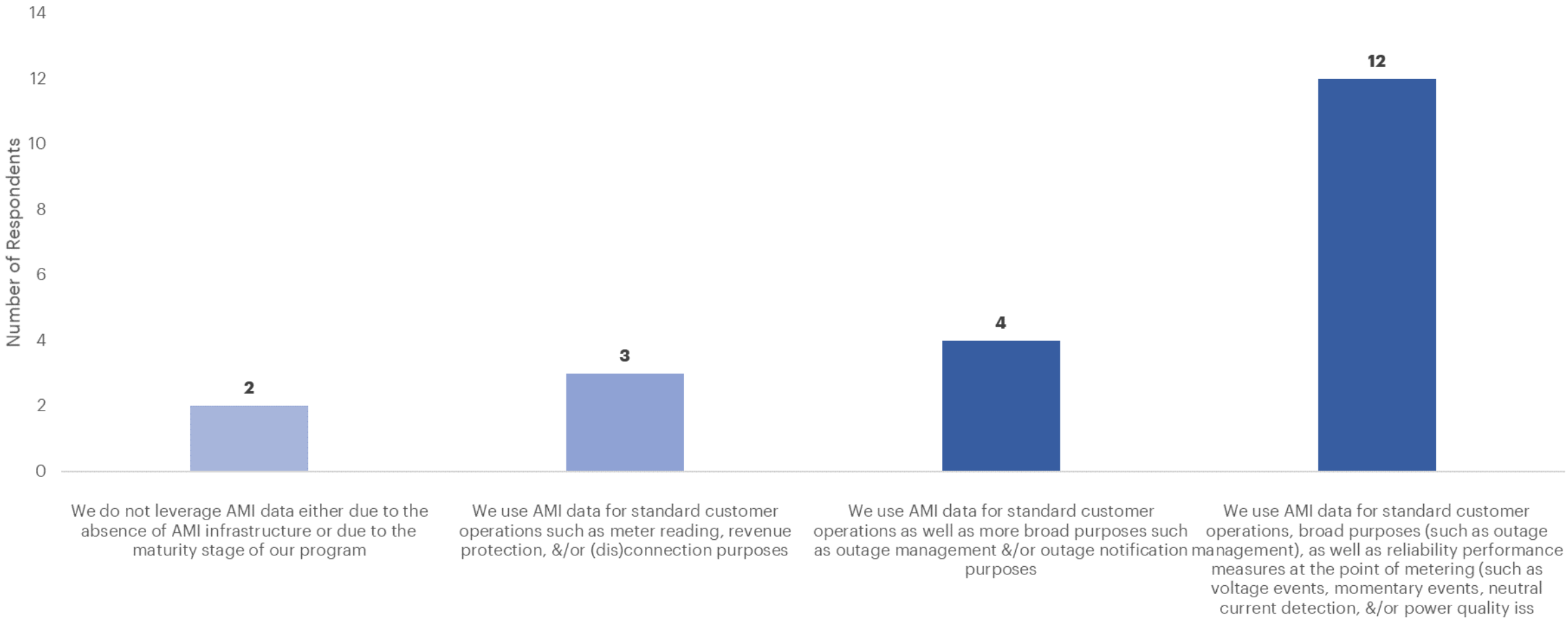
4.15) AMI Coverage

Question:	What percentage of your customer base is covered by AMI?



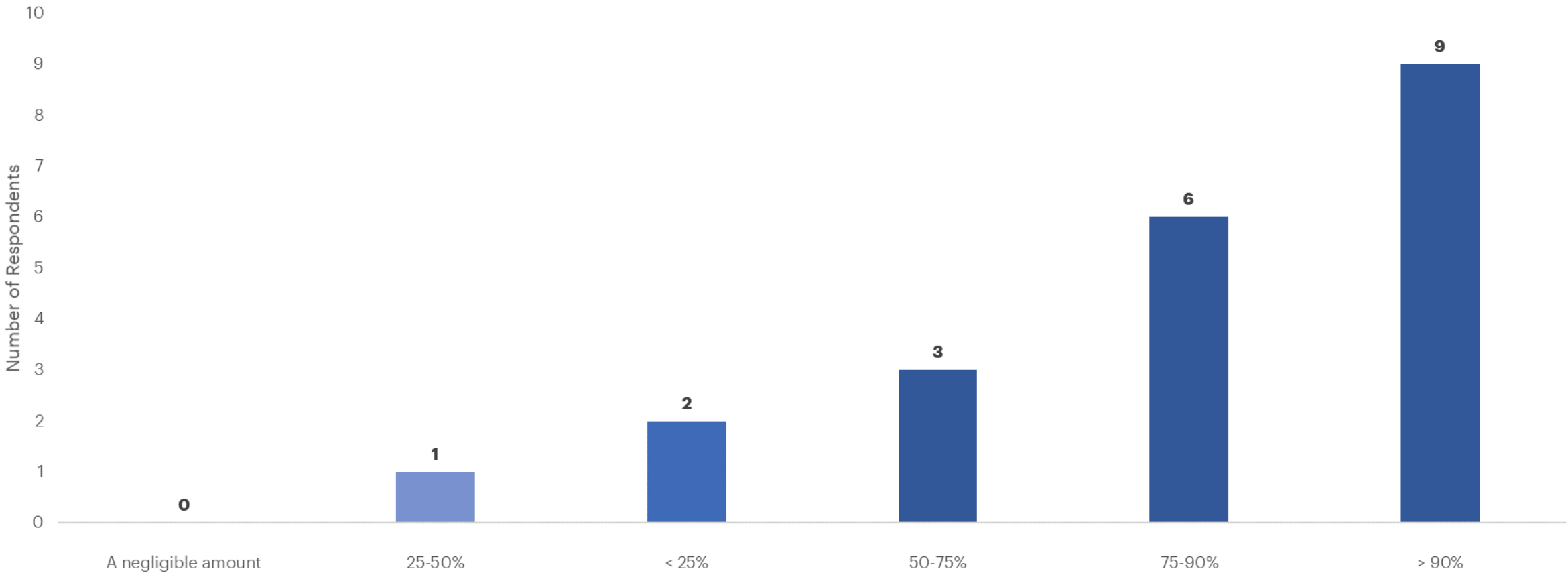
4.16) AMI Data Usage

Question:	Which of the following best describes usage of data and analytics from your AMI system?



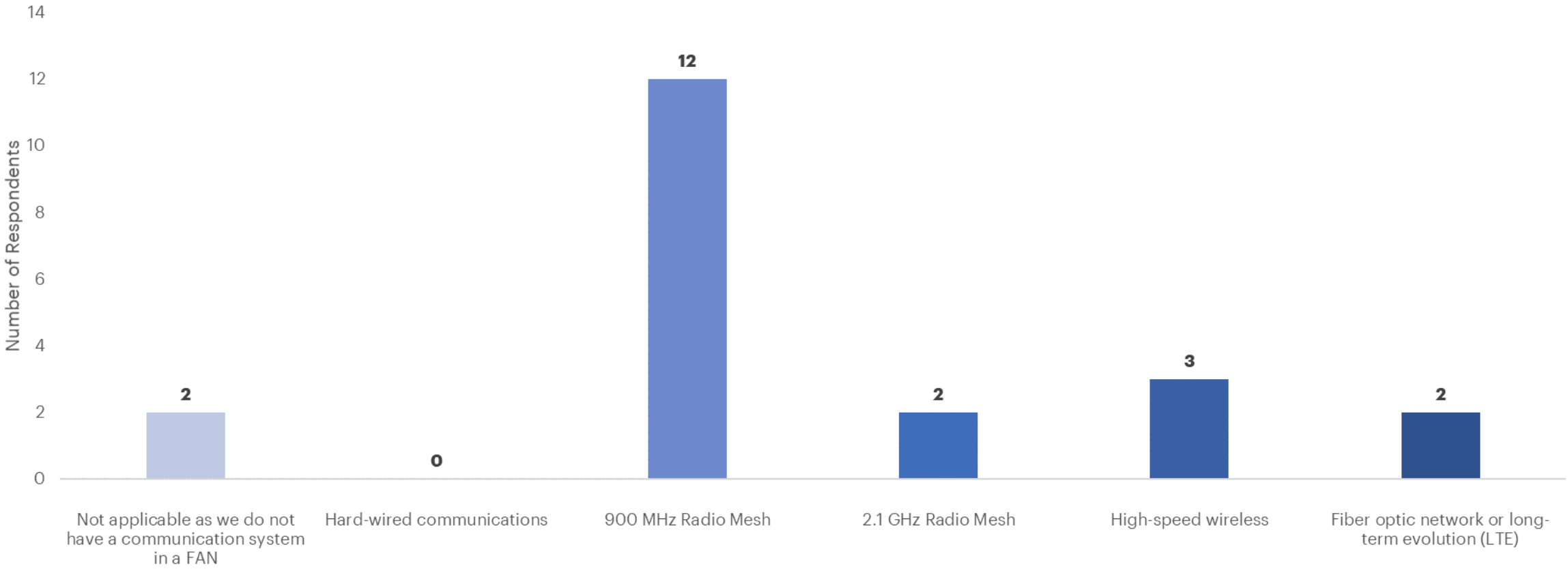
4.17) SCADA

Question:	What percentage of your substations that serve distribution are covered by SCADA? NOTE: Here, a substation that serves distribution is defined as having a distribution-level output voltage (approximately 12 to 25kV).



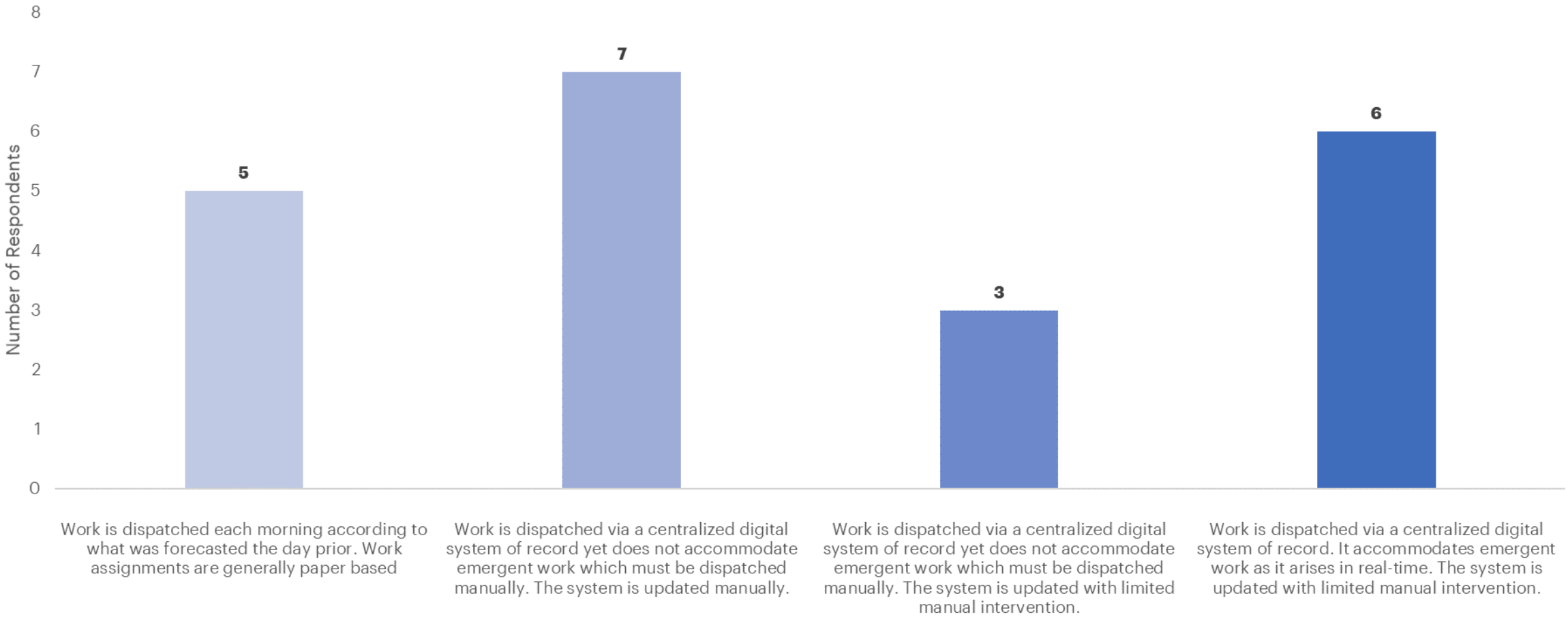
4.18) FAN Communication

Question:	What type of device-to-device communication system is most prominent in the field area network (FAN)?



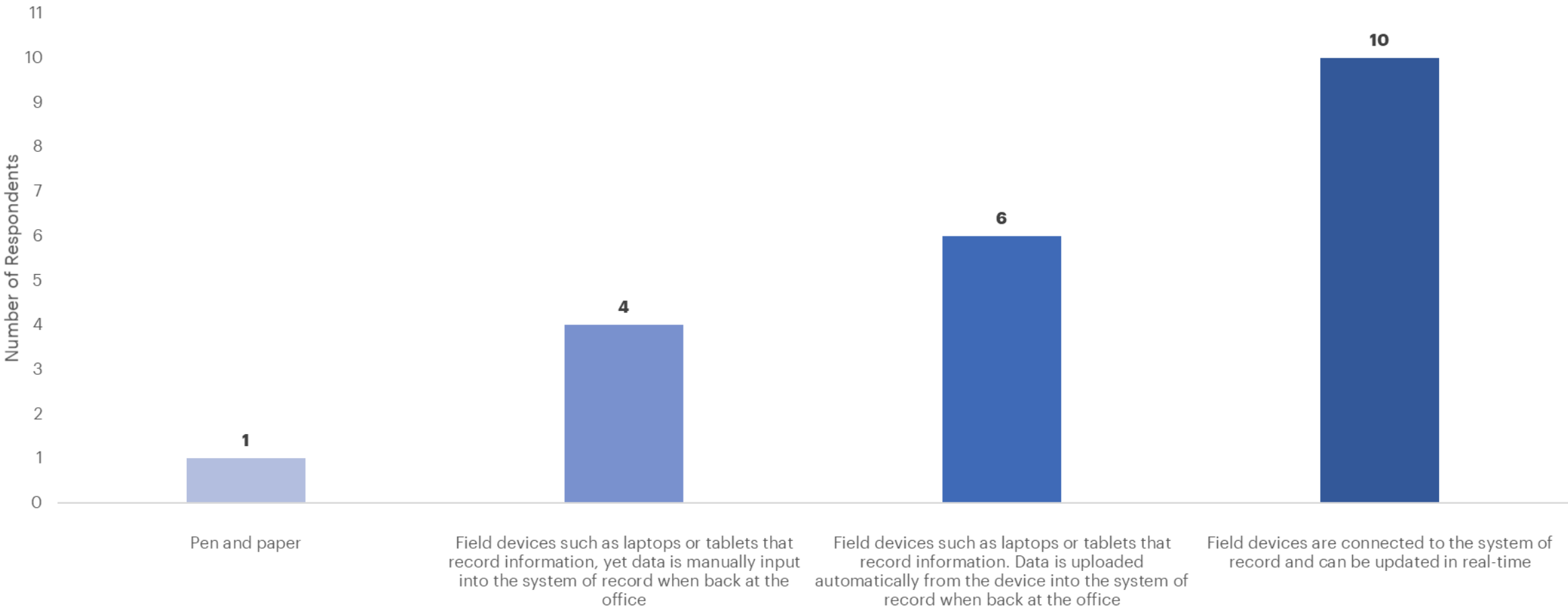
5.1) Field Work Dispatch

Question:	Which of the following best describes your field work assignment methods? NOTE: This is in reference to dispatch of your own employee workforce (as opposed to contractors) during blue sky days (as opposed to during restoration work).



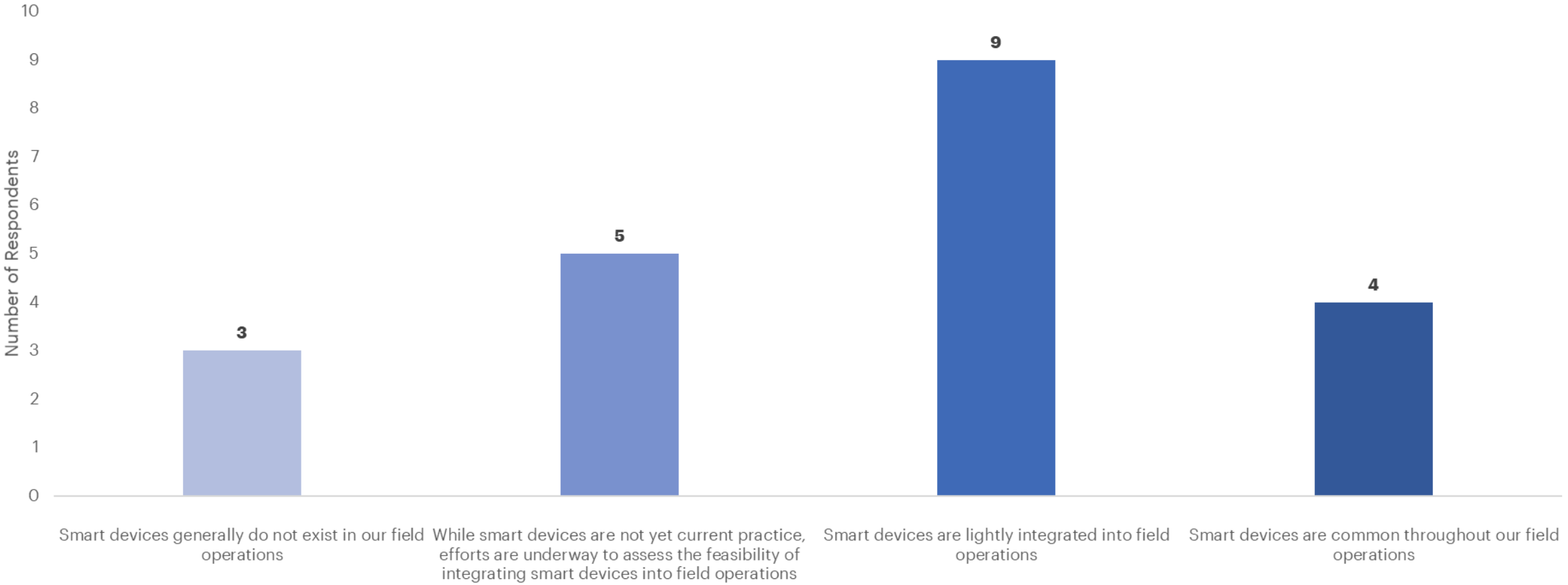
5.2) Field Data Recording

Question:	What is the most common medium used by field employees for recording field data?



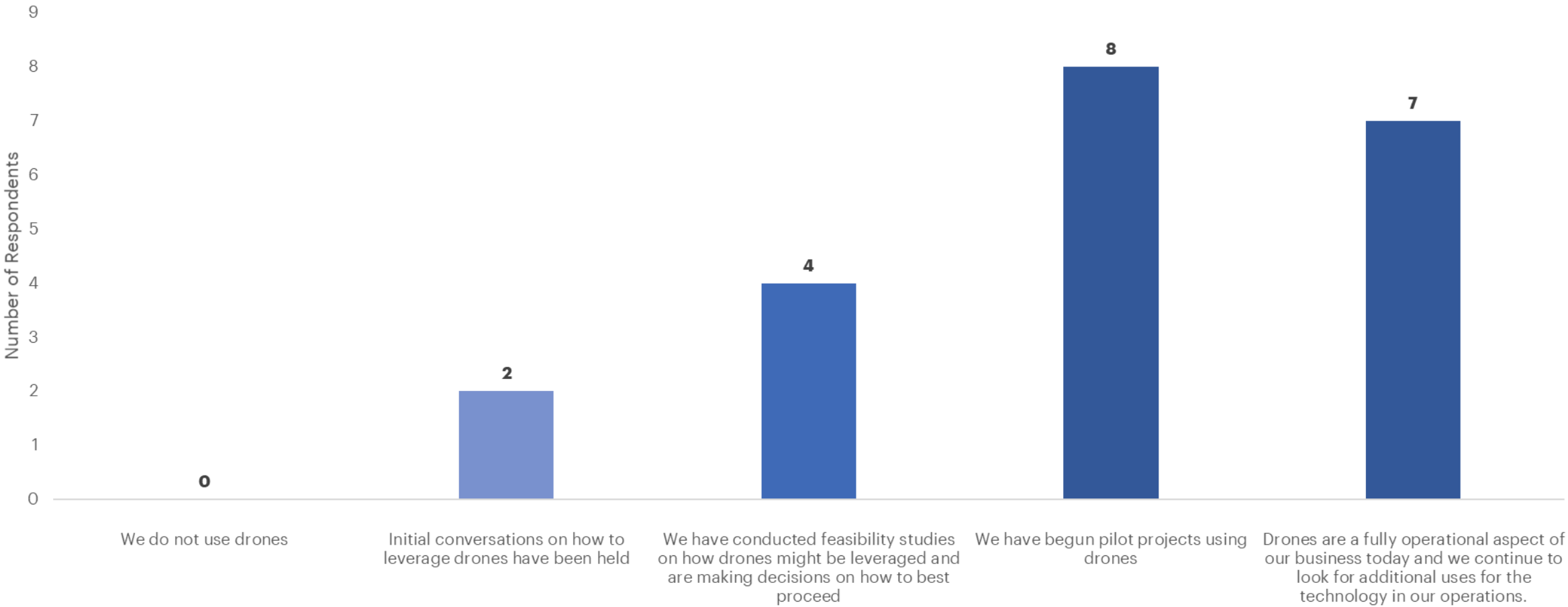
5.3) Smart Devices

Question:	How prevalent are smart devices in your field operations? NOTE: Here, "smart devices" refer to machinery/equipment that replaces human intervention (for the sake of safety &/or efficiency) such as a probe that sits inside a transformer and communicates an issue to field operations in lieu of conducting oil tests manually



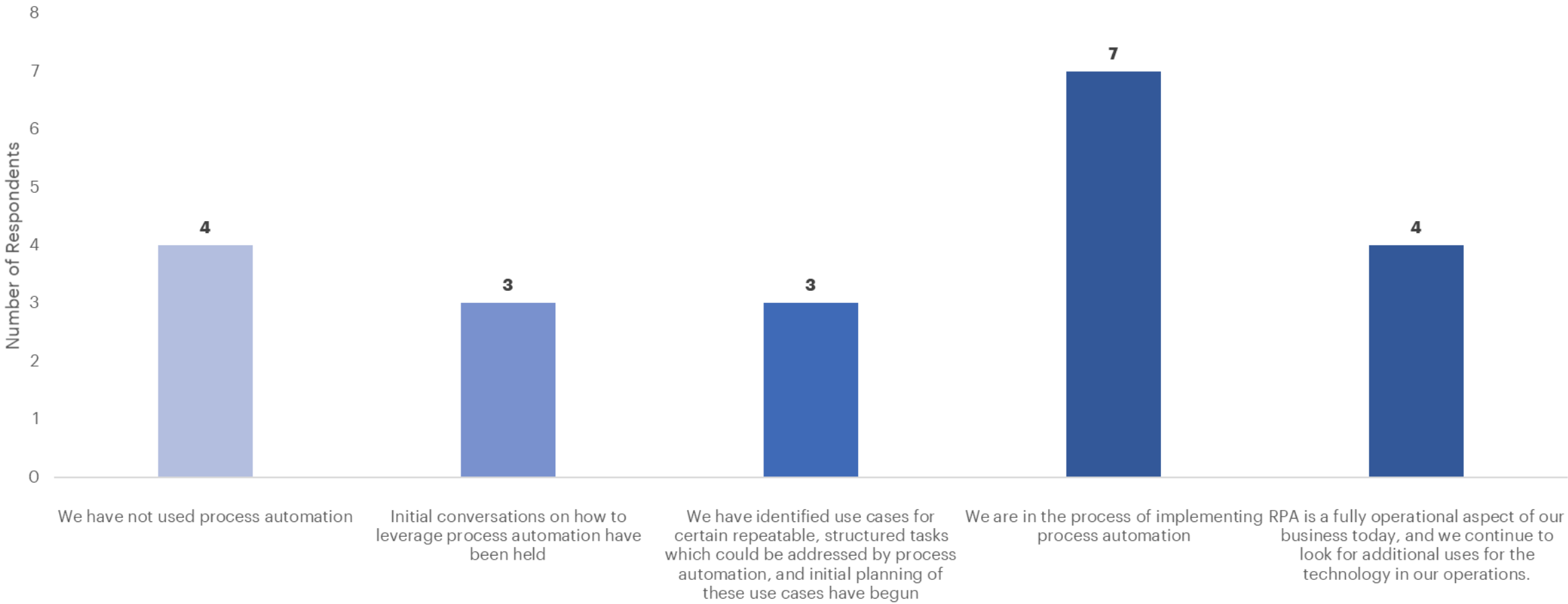
5.4) Drones

Question:	Which of the following best describes your use of drones for tasks such as inspections or damage assessments?



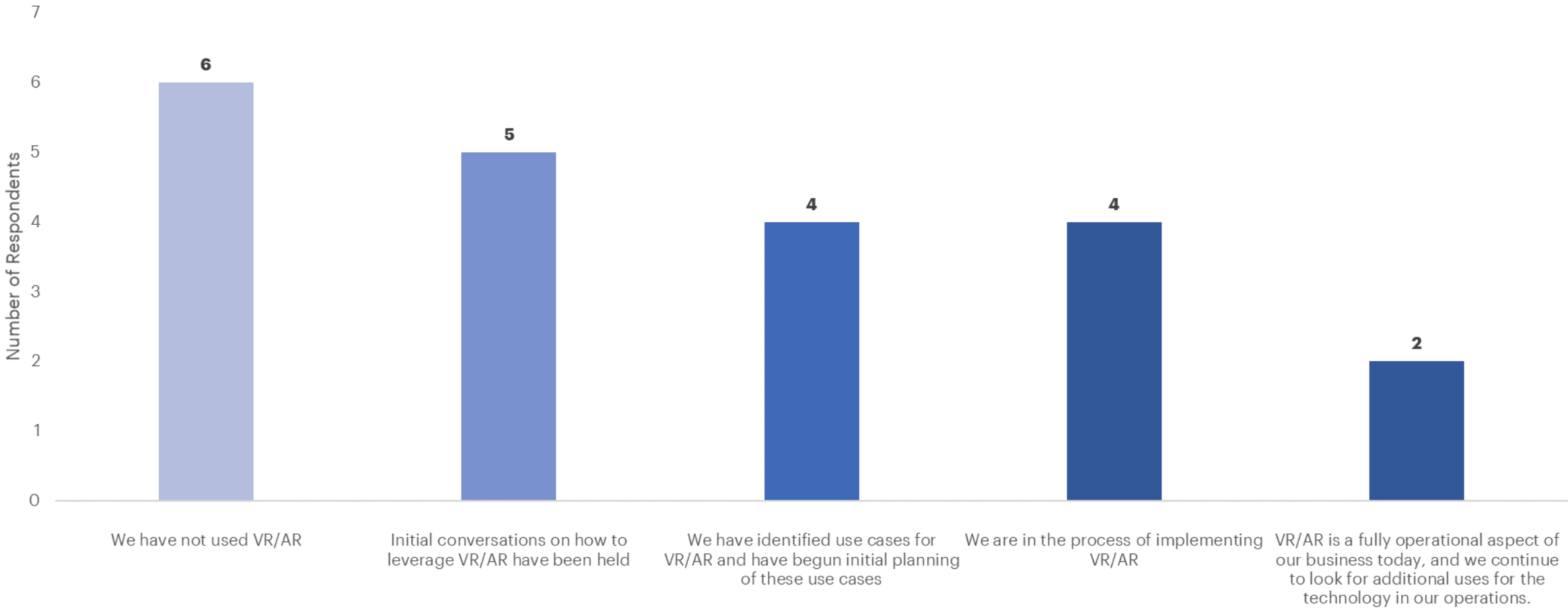
5.5) Process Automation Technology

Question:	Which of the following best describes the integration of process automation technology within your business, such as bots or robotic process automation (RPA)? NOTE: Process automation refers to the use of technology such as a bot or robotic process automation (RPA) to automate tasks.



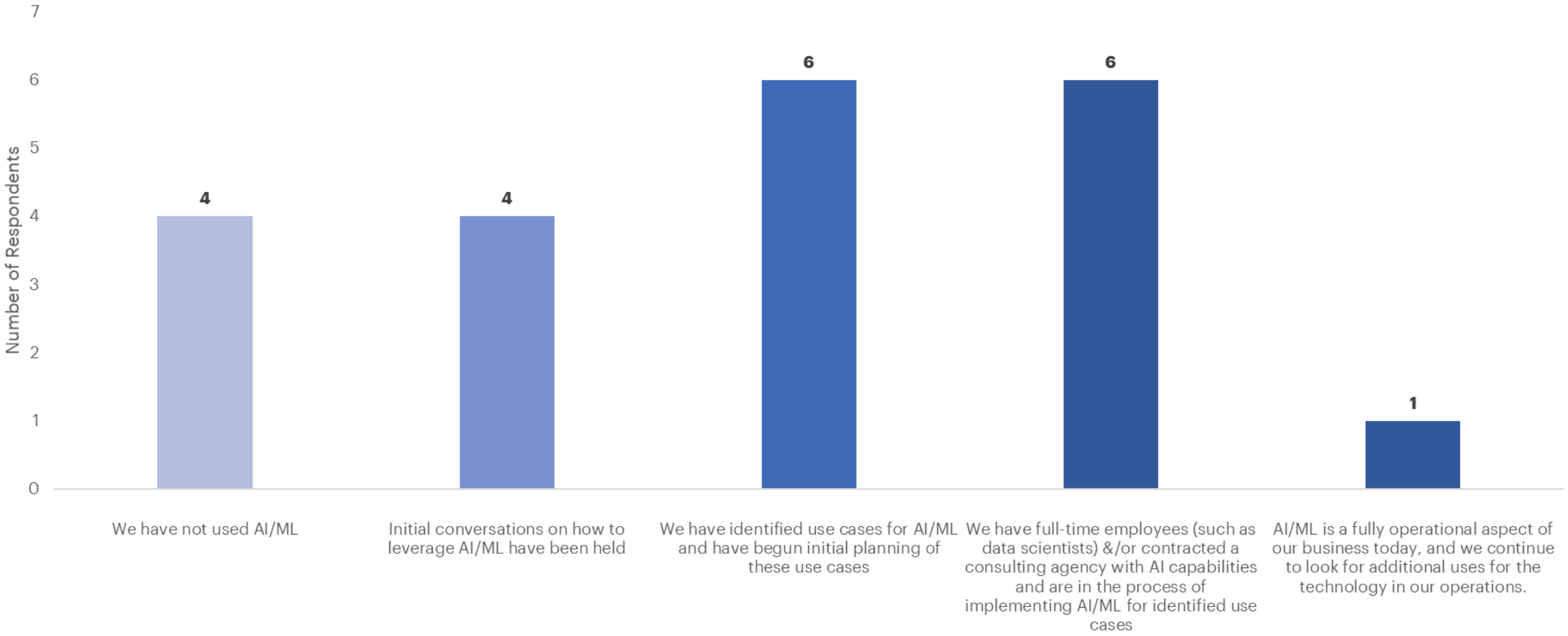
5.6) Virtual and Augmented Reality

Question:	Is virtual reality (VR) or augmented reality (AR) leveraged in operations, such as for training purposes or field use?



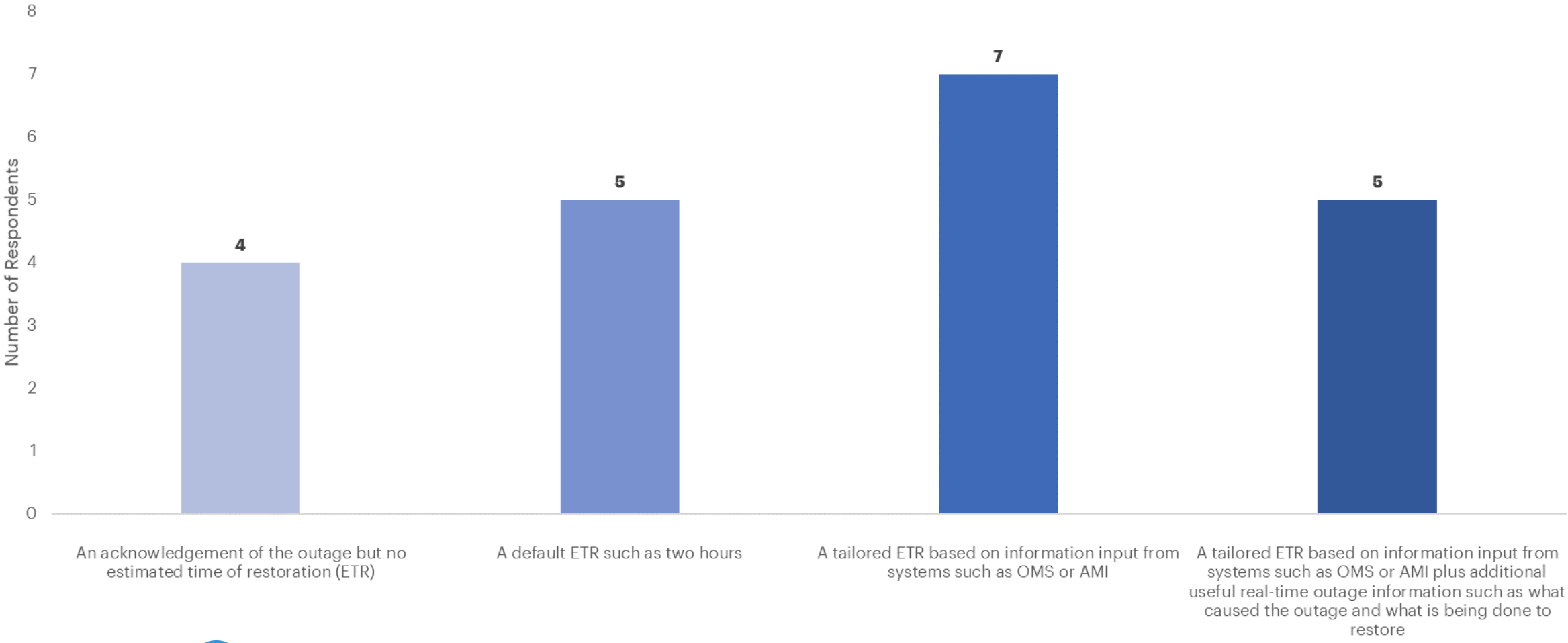
5.7) Artificial Intelligence / Machine Learning

Question:	Which of the following best describes your involvement with and use of artificial intelligence (AI) and machine learning (ML) within distribution operations?



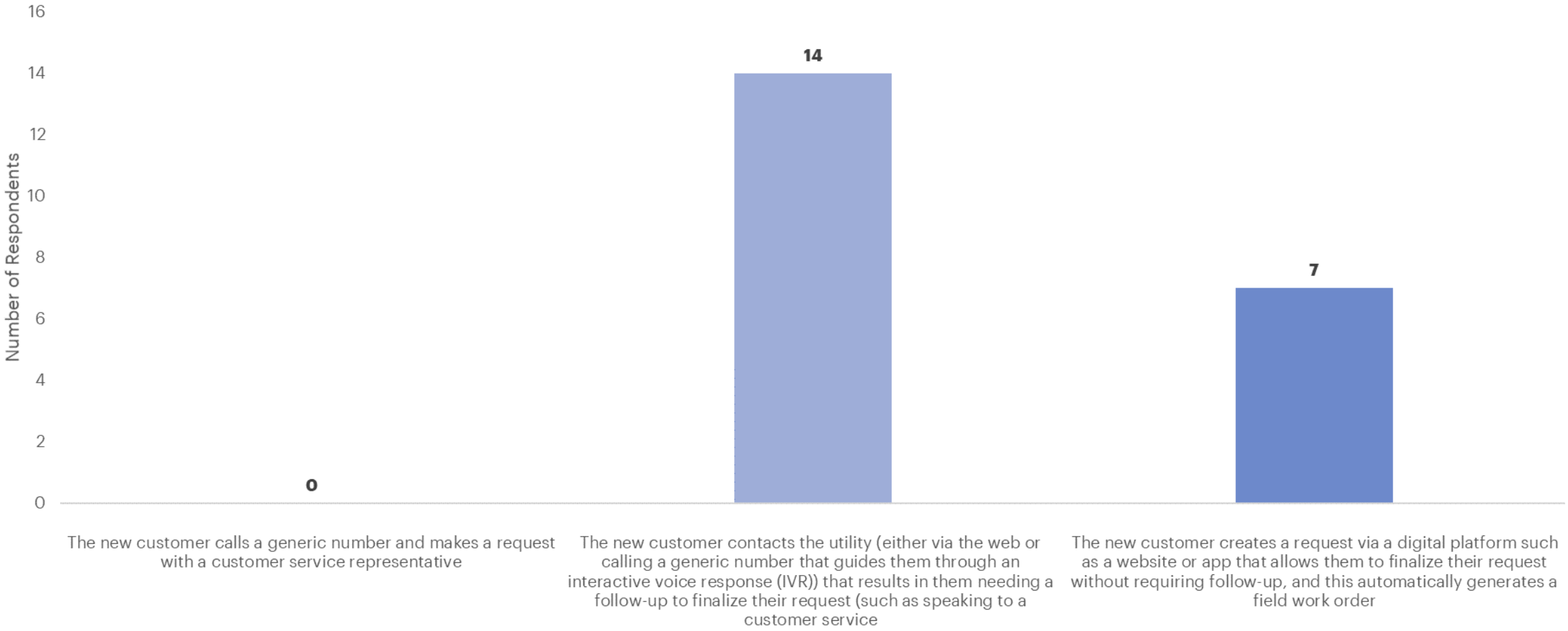
6.1) Outage Feedback

Question:	When a customer experiences an outage, what information is provided at their first touchpoint (e.g. their first call or visit to your website)?



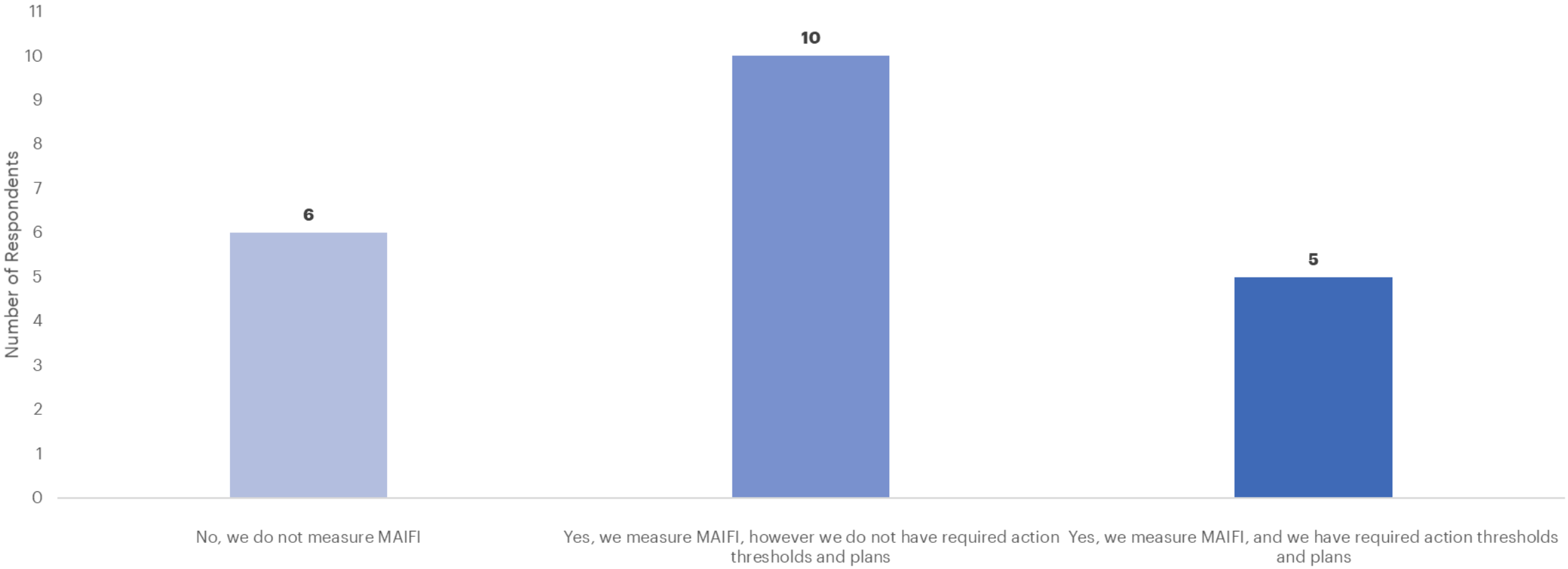
6.2) New Service Request

Question:	How does a new customer request service?



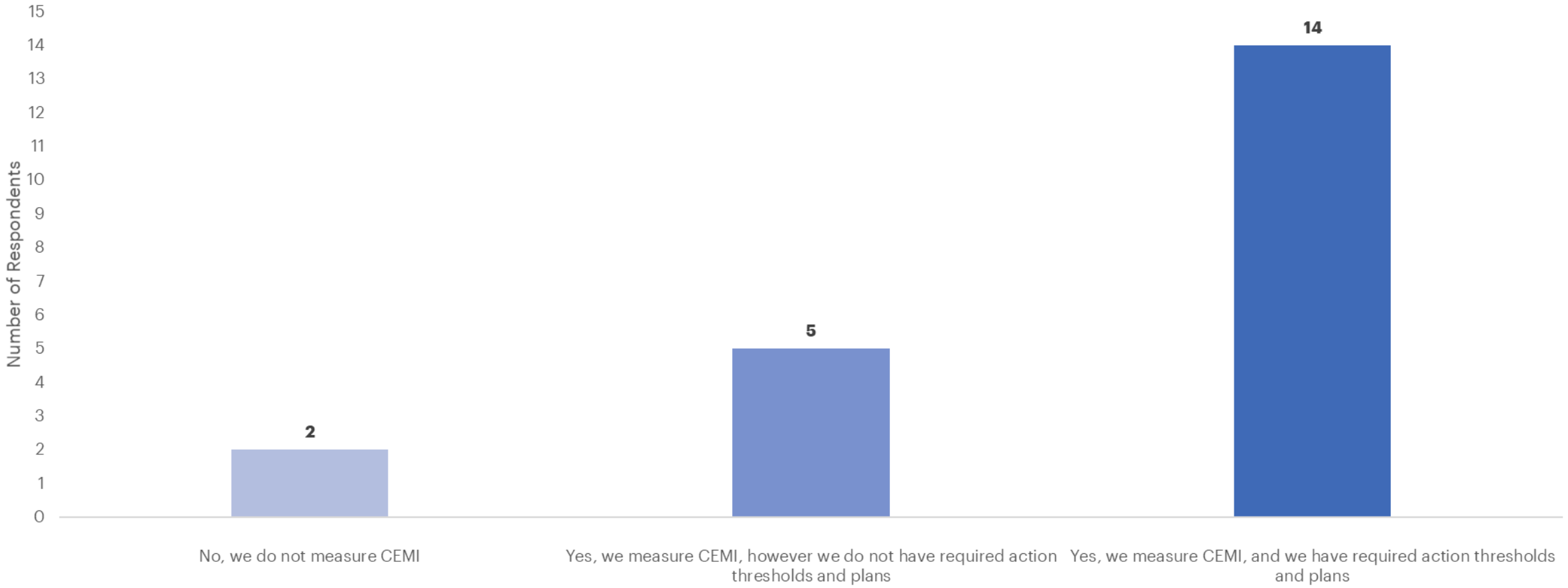
6.3) Distribution Breaker Momentary Response

Question:	Do you measure MAIFI (momentary average interruption frequency index) at the distribution breaker level, and do you have thresholds for required action? NOTE: “Thresholds for required action" would mean a prescribed action plan when a distribution breaker experiences multiple relay events.



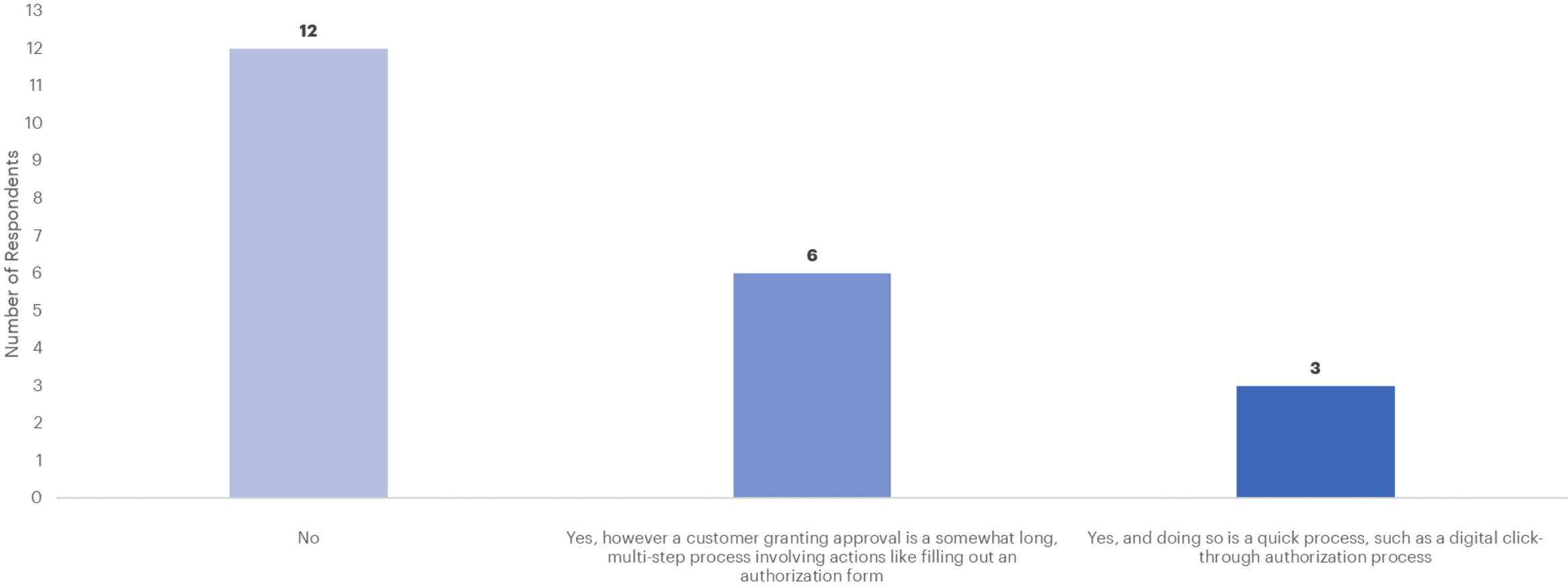
6.4) CEMI

Question:	Do you measure CEMI (customers experiencing multiple interruptions), and do you have thresholds for required action? NOTE: "Thresholds for required action" would mean a prescribed action plan when a customer reaches a given CEMI value



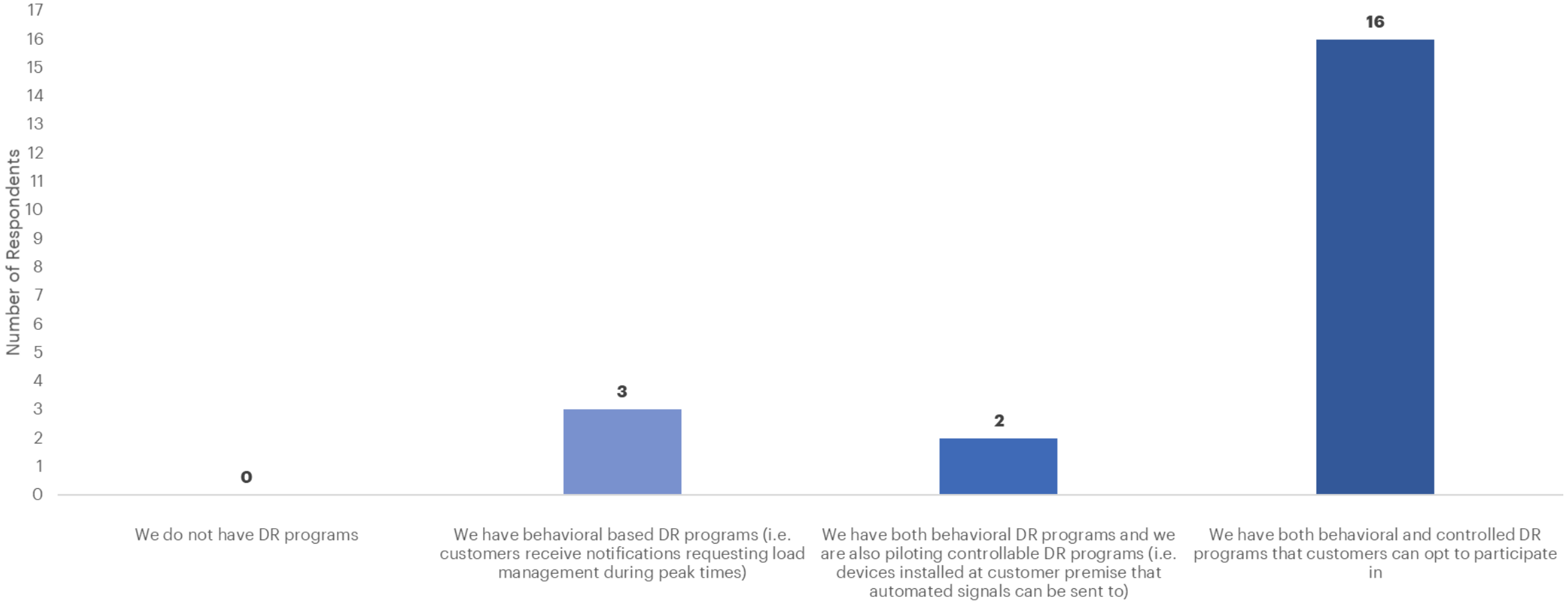
6.5) Data Access To Third Parties

Question:	Do you permit third party access to customer usage data upon customer approval?



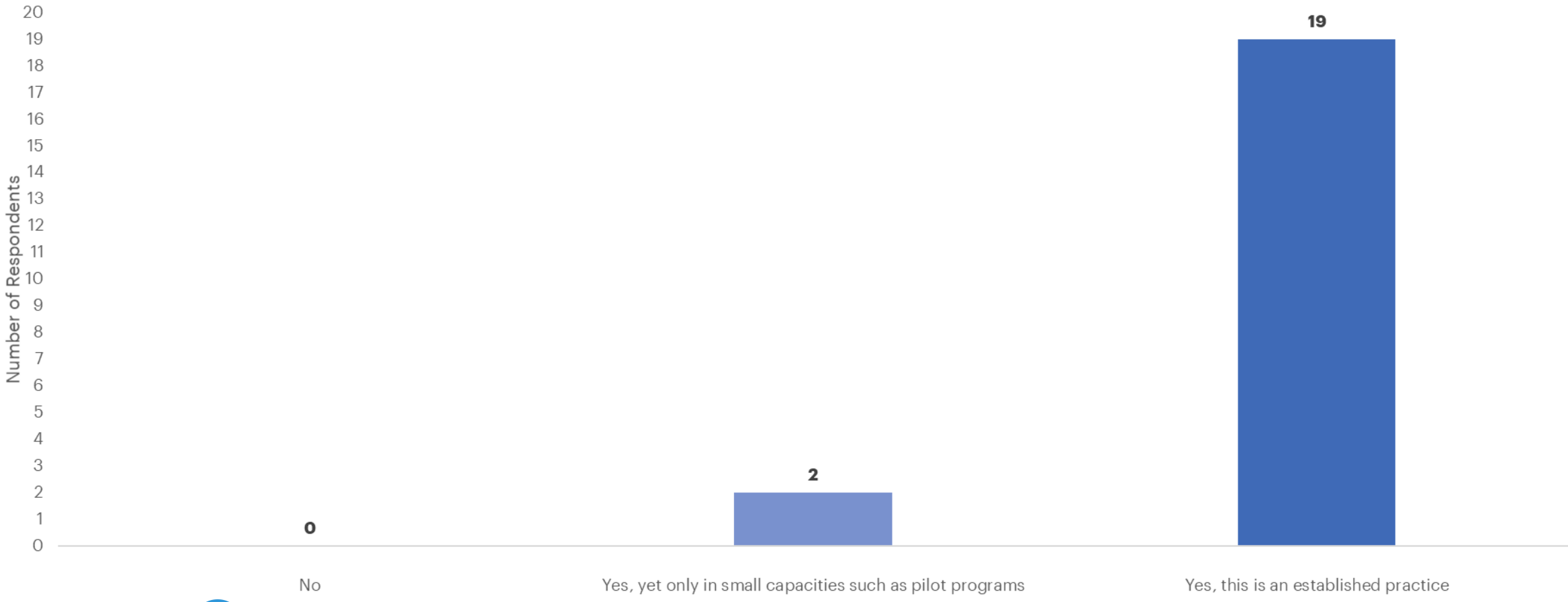
6.6) Demand Response Programs

Question:	Does your utility have demand response (DR) programs available to customer?



6.7) Energy Efficiency Programs

Question:	Does your utility have energy efficiency programs with your customers? NOTE: An example of an "energy efficiency program" would be a rebate program for a customer installing an energy efficient device in their home



RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-6

Reference: Exhibit 1B

Please provide a copy of all budget guidance documents that were issued regarding the budgets that underlie the application.

RESPONSE:

The requested information is provided in Appendices A to D of this interrogatory response. Please note that Toronto Hydro has redacted content that does not contain guidance related to the development of budgets (e.g. information with respect to process management) and information that was superseded and no longer reflects the utility's business plan (e.g. outdated planning and application filing timelines). Supporting evidence detailing Toronto Hydro's business planning process can be found at: (i) Exhibit 1B, Tab 1, Schedule 1, at pages 14-17; (ii) Exhibit 2B, Section E2, (iii) Exhibit 4, Tab 1, Schedule 1; and (iv) interrogatory responses 2B-SEC-32, 2B-SEC-33, 1B-CCC-14, and 4-CCC-58 (d). /C

2022 Investment Planning and Portfolio Reporting (IPPR) Kick-Off

Presented by Integrated Planning & Modernization

March 3, 2022

CONFIDENTIAL

Agenda

- Introduction
- 2022 IPPR Timeline
- IPPR Changes
- Next Steps
- Questions & Appendices

2022 IPPR Introduction

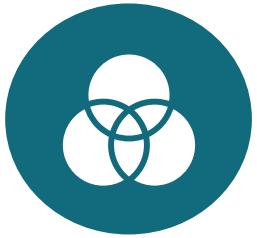
IPPR Process

WHAT?

IPPR is a comprehensive and integrated annual planning process for all distribution system, fleet, facilities, and IT/OT investment programs.

Analyze
current state and future needs

Develop
short-term and long-term plans



Optimize
risks, outcomes, and cost

WHY?

- Ensure effective **execution** of the OEB-approved Distribution System Plan
- Identify and adapt to evolving **risks** and customer/stakeholder **needs**
- Enable effective short- and long-term **strategic** and **financial planning**
- Support efficient and effective development of future **regulatory evidence**
- Integrate **new** and **innovative** investment programs
- Facilitate **continuous improvement** in asset management and planning

Funding Cycle

Non-Application Year

Live Application Year

Re-baseline Plan for Funding Approval

Planning Discretion:
Current Rate Period: **Moderate**
Next Rate Period : **Very High**

Work the Plan

Planning Discretion:
Current Rate Period : **Low**
Next Rate Period : **Very High**

★ Plan for Next Funding Cycle

Planning Discretion:
Current Rate Period : **Low**
Next Rate Period : **High**

Draft and File Next Plan

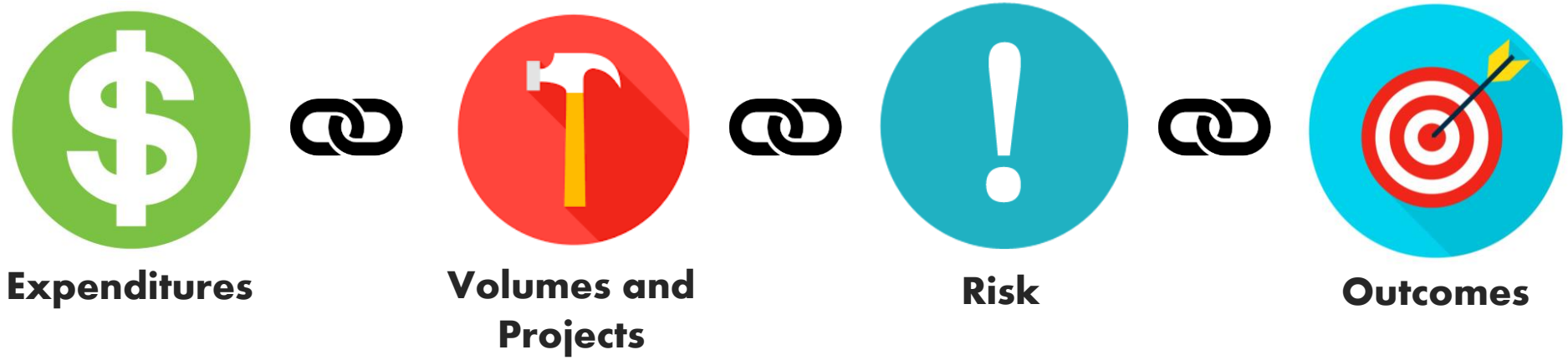
Planning Discretion:
Current Rate Period : **Very Low**
Next Rate Period : **Moderate**

Defend Next Plan

Planning Discretion:
Current Rate Period : **None**
Next Rate Period : **Moderate**

Planning Scenarios

Financially Constrained Scenarios (2020-2024)



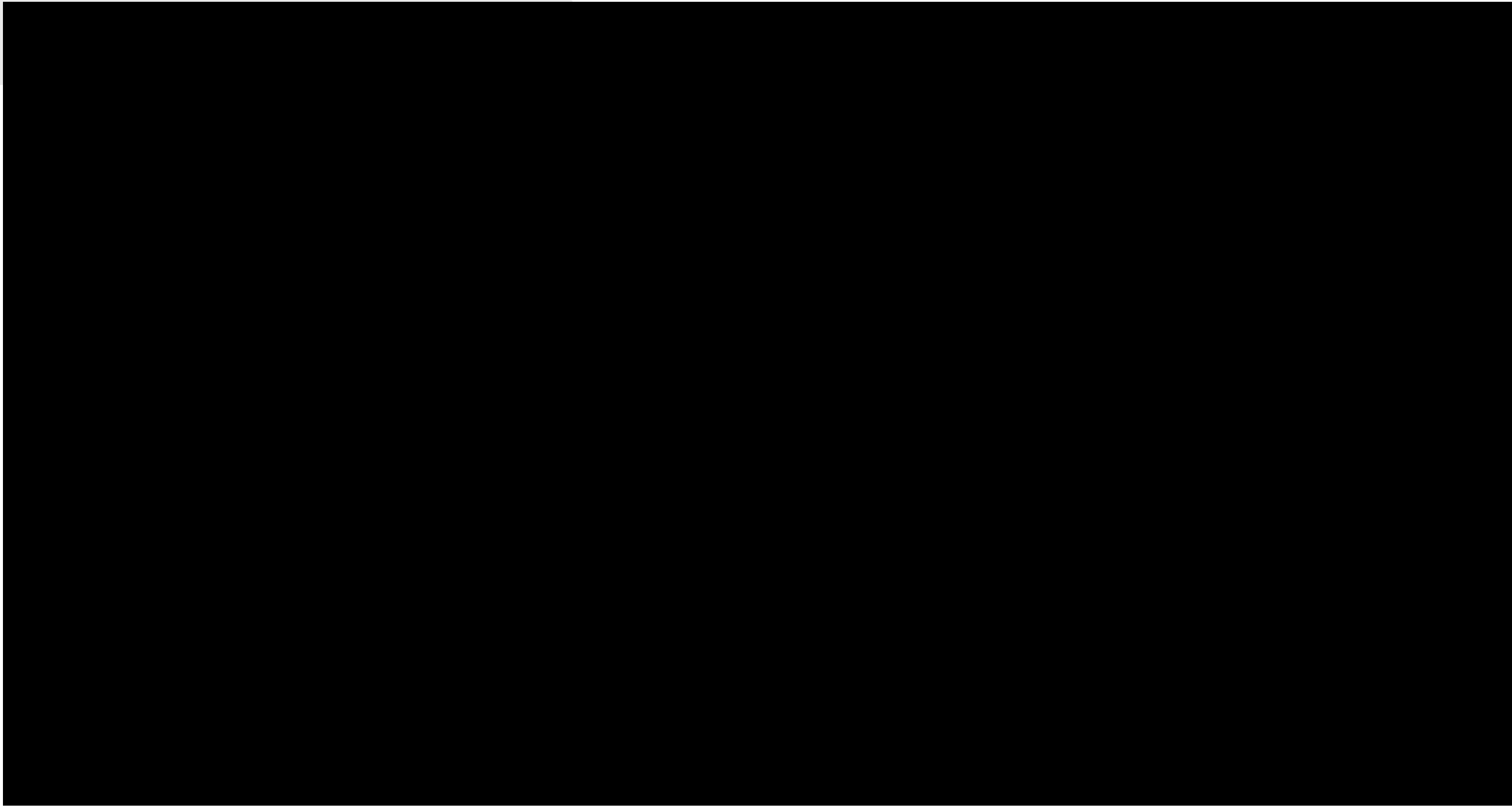
Financially Unconstrained Scenarios (2025-2029)

Strategic Inputs

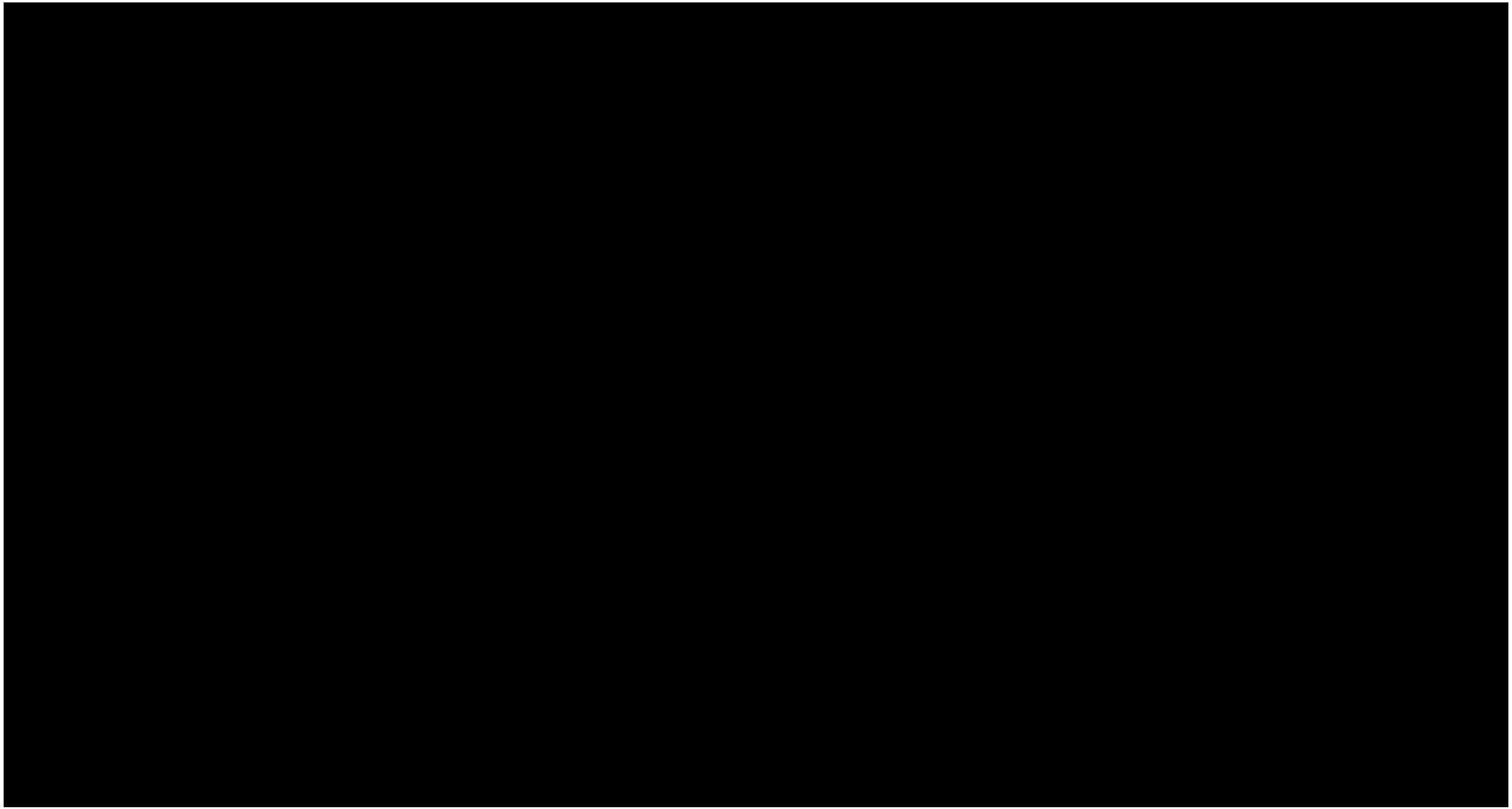
Planning for a more dynamic future...

- This year's IPPR is the beginning of an extended, iterative planning process that will result in the 2025-2029 Rate Application
- In parallel, we are running a number of industry-leading strategic projects that will help us sculpt a clear-eyed and objective-driven plan for a changing energy landscape
- Project owners will engage planners and their leaders as strategic inputs become available during the IPPR, Business Planning, and Rate Application Drafting processes

2022 IPPR Timelines



2022 Changes



2022 Investment Options

Options

Align with Business Plan

Unconstrained

Dependent on Segment Drivers

Driver

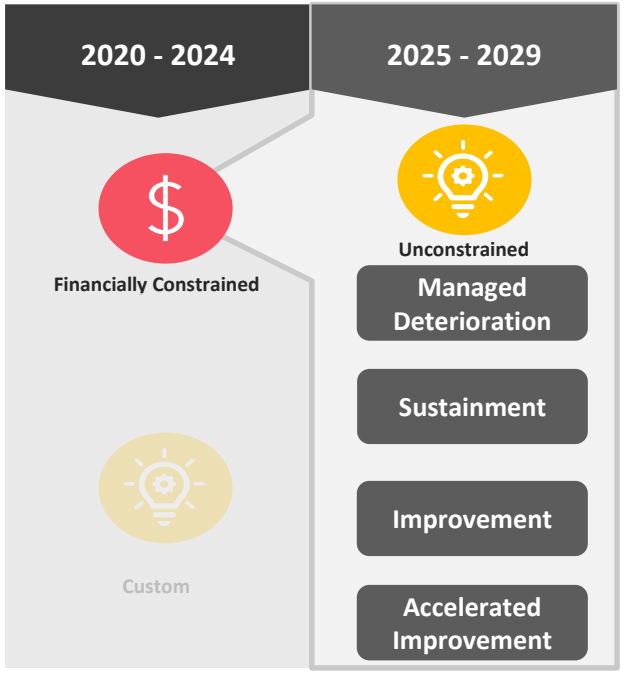
Risk driven, high TH discretion

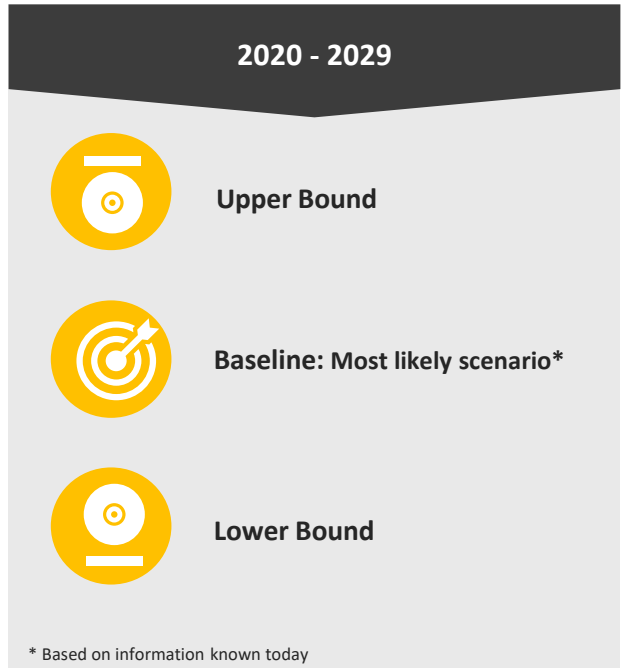
System Renewal, System Service, System Access (GPMC and Revenue Metering) Preventive and Predictive Mtce, Corrective Mtce, General Plant

Demand driven, low TH discretion

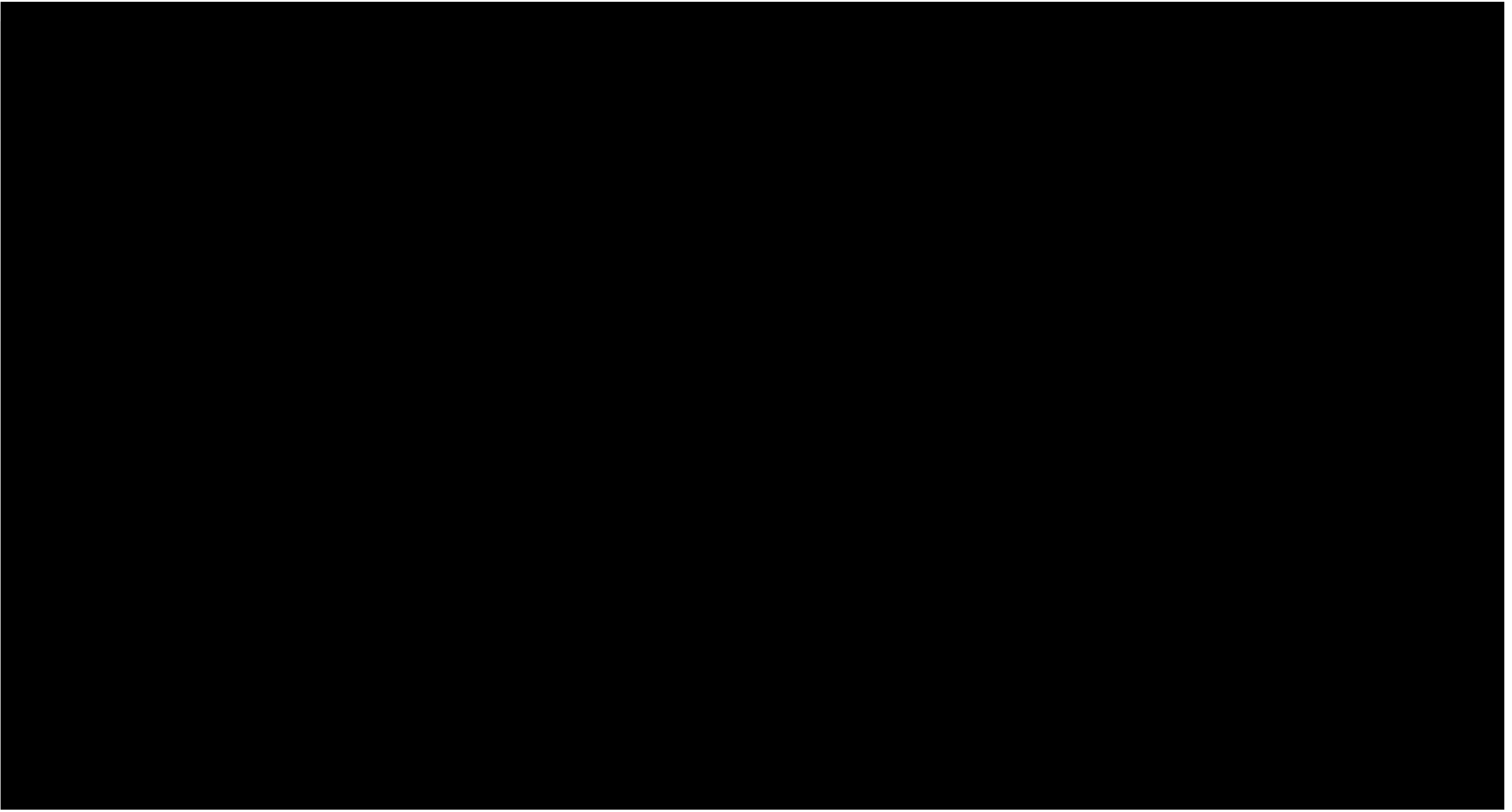
System Access (excl GPMC and Revenue Metering), Emergency Response, Customer Driven Work OpEx

Options

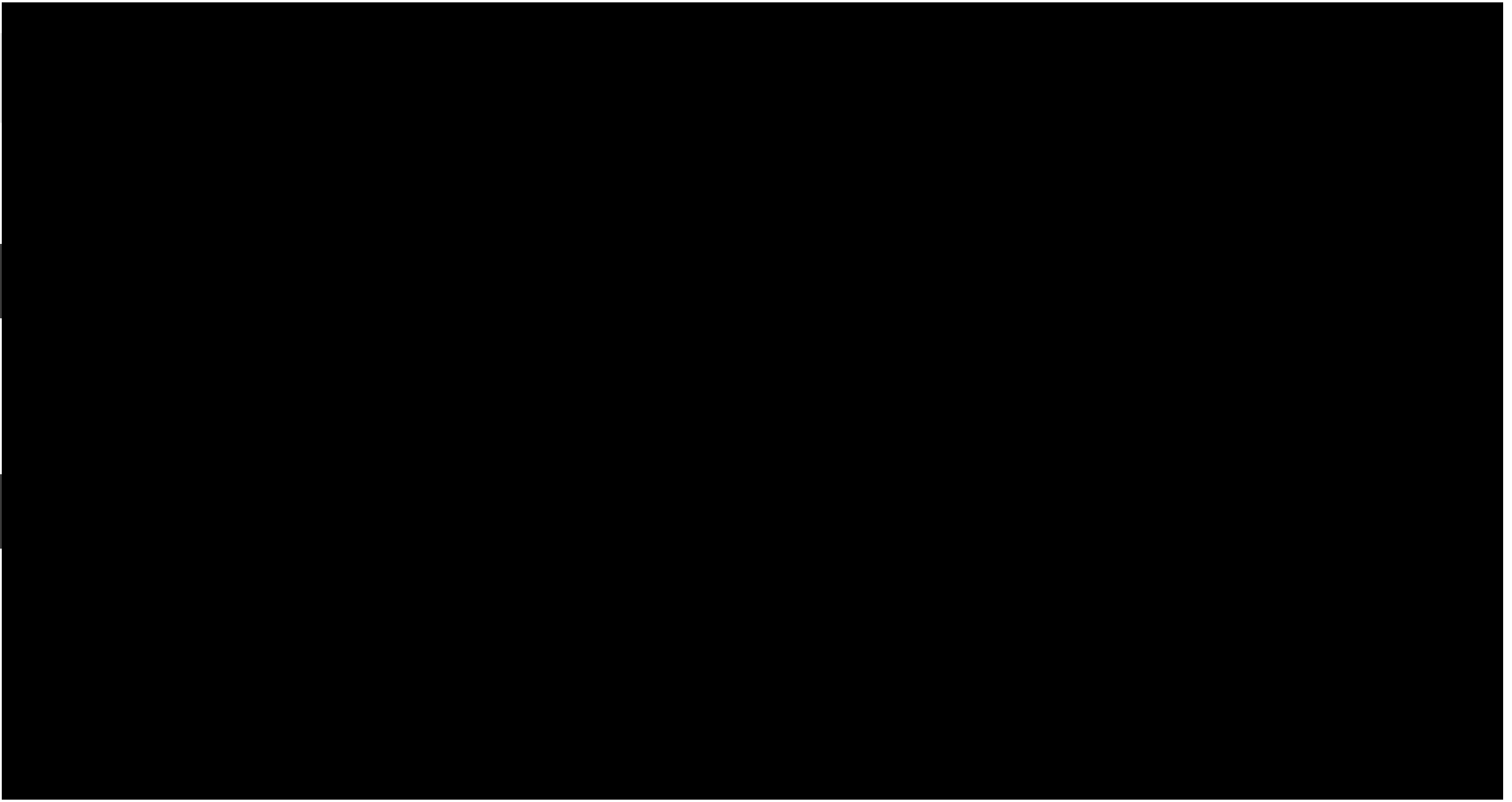




Roles and Responsibilities



Next Steps



Thank You and Questions?

Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1B-SEC-6
Appendix B
FILED: May 7, 2024
(19 Pages)

2025 Rate Application Customer Engagement

Phase I Results and Placemat Rollout

Presented by: **Elissar El-Hage,** Supervisor, Rate Applications
Sakaran Manivannan, Supervisor, Planning, Integration and Analytics

March 28 & 29 2022

Privileged and Confidential

Agenda

1. **Customer Engagement Overview**
   Filing Requirements, CE Process; Phase I Methodology and the Placemat
2. **Phase I – Customer Engagement Results**
   Customer Needs and Preferences
3. **Next Steps**
   Planning Guidelines; Phase II - Customer Engagement

Customer Engagement Overview

Filing Requirements; Customer Engagement Process; Phase I Methodology and the Placemat

Why Customer Engagement?

OEB Requirements and Utility Stewardship	
	Utilities are expected to develop a genuine understanding of their customers' interests and preferences
	Customer engagement is expected to inform the development of utility plans, and utilities are expected to demonstrate in their proposals how customer expectations have been integrated into their plans, including the trade-offs between outcomes and costs
	Utilities are expected to demonstrate value for money by delivering genuine benefits to customers and by providing services in a manner which is responsive to customer preferences.

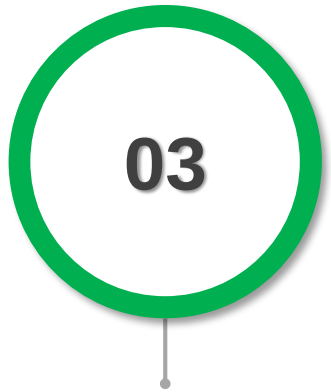
Customer Engagement Process

Phase I – Needs and Priorities

- *Assess customer needs and preferences in relation to outcomes relevant to our program and services.*
- *It a comprehensive view of customer priorities to as a front-end input to the Business and Investment Planning processes.*

Targeted Engagement

- *Strategically explore and seek feedback on key topics relative to specific customers and emerging issues.*
- *These engagements are intended to add another layer of understanding further driving inputs and strategy for the Plan.*



Phase II – Customer Feedback

- *Confirm Phase I customer needs, preferences, and priorities.*
- *Solicit feedback on our plans and their subsequent rate impacts including customer preferences on specific programs where trade-offs on pacing exist.*

Phase I Methodology

Qualitative research informs subsequent survey design

Qualitative Research

- 4 focus groups with residential customers
- 4 focus groups with small business customers
- 4 focus groups with C&I customers
- 14 in-depth interviews with Key Account customers

Quantitative Research

- **Residential**
  Telephone survey n=**1,006**
  Online survey n=**1,685**
- **Small Business**
  Telephone survey n=**401**
  Online survey n=**430**
- **C&I Customers (GS>50kW)***
  Online survey n=**48**
- **Key Account Customers**
  Online survey n=**68**

The Placemat

- A high-level, one-page “Placemat” summary of the findings, by rate-class (e.g. customer type).
- Placemat Structure:
  - Customer Needs;
  - Priorities: General; Reliability; and Technology
  - Investment Trade-Offs
  - Grid Modernization
  - Climate Action; and
  - Social Equity

Phase I Customer Engagement
Toronto Hydro’s 2025 Rate Application
Needs and Preferences Planning Placemat (March 2022)

INNOVATIVE RESEARCH GROUP

Rate Class / Sample Size (Unweighted n)	Residential (n=1,685)	Small Business (n=430)	C&I* (n=48)	Key Accounts (n=68)

* Interpret as directional due to small 'n'

Needs

What are customer needs?
Most customers are generally satisfied with the service they receive from Toronto Hydro. When asked how Toronto Hydro can improve service, customers were not wedded to any specific needs or wants. Overall, the top customer needs continue to be “lower or reduce rates” and “ensure reliability” followed by “investing new technology” and “reducing restoration time”.

	Residential	Small Business	C&I	Key Accounts
Top Customer Needs	Rates Reliability	Rates Invest in new technology	Rates Reliability	Reliability Reduce restoration time

Preferences

Prioritizing Outcomes

General Priorities ((%) indicates total percentage by rate class that place specific priority in their top 3 outcomes)	Residential	Small Business	C&I	Key Accounts
	Reasonable rates (46%)	Reasonable rates (54%)	Reasonable rates (50%)	Reliable service including power quality (69%)
	Reliable service (45%)	Invest in new technology (40%) Reduce costs Withstand adverse weather	Reliable service (48%)	Outage restoration in extreme weather (52%)
	Invest in new technology (45%) Reduce costs Withstand adverse weather	Reliable service (36%)	Grid capacity expansion for climate action (33%)	Safety of infrastructure (39%)

Prioritizing Reliability Investments

Reliability ((%) indicates total percentage by rate class that place specific priority in their top 3 outcomes)	Residential	Small Business	C&I	Key Accounts
	Reduce restoration time in extreme weather (70%)	Reduce restoration time in extreme weather (60%)	Reduce restoration time (63%)	Reduce outages (78%)
	Reduce outages in extreme weather (57%)	Reduce outages (57%)	Reduce outages (56%)	Improve power quality (73%)
	Reduce outages (56%)	Reduce outages in extreme weather(56%)	Reduce outages in extreme weather (54%)	Reduce restoration time (59%)

Prioritizing Technology Investments

Grid Modernization ((%) indicate total percentage by rate class that place specific priority in their top 3 outcomes)	Residential	Small Business	C&I	Key Accounts
	Find efficiencies and reduce customer costs (79%)	Find efficiencies and reduce customer costs (79%)	Find efficiencies and reduce customer costs (79%)	N/A
	Reduce environmental impact of internal operations (56%)	Reduce environmental impact of internal operations (51%)	Reduce environmental impact of internal operations (52%)	
	Reduce both length and number of outages (54%)	Help customers better manage electricity usage (50%)	Reduce both length and number of outages (54%)	

INVESTMENT TRADE-OFFS (% Total Support)	Residential	Small Business	C&I	Key Accounts
System Renewal – Necessary investments in aging infrastructure to maintain system reliability.	76%	69%	79%	87%
General Plant – Necessary investments to ensure staff have reliable equipment and IT systems.	68%	59%	56%	68%
System Capacity – Proactive investments to ensure customers in high growth areas do not experience a decrease in reliability.	66%	61%	73%	82%

GRID MODERNIZATION (% Total Support)	Residential	Small Business	C&I	Key Accounts
System Enhancements – Explore new technologies that would make the system better even if they are not the lowest cost option.	63%	59%	75%	76%
Future Benefits – Explore new technologies that will provide future (rather than immediate) benefits if the costs and benefits are clearly articulated.	71%	67%	73%	78%

CLIMATE ACTION (% Total Support)	Residential	Small Business	C&I	Key Accounts
Electrification – Willingness to pay extra to help the City of Toronto meet its future emissions targets.	48%	47%	44%	53%
Social Equity – Willingness to pay extra to provide financial assistance to low-income customers.	41%	42%	52%	N/A

An estimated 54% of Key Accounts have their own targets or carbon reduction initiatives currently in place.

For more information about this document or the Phase I customer engagement results please contact the Regulatory Applications and Business Support team.

Phase I – Customer Engagement Results

Customer Needs and Preferences

Customer Needs

Rate Class	Residential	Small Business	C&I*	Key Accounts
What are customer needs? Most customers are generally satisfied with the service they receive from Toronto Hydro. When asked how Toronto Hydro can improve service, customers were not wedded to any specific needs or wants. Overall, the top customer needs continue to be "lower or reduce rates" and "ensure reliability" followed by "investing new technology" and "reducing restoration time".				
Top Customer Needs	**Rates**	**Rates**	**Rates**	**Reliability**
	Reliability	**Invest in new technology**	**Reliability**	**Reduce restoration time**

Preferences: General Priorities

Rate Class	Residential	Small Business	C&I*	Key Accounts
Prioritizing Outcomes				
General Priorities (%) indicates total percentage by rate class that place specific priority in their top 3 outcomes	**Reasonable rates (46%)**	**Reasonable rates (54%)**	**Reasonable rates (50%)**	**Reliable service including power quality (69%)**
	Reliable service (45%)	**Invest in new technology (40%)** Reduce costs Withstand adverse weather	**Reliable service (48%)**	**Outage restoration in extreme weather (52%)**
	Invest in new technology (45%) Reduce costs Withstand adverse weather	**Reliable service (36%)**	**Grid capacity expansion for climate action (33%)**	**Safety of infrastructure (39%)**

Preferences: Reliability

Rate Class	Residential	Small Business	C&I*	Key Accounts
Prioritizing Reliability Investments				
Reliability (%) indicates total percentage by rate class that place specific priority in their top 3 outcomes	**Reduce restoration time in extreme weather (70%)**	**Reduce restoration time in extreme weather (60%)**	**Reduce restoration time (63%)**	**Reduce outages (78%)**
	Reduce outages in extreme weather (57%)	**Reduce outages (57%)**	**Reduce outages (56%)**	**Improve power quality (73%)**
	Reduce outages (56%)	**Reduce outages in extreme weather (56%)**	**Reduce outages in extreme weather (54%)**	**Reduce restoration time (59%)**

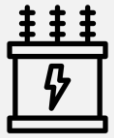
- *Consider options increase the resilience of the grid during extreme weather events. For example, increasing switching capability within the system can help reduce restoration times. Similarly, increasing proactive inspection and corrective action for storm guying requirements can help reduce pole failures during extreme wind events.*

Preferences: Technology

Rate Class	Residential	Small Business	C&I*	Key Accounts
Prioritizing Technology Investments				
Grid Modernization (%) indicate total percentage by rate class that place specific priority in their top 3 outcomes	**Find efficiencies and reduce customer costs (79%)**	**Find efficiencies and reduce customer costs (79%)**	**Find efficiencies and reduce customer costs (79%)**	N/A
	Reduce environmental impact of internal operations (56%)	**Reduce environmental impact of internal operations (51%)**	**Reduce environmental impact of internal operations (52%)**	
	Reduce both length and number of outages (54%)	**Help customers better manage electricity usage (50%)**	**Reduce both length and number of outages (54%)**	

- *Consider an increased pace of monitoring and control capabilities allowing for potential OPEX savings in the future, help identify oil spills early, and reducing service failures.*

Investment Trade-Offs

Rate Class		Residential	Small Business	C&I*	Key Accounts
INVESTMENT TRADE-OFFS		*% Total Support*			
	**System Renewal** Necessary investments in aging infrastructure to maintain system reliability.	**76%**	**69%**	**79%**	**87%**
	**General Plant** Necessary investments to ensure staff have reliable equipment and IT systems.	**68%**	**59%**	**56%**	**68%**
	**System Capacity** Proactive investments to ensure customers in high growth areas do not experience a decrease in reliability.	**66%**	**61%**	**73%**	**82%**

Grid Modernization

Rate Class		Residential	Small Business	C&I*	Key Accounts
GRID MODERNIZATION		*% Total Support*			
	**System Enhancements** Explore new technologies that would make the system better even if they are not the lowest cost option.	**63%**	**59%**	**75%**	**76%**
	**Future Benefits** Explore new technologies that will provide future (rather than immediate) benefits if the costs and benefits are clearly articulated.	**71%**	**67%**	**73%**	**78%**

- *For example, consider an option to increase the pace of investment in automation technologies like FLISR to allow Toronto Hydro to have greater flexibility within the distribution system and to leverage this technology to reduce outage impacts.*

Climate Action & Social Equity

Rate Class		Residential	Small Business	C&I*	Key Accounts
CLIMATE ACTION			*% Total Support*		
	**Electrification** Willingness to pay extra to help the City of Toronto meet its future emissions targets.	**48%**	**47%**	**44%**	**53%**
	**Social Equity** Willingness to pay extra to provide financial assistance to low-income customers.	**41%**	**42%**	**52%**	**N/A**

An estimated 64% of Key Accounts have "net zero" targets or carbon reduction initiatives currently in place.

- *For example, consider investments that reduce Toronto Hydro's GHG emissions such as fleet electrification; as well as investments that support City electrification, such as renewable enabling investments like GPMC or system expansions.*

Next Steps

General Planning Guidance; Phase II - Customer Engagement

General Planning Guidance

- Phase I customer engagement results provide the general priorities for Toronto Hydro's customers
  - Review program investment options presented within IPPR to ensure general alignment with these priorities
  - Tie-in customer priorities clearly as part of IPPR narratives where applicable
- Articulate the balance of costs, risks, and benefits for the grid and the customer as part of narratives, especially for programs focused on new technologies that may have future benefits

Phase I Customer Engagement
Toronto Hydro's 2025 Rate Application
Needs and Preferences Planning Placemat (March 2022)

INNOVATIVE RESEARCH GROUP

Rate Class Sample Size (Unweighted n)	Residential (n=1,685)	Small Business (n=430)	C&I* (n=48) * Interpret as directional due to small 'n'	Key Accounts (n=68)
Needs				
What are customer needs? Most customers are generally satisfied with the service they receive from Toronto Hydro. When asked how Toronto Hydro can improve service, customers were not wedded to any specific needs or wants. Overall, the top customer needs continue to be "lower or reduce rates" and "ensure reliability" followed by "investing new technology" and "reducing restoration time".				
Top Customer Needs	Rates Reliability	Rates Invest in new technology	Rates Reliability	Reliability Reduce restoration time
Preferences				
Prioritizing Outcomes				
General Priorities (%) indicates total percentage by rate class that place specific priority in their top 3 outcomes	Reasonable rates (46%) Reliable service (45%) Invest in new technology (45%) Reduce costs Withstand adverse weather	Reasonable rates (54%) Invest in new technology (40%) Reduce costs Withstand adverse weather Reliable service (36%)	Reasonable rates (50%) Reliable service (48%) Grid capacity expansion for climate action (33%)	Reliable service including power quality (69%) Outage restoration in extreme weather (52%) Safety of infrastructure (39%)
Prioritizing Reliability Investments				
Reliability (%) indicates total percentage by rate class that place specific priority in their top 3 outcomes	Reduce restoration time in extreme weather (70%) Reduce outages in extreme weather (57%) Reduce outages (56%)	Reduce restoration time in extreme weather (60%) Reduce outages (57%) Reduce outages in extreme weather(56%)	Reduce restoration time (63%) Reduce outages (56%) Reduce outages in extreme weather (54%)	Reduce outages (78%) Improve power quality (73%) Reduce restoration time (59%)
Prioritizing Technology Investments				
Grid Modernization (%) indicate total percentage by rate class that place specific priority in their top 3 outcomes	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (56%) Reduce both length and number of outages (54%)	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (51%) Help customers better manage electricity usage (50%)	Find efficiencies and reduce customer costs (79%) Reduce environmental impact of internal operations (52%) Reduce both length and number of outages (54%)	N/A

INVESTMENT TRADE-OFFS	% Total Support			
System Renewal Necessary investments in aging infrastructure to maintain system reliability.	76%	69%	79%	87%
General Plant Necessary investments to ensure staff have reliable equipment and IT systems.	68%	59%	56%	68%
System Capacity Proactive investments to ensure customers in high growth areas do not experience a decrease in reliability.	66%	61%	73%	82%
GRID MODERNIZATION	**% Total Support**			
System Enhancements Explore new technologies that would make the system better even if they are not the lowest cost option.	63%	59%	75%	76%
Future Benefits Explore new technologies that will provide future (rather than immediate) benefits if the costs and benefits are clearly articulated.	71%	67%	73%	78%
CLIMATE ACTION	**% Total Support**			
Electrification Willingness to pay extra to help the City of Toronto meet its future emissions targets.	48%	47%	44%	53%
Social Equity Willingness to pay extra to provide financial assistance to low-income customers.	41%	42%	52%	N/A

An estimated [illegible] of Key Accounts have [illegible] targets or carbon reduction initiatives currently in place.

For more information about this document or the Phase I customer engagement results please contact the Regulatory Applications and Business Support team.

Customer Engagement Phase 2

01

Phase I – Needs and Priorities

- *Assess customer needs and preferences in relation to outcomes relevant to our program and services.*
- *It a comprehensive view of customer priorities to as a front-end input to the Business and Investment Planning processes.*

02

Targeted Engagement

- *Strategically explore and seek feedback on key topics relative to specific customers and emerging issues.*
- *These engagements are intended to add another layer of understanding further driving inputs and strategy for the Plan.*

03

Phase II – Customer Feedback

- *Confirm Phase I customer needs, preferences, and priorities.*
- *Solicit feedback on our plans and their subsequent rate impacts including customer preferences on specific programs where trade-offs on pacing exist.*

Thank you

For more information about the Placemat or the Phase I customer engagement results please contact the Regulatory Applications and Business Support team.

For additional insights into the integration of the results into Business and Investment Planning, please contact Elissar El-Hage and/or Sakaran Manivannan.

System Renewal, System Access (GPMC and Metering) Preventive and Predictive Mtce, Corrective Mtce, Emergency Response, General Plant

2020-2024

Option	Description
Baseline Minus*	This option represents a percent or dollar reduction to the Baseline Option(L1), where a 5-year budget, with annual targets, will be provided by PIA. Units, outcomes, short and long term impacts and risks will need to be determined.
Baseline*	This option is equivalent to the current Business Plan as approved by the Board of Directors, where the 5-year (2020-2024) dollars are known. Total funding considered under the baseline option must be equivalent to the 5-year Business Plan total. Units, outcomes, short and long term impacts and risks will need to be determined.
Custom	This represents a custom (i.e. unconstrained) option where planners have the ability to set spending, unit and outcome achievements. Short and long term impacts and risks will need to be determined.

* Constrained options.

System Renewal, System Access (GPMC and Metering) Preventive and Predictive Mtce, Corrective Mtce, Emergency Response, General Plant

2025-2029

Option	Description
Managed Deterioration	This option represents the management of the system without realizing the full outcomes, benefits and/or performance expected from the Sustainment Investment Strategy. This option must be at a level sufficient to maintain short-term performance of the system while allowing for some incremental risk. Funding levels considered for this option should not be sustainable over the long-term.
Sustainment	This option represents the baseline level of investment required to maintain the system at status quo as measured by key indicators of risk and performance that are most relevant to the program (i.e. reliability, asset condition, system capacity, customers connected on time etc.)
Improvement	This option achieves outcomes, benefits and/or performance beyond those achieved in the Sustainment Option, while accounting for the need to keep year-over-year spending changes within reasonable limits.

System Service

2020-2024

Option	Description
Baseline Minus *	This option represents a percent or dollar reduction to the Baseline Option(L1), where a 5-year budget, with annual targets, will be provided by PIA. Units, outcomes, short and long term impacts and risks will need to be determined.
Baseline*	This option is equivalent to the current Business Plan as approved by the Board of Directors, where the 5-year (2020-2024) dollars are known. Total funding considered under the baseline option must be equivalent to the 5-year Business Plan total. Units, outcomes, short and long term impacts and risks will need to be determined.
Custom	This represents a custom (i.e. unconstrained) option where planners have the ability to set spending, unit and outcome achievements. Short and long term impacts and risks will need to be determined.

*Constrained options.

System Service

2025-2029

Option	Description
Sustainment	This option represents the minimum amount of spending required to achieve minimize required outcome (e.g. meet long-term system capacity requirements) or otherwise advance the program (e.g. pilot level spending).
Improvement	This option achieves outcomes, benefits and/or performance beyond those achieved in the Sustainment Option, while accounting for the need to keep year-over-year spending changes within reasonable limits.
Accelerated Improvement	This option achieves outcomes, benefits and/or performance beyond those achieved in the Improvement Investment Strategy.

System Access (excl GPMC and Revenue Metering), Customer Driven Work OpEx

2020-2029

Option	Description
Lower Bound	This option must consider variation of assumptions from the baseline scenario to determine a reasonable lower bound on required spending.
Baseline -Most Likely	This option represents the most likely investment scenario based on the program forecast methodology.
Upper Bound	This option must consider variation of assumptions from the baseline scenario to determine a reasonable upper bound on required spending.

Toronto Hydro-Electric System Limited
EB-2023-0195
Interrogatory Responses
1B-SEC-6
Appendix D
FILED: May 7, 2024

(16 Pages)

2023–2029
BUSINESS PLANNING

AGENDA

1. Meeting Kick-off
2. Business Plan approach and assumptions overview
3. Regulatory Application Planning and timelines
4. Investment Planning approach
5. Enterprise Risk Management considerations
6. Next steps and Q&A

Critical Themes
Business Plan

- Capital Investment and Operational Requirements
- Utility of the Future
- Resource Strategy
- Inflationary Costs pressures
- COVID-19 ongoing impacts
- Climate Action Plan and Expanded Distributor

Integrated Business Plan

CORPORATE STRATEGY
The Interactive Grid

Alignment to the 10-year Utility of the Future Strategy and strategic priorities

BUSINESS NEEDS

Identification of Capital Investment and Operational needs that underpin the Corporate Pillars

PEOPLE STRATEGY
Workforce of Tomorrow

Build a culture of safety, sustainment and innovation that propels TH into the future

COMPLIANCE REVIEW

Consideration of compliance requirements and related mitigating actions

REGULATORY ALIGNMENT

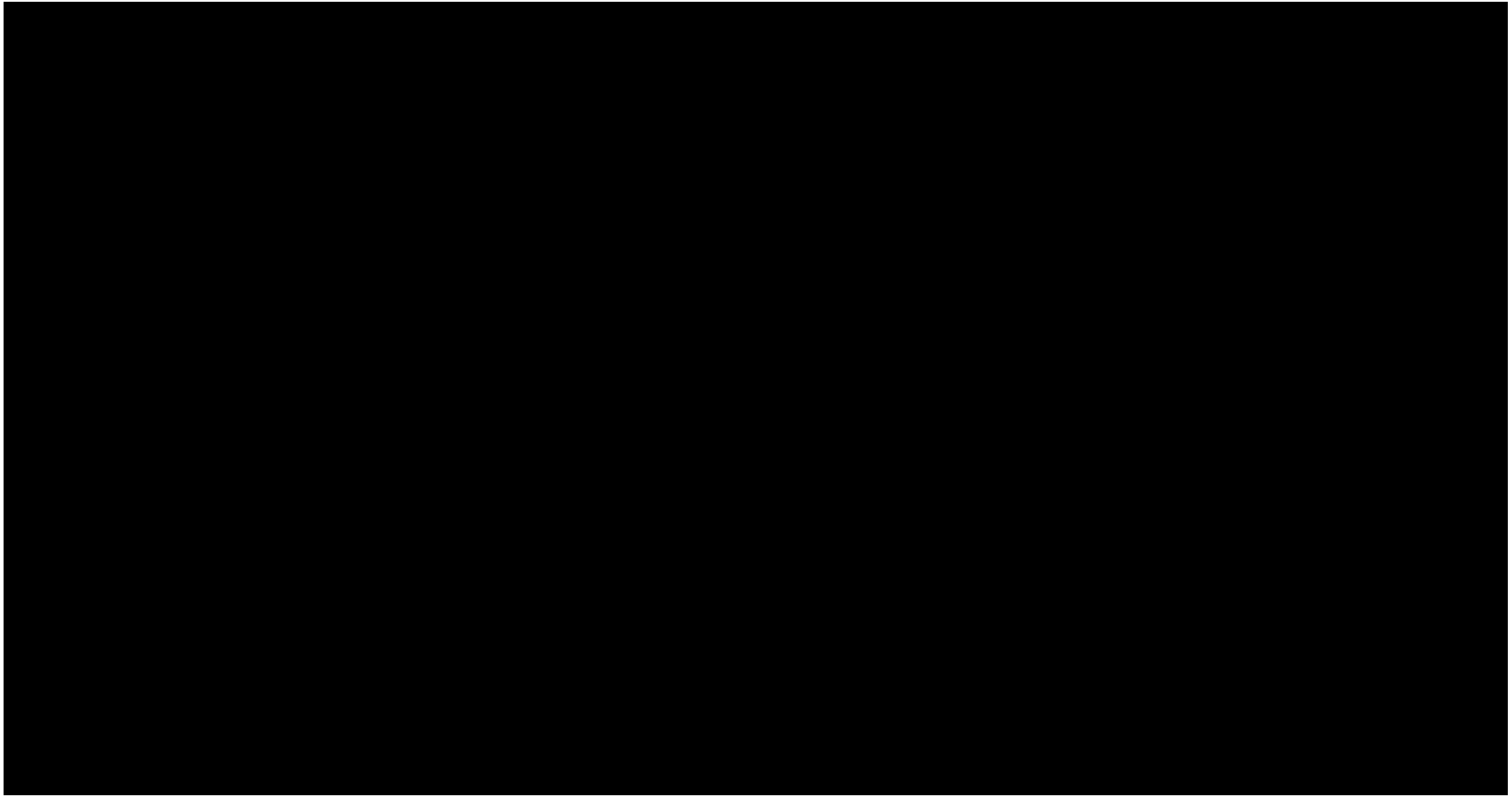
- 2023-2024: Alignment to 2020-2024 OEB decision and inclusion of new emerging issues (e.g.: customer connections, inflation)
- 2025-2029: Alignment to 2025 rate application strategy

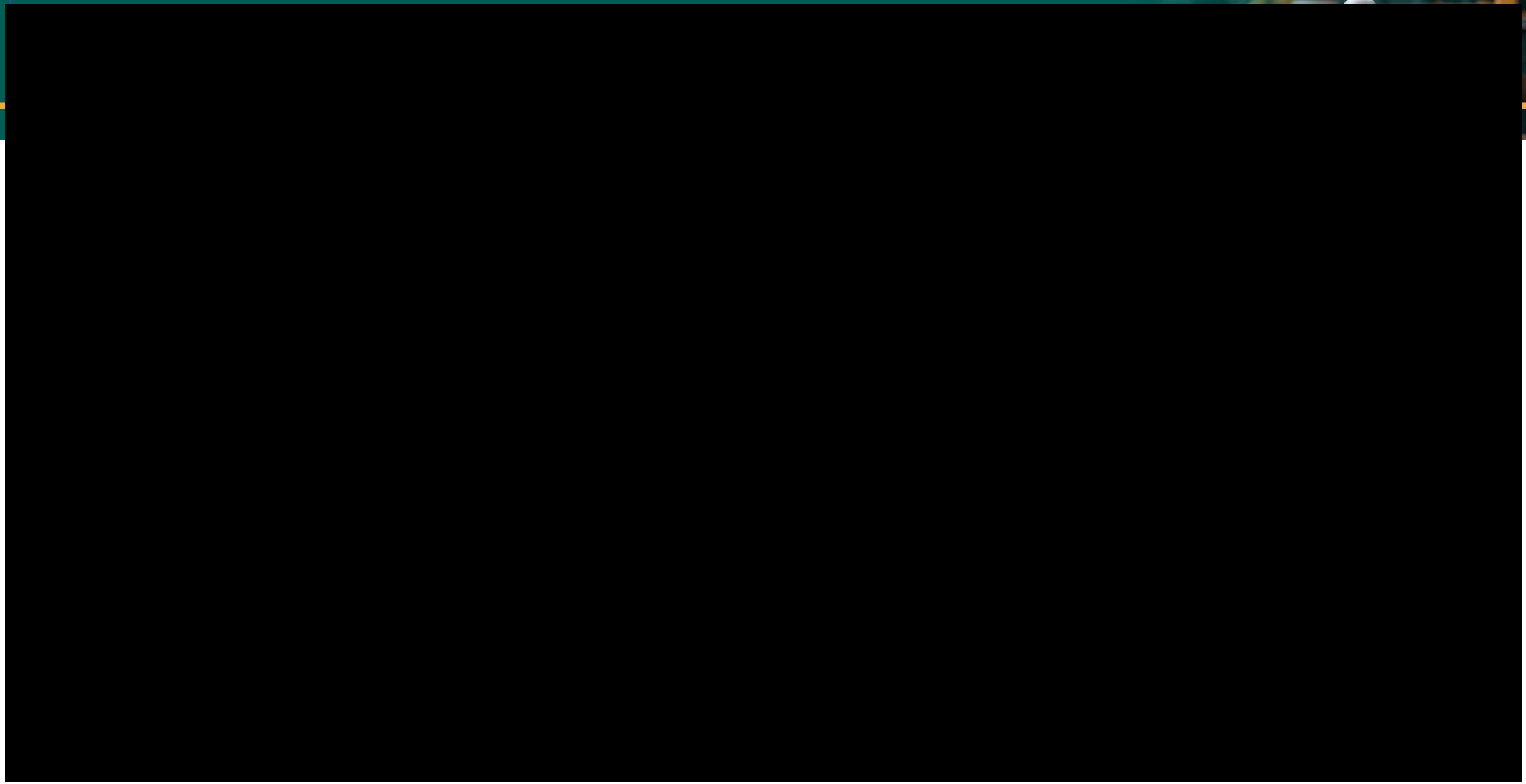
RISK ALIGNMENT

Ensure the Business Plan is grounded in ERM assessments and mitigation plans

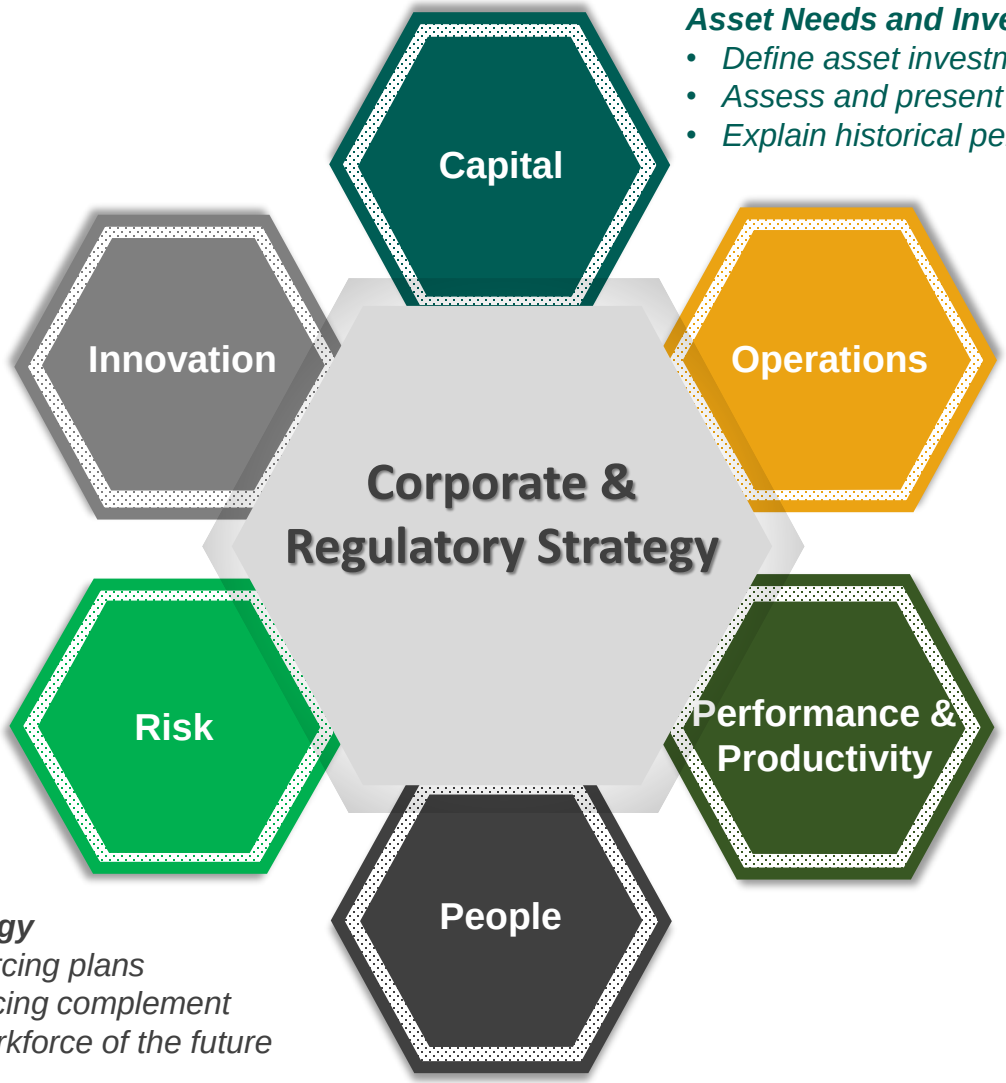
CLIMATE ACTION PLAN

- Support to the Transform TO strategy and initiatives
- Expanded Distributor
- LED Conversion
- Other climate mandates





Regulatory
2025-29 Planning Focus



Asset Needs and Investment Drivers
- *Define asset investment needs and drivers for the 2023-2029*
- *Assess and present options to manage performance*
- *Explain historical performance and cost variances*

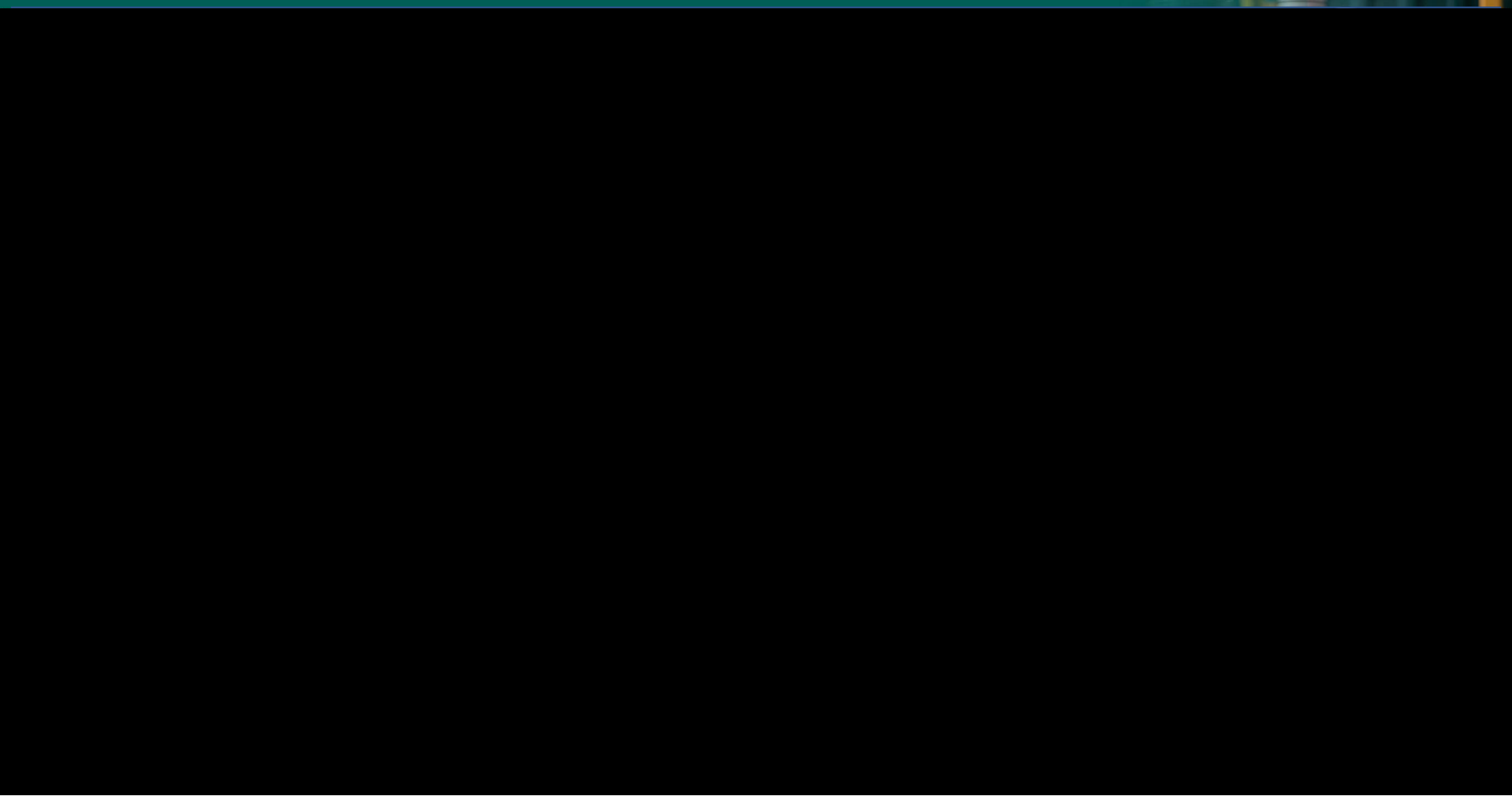
Innovation
- *New technologies and practices*
- *Non-Wires Alternatives/DERs*
- *Grid optimization and modernization*

Operational Needs and Drivers.
- *Define business needs and drivers for 2023-2025*
- *Assess emerging trends and needs 2026-2029*
- *Explain historical performance and cost variances*

Enterprise Risk Framework
- *Manage oversight risk (e.g. disallowances)*
- *Develop a balanced risk-adjusted plan*

Performance & Productivity
- *Integrate performance objectives into planning analysis and decision-making*
- *Create direct links between planning and productivity/efficiency (e.g. benefits realization)*

Workforce Strategy
- *Optimize resourcing plans*
- *Balance resourcing complement*
- *Develop the workforce of the future*



Investment Planning & Portfolio Reporting

WHAT?

IPPR is a comprehensive and integrated annual planning process for all distribution system, fleet, facilities, and IT/OT investment programs.

Analyze
current state and future needs

Develop
short-term and long-term plans

Optimize
risks, outcomes, and cost

FOCUS

	2020-2024 Planning	Planning Discretion	2025-2029 Planning	Planning Discretion
Year 1	Re-baseline Plan	Moderate	Strategic Planning	Very High
Year 2	Work the Plan	Low	Strategic Planning	Very High
Year 3	**Work the Plan**	**Low**	**Penultimate Plan**	**High**
Year 4	Work the Plan	Very Low	Final Plan	Moderate
Year 5	Close-out the Plan	None	Prepare to Re-baseline	Moderate

Business Plan Risk Review

Overview

Goal

Ensure the 2023 Business Plan addresses the enterprise risks and mitigations as identified in the corporate risk assessment (RA) process

Collaborate

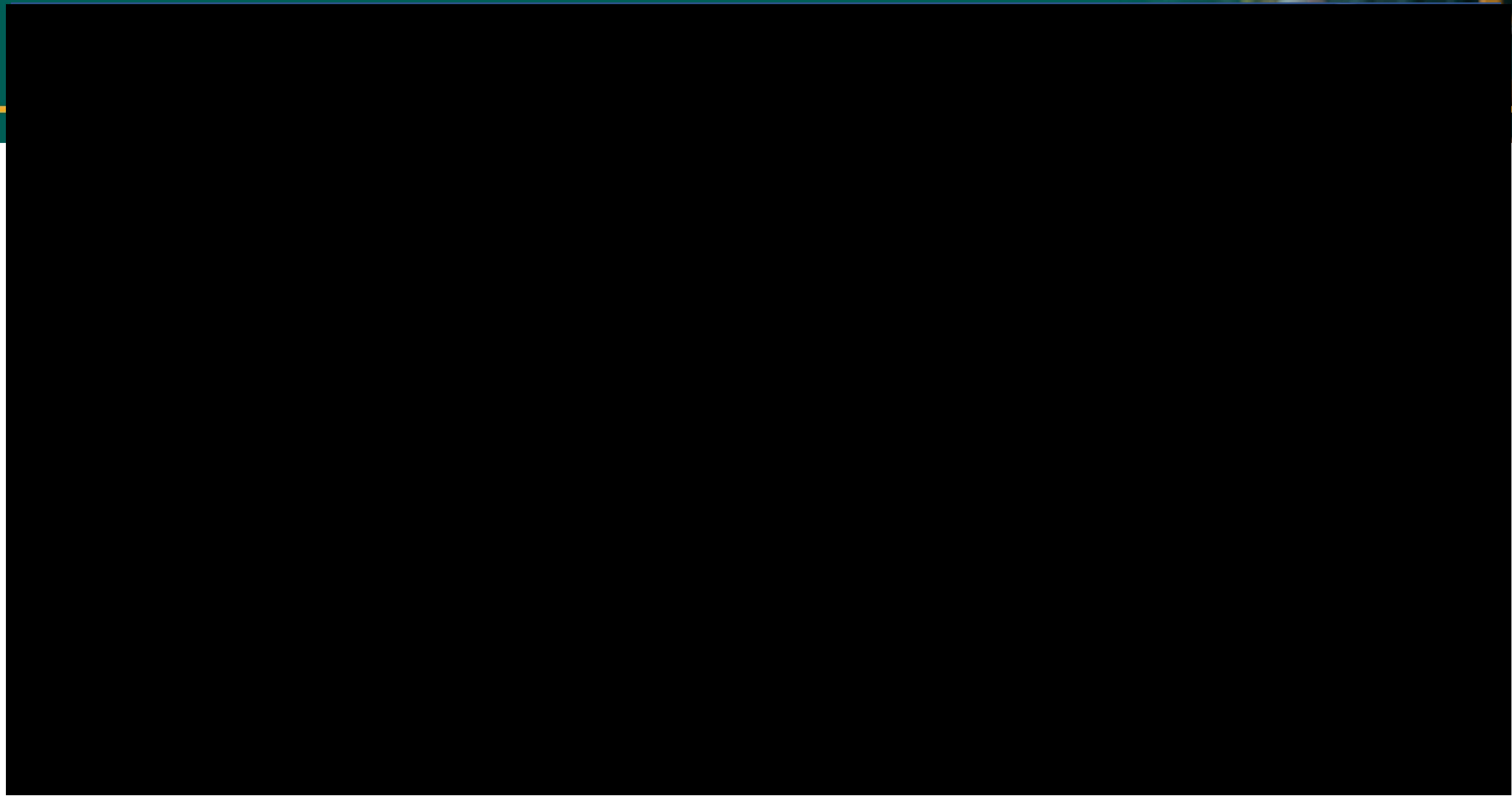
- Risk DRPs identified control weaknesses, mitigations and required actions during the annual RA process
- ERM key partner in business plan process at the outset

Process

- Critically examine proposed impacts to key mitigations
- Close control deficiencies identified during RA and test/implement action plans

Results

- Presentation on control deficiency closure and RA action plan implementation
- Consideration of RA heat map results
- Determine impact on risk position



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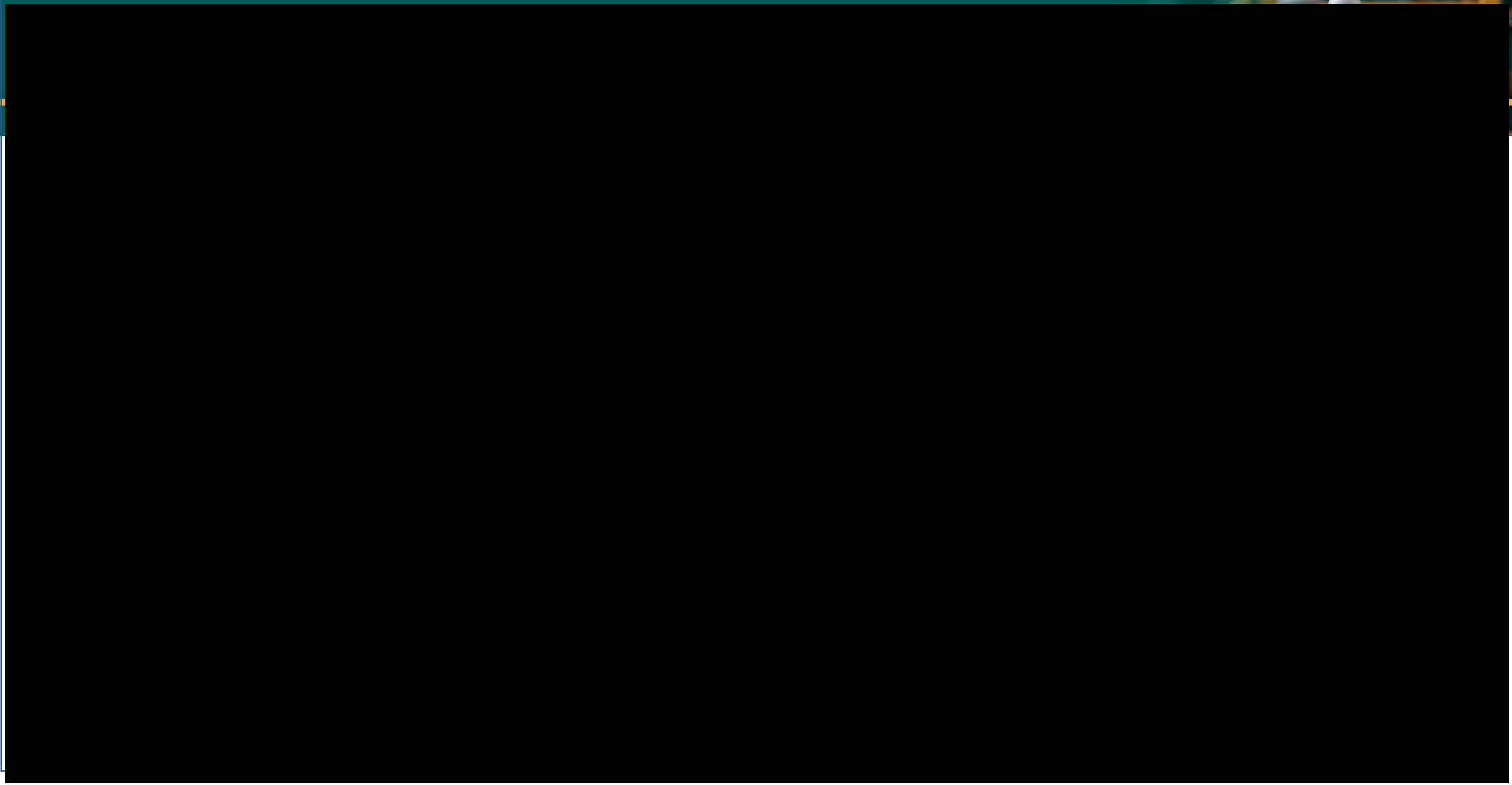
APPENDIX



RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 1B-SEC-20

Reference: Exhibit 1B, Tab 3, Schedule 1, Pages 6-68

With respect to the proposed 2025-2029 Performance Incentives Scorecard Measures:

QUESTION (A):

a) Please detail all Performance Incentive Measures that Toronto Hydro considered, but ultimately rejected.

UPDATED RESPONSE (A):

Toronto Hydro's proposed scorecard measures for the 2025-2029 rate period were the result of consideration and internal discussions that evolved over a period of many months leading to the finalization of the measures. It is the actual measures that have been put forward on the application which will be assessed by the OEB on their merits. It would be impractical, and Toronto Hydro's position is that it would be of no probative value, to try to provide details of the evolution of the various internal discussions or considerations and ideas on this topic that led to the final measures. Further, Toronto Hydro's internal discussions and consideration on this topic would be subject to litigation privilege in the process of the development of the rate application, and to some extent would also involve information subject to solicitor-client privilege in light of the participants in the discussions. For the above reasons, Toronto Hydro has objected to this request.

/C

QUESTION (B)

b) Please explain the basis for the relative weights for each measure.

RESPONSE (B):

Toronto Hydro applied a balanced scorecard approach to determine the relative weight for each measure on the Custom Scorecard. This approach entailed two steps: (1) an assessment of the weight

to be attributed to each area of performance, and (2) a determination of the weight for each measure within that area of performance based on a consideration of value to customers.

In the first step, the utility was guided by the customer needs and priorities ascertained through the Phase 1 engagement study:

- **Price and reliability are the top customer priorities**: Relative to price, reliability has become increasingly important to residential customers. When it comes to reliability, customers prioritize reducing the length of outages.
- **New Technology**: Almost as equally important to price and reliability, customers expect the utility to invest in new technologies that will reduce costs and make the system better, even if the benefits aren't immediate, as long as the costs and benefits are clear.
- **System Capacity**: Customers expect Toronto Hydro to invest proactively in system capacity to ensure that high growth areas do not experience a decrease in service levels.

With these key considerations in mind, Toronto Hydro attributed:

- 30% weight to Reliability and Resilience;
- 30% weight to Efficiency and Financial Performance,
- 20% weight to Customer Service & Experience,
- 20% weight to Environment Safety and Governance.

In step 2, once the performance measures were finalized, Toronto Hydro's subject matter experts worked cross-functionally to allocate weight to each measure, applying their judgement and expertise to determine a leading measure for each category and to place the greatest weights on the measures that (i) best align customer and utility priorities, and (ii) provide high value to customers as quantified by the Benefits Analysis in section 3 of the evidence (Exhibit 1B, Tab 3, Schedule 1 starting on page 56) and summarized at Table 21. For example, within the Reliability and Resilience category Toronto Hydro placed greater weight on Outage Duration (SAIDI) over Outage Frequency (SAIFI) because when it comes to reliability, customers prioritize reducing the length of outages over

the total number of outages. In the Efficiency and Financial Performance category, Toronto Hydro prioritized Efficiency Achievements to recognize the importance of cost-effectiveness in (i) providing value for money to customers, and (ii) achieving the utility's financial performance objectives with respect to being able to earn the allowed rate of return.

QUESTION (C):

c) If the application is approved as filed, does Toronto Hydro expect to achieve each Performance Incentive Measure?

RESPONSE (C):

Yes.

QUESTION (D) :

d) [p.16] Please explain why a 2 standard deviation range is an appropriate target for SAIFI defective requirements measure.

RESPONSE (D):

Standard deviation measures the amount of variation or dispersion in SAIFI Defective Equipment historical values and quantifies how much the metric's performance varies from the average. Two standard deviations encompass approximately 95% of the data points. This means that setting SAIFI Defective Equipment PIM within this range can account for the variability of outcomes expected based on the past performance, making the target realistic and achievable in the face of typical volatility. The target range set too close to the average might be unachievable/demotivating due to inherent volatility leading to the performance being outside of the range despite the utility's efforts. A target of two standard deviations strikes a balance, challenging the organization to be proactive in managing SAIFI Defective Equipment while still being within a statistically reasonable range of outcomes.

See response to 2B-SEC-42 for a detailed explanation of Toronto Hydro reliability projection methodology.

QUESTION (E):

e) [p.37] Please explain in detail Toronto Hydro's methodology for calculating its scope 1 emissions.

RESPONSE (E):

Scope 1 emissions are calculated by multiplying the activity data for Toronto Hydro's sources of direct emissions by the appropriate emissions factor. The activity data includes cubic meters of natural gas, litres of fuel, and kilograms of sulfur hexafluoride (SF_6) emissions. Toronto Hydro uses the emission factors published in the National Inventory Report ("NIR"), which is prepared by Environment and Climate Change Canada and submitted annually to the United Nations.

QUESTION (F):

f) [p.41-42] Toronto Hydro proposes an Efficiency Achievement measure which "tracks this commitment over the next rate period by holding the utility accountable for delivering sustained (and quantifiable) efficiency benefits to customers in the next rebasing application."
   i. Please explain the methodology for calculating efficiency achievements.
   ii. Please provide how the methodology ensures that the savings or cost avoidance are sustainable.

RESPONSE (F):

The proposed custom measure tracks efficiency benefits realized through cost reduction and cost avoidance strategies that Toronto Hydro would deploy in the next rate term in order to manage the revenue deficiency and meet the efficiency expectation imposed by the 0.15% efficiency factor proposed as part of the custom revenue cap index.

Toronto Hydro would ensure that benefits are sustained into future rate periods by excluding any savings related to expenditures that are simply deferred into future periods. For example, the deferral of the S4 Hana upgrade in the current 2020-2024 rate period would not have met the criteria for this measure, because the costs associated with this project were deferred into the 2025-2029 rate period.

Efficiency achievements would be tracked and measured in accordance with the following methodologies:

- **Cost Reduction:** Projects with cost reduction efficiency benefits yield an absolute reduction in an overall expenditures. Cost reduction benefits are measured by comparing actual costs in a defined area of scope (e.g. an expense category) against an annual (or justified pro-rated amount) baseline cost based on previously funded expenses in rates. For example, if the utility introduces process automation to reduce OM&A expenses associated with completing a manual work process, the OM&A savings would be tracked as a cost reduction benefit.
- **Cost Avoidance:** Projects with cost avoidance efficiency benefits yield an avoidance of future cost increases which were not included in the forecasts used to set base rates for 2025-2029. Cost avoidance benefits are measured by determining a forecast annual (or justified pro-rated amount) incremental cost that the utility must manage. For example, if the utility faces an incremental business requirement that was not included in the 2025-2029 Investment Plan, such as the need to lease additional office space to house its growing workforce, and is able to reconfigure its existing workspaces to avoid the incremental costs associated with obtaining additional office space, the annual savings would be tracked as a cost avoidance benefit.

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 2B-SEC-57

Reference: Exhibit 2B, Section E4, Page 7

Please provide a revised version of Appendix 2-AA, that shows Toronto Hydro's annual internal budget (as opposed to the OEB approved budget) for each year between 2020 and 2024.

RESPONSE:

Please see Appendix A to this response for Toronto Hydro's internal budgets by program for each year between 2020 and 2024.

As part of its annual budgeting process, Toronto Hydro continuously assesses the cumulative five-year plan that it is being funded through rates in current rate period. This assessment takes into account historical actual expenditures and updated forecasts out to the end of the rate period based on the best available information known at the time. In keeping with the objective of delivering a five-year cumulative capital plan and recognizing the need for flexibility in the execution of that plan, a mechanism exists to true up/down the annual budget targets to recognize any overspends or underspends relative to the forecast of the immediately preceding year to the annual internal budget. For these reasons, the annual internal budgets presented in the Appendix A do not add up to yield a five-year plan for 2020 to 2024. The most up to date view of the 2020-2024 plan has been detailed in Exhibit 2B, Section E4, and updated April 2, 2024 to include 2023 actuals.

/C

RESPONSES TO SCHOOL ENERGY COALITION INTERROGATORIES

INTERROGATORY 4-SEC-90

Reference: Exhibit 4, Tab 1, Schedule 1, Appendix J-C

Please provide a revised version of Appendix 2-JC, that shows Toronto Hydro's annual internal budget for each year between 2020 and 2024.

RESPONSE:

Table 1 below shows Toronto Hydro's internal OM&A budgets and actual expenditures for the current 2020-2024 rate period.[1] Below the table Toronto Hydro provides variance analyses comparing actual to budgeted expenditures for each. For the years 2023 to 2024, Toronto Hydro's internal budgets are consistent with the bridge year forecasts filed as part of the application.[2] In addition, it is important to note that when preparing internal budgets for 2020-2024, Toronto Hydro largely assumed the normal continuation of business and did not build in any material assumptions or changes regarding the ongoing and long-term operational impacts of the COVID-19 pandemic.

Table 1: 2020-2024 OM&A Internal Budget and Actuals ($ Millions)

	2020	2021	2022	2023	2024
Budget	269.5	284.6	294.8	301.5	320.5
Actual	288.1	277.5	280.4	294.2	N/A

/C

[1] Toronto Hydro is unable to provide a revised version of Appendix 2-JC that shows internal budgets for the same period because the utility does not manage its internal budgets in the program view that is presented in the rate application in accordance with the Filing Requirements.

[2] Following the approval of the 2023-2025 Business Plan in the fall of 2022, Toronto Hydro continued its planning process into Q1 of 2023 in order to support the rate application. This resulted in an updated 2023 internal budget which aligned with the 2023 bridge year forecast submitted as part of the rate application.

2020 Budget – 2020 Actual Variance Explanation

An overspend of $18.6 million primarily due to:

- Higher bad debt expense of $17.2 million as a result of the COVID-19 emergency and related financial pressures as detailed in the evidence Exhibit 4, Tab 2, Schedule 14 at p. 29.
- Higher non-routine operational and emergency expenses of $3.9 million related to the COVID-19 response as detailed in the evidence at Exhibit 4, Tab 2, Schedule 6 at Table 1.
- Higher corrective maintenance costs of $2.1 million to address system, environmental and safety risks, including cap and grounding of unused lines, switchgear repair to address known quality risks and sustained corrective work volume as detailed in the evidence at Exhibit 4, Tab 2, Schedule 4 at pages 1-3 and 7-15.
- Higher emergency response costs of $1.5 million due to storm and major event restoration costs as detailed in the evidence at Exhibit 4, Tab 2, Schedule 5, Table 3.
- Lower payroll costs of $5.7 million due to workforce vacancies as a result of unplanned retirements and delayed implementation of the hiring plan due to the challenges related to COVID-19 across various programs as detailed in the evidence at Exhibit 1B, Tab 3, Schedule 3 at pages 10-11; Exhibit 4, Tab 4, Schedule 3 at page 4; and Toronto Hydro's responses to interrogatories 4-SEC-111, 4-Staff-308 (c), and 4-AMPCO-83. /C
- Lower other costs of $0.4 million across various areas.

2021 Budget – 2021 Actual Variance Explanation

An underspend of $7.1 million primarily due to:

- Lower payroll costs of $10.0 million due to workforce vacancies as a result of unplanned retirements and delayed implementation of the hiring plan due to the challenges related to COVID-19 across various programs as detailed in the evidence at Exhibit 1B, Tab 3, Schedule 3 at pages 10-11; Exhibit 4, Tab 1, Schedule 1 at page 21; Exhibit 4, Tab 4, Schedule 3 at page 4; and Toronto Hydro's responses to interrogatories 4-SEC-111, 4-Staff-308(c), and 4-AMPCO-83.
- Lower other costs of $0.7 million across various areas.
- Higher non-routine operational and emergency expenses of $3.6 million related to the COVID-19 response as detailed in the evidence in Exhibit 4, Tab 2, Schedule 6, Table 1.

2022 Budget – 2022 Actual Variance Explanation

An underspend of $14.4 million primarily due to:

- Lower payroll costs of $10.0 million due to workforce vacancies as a result of unplanned retirements and delayed implementation of the hiring plan due to the persisting impacts of the COVID-19 challenges explained above.[3]
- Lower Public, Legal and Regulatory Affairs costs of $2.1 million due to underspend in external services of $1.2 million related to deferred implementation of enhanced customer awareness and public communications work plans, and lower volume of externally-driven legal claims of $0.9 million.
- Lower payroll costs of $2.0 million due to one-time favourable labour capitalization in Customer Care as a result of employee time allocated to the Customer Information System ("CIS") upgrade project as detailed in Toronto Hydro's response to undertaking JT4.14.
- Lower other costs of $0.3 million across various areas.

2023 Budget – 2023 Actual Variance Explanation

An underspend of $7.2 million was primarily due to:

- One-time underspend totaling to $2.5 million driven by:
  - lower payroll costs of $1.1 million due to one-time favourable labour capitalization in Customer Care as a result of employee time allocated to the CIS upgrade project as noted in Toronto Hydro's response to undertaking JT4.14;
  - transfer of $0.9 million to the *Getting Ontario Connected Act* ("GOCA") variance account as noted in Toronto Hydro's response to interrogatory 4-Staff-296.; and
  - transfer of $0.5 million to the Cloud Computing Implementation deferral account as noted in Toronto Hydro's response to JT3.6.
- Lower Public, Legal and Regulatory Affairs costs of $2.1 million driven by: (i) $1.2 million underspend in external services primarily related to deferred implementation of enhanced customer awareness and public communications work in the Communications and Public Affairs segments, and deferred implementation of continuous improvement work plans and

/C

[3] Exhibit 4, Tab 1, Schedule 1; Toronto Hydro's responses to interrogatories 4-SEC-111, 4-Staff-308 (c), and 4-AMPCO-83.

initiatives in the Regulatory Affairs segment due to the need support the rate application; (ii) $0.5 million payroll variance in the Legal Services segment driven by higher-than-expected turnover, internal promotions and challenges in attracting talent in this segment; and (iii) $0.4 million variance due to lower volume of externally-driven legal claims.

- Lower Asset and Program Management program cost of $1.7 million due to underspend in external services in the System Planning segment primarily related to the deferral of various continuous improvement work plans and initiatives in order to support the rate application (i.e. capital and maintenance planning and evidence drafting).
- Lower Information Technology program cost of $1.1 million driven by underspend in the Project Execution segment primarily related to the deferred vendor procurement relating to solutions for the Customer Relationship Management segment.
- Higher other costs of $0.2 million across various areas.

Please also refer to Toronto Hydro's response to undertaking JT3.28 for a causal track view comparing 2023 forecast to actual expenditures.

/C

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 5-STAFF-313

References: Exhibit 5, Tab 1, Schedule 1 , Pages 4, 6
Excel Appendix OA-OB, November 17, 2023
Exhibit 1C, Tab 3, Schedule 6
OEB letter, 2024 Cost of Capital Parameters, October 31, 2023
Excel Revenue Requirement Workforms (2025, 2026, 2027, 2028, and 2029), November, Tab 7 Cost of Capital, November 17, 2023

Preamble:

Toronto Hydro stated that is had an all-in coupon rate of 4.93% on Toronto Hydro Corporation's (THC) 30-year issuance on August 28, 2023. However, OEB staff could not find this bond listed in Toronto Hydro's Appendix OB Debt Instruments for the rate year 2025.

In Appendix OB, Toronto Hydro indicated that on October 2, 2023, it had issued a debenture for $200,000,000 with a rate of 5.25%, however, no promissory note was filed in Toronto Hydro's evidence in Exhibit 1C. Also, "Table 5: Forecasted Long-Term Debt Issues" on page 6 of Exhibit 5 shows a forecasted rate of 5.00% and not 5.25% for the debt issued in October 2023.

The deemed long-term debt rate of 4.58% for electricity distributors was issued by the OEB on October 31, 2023.

Toronto Hydro has calculated a long-term debt rate of 3.95% in Appendix OB for the 2025 rate year. A long-term debt rate of 3.95% is also reflected in Toronto Hydro's Excel revenue requirement workforms for the rate years 2025 through 2029.

QUESTION (A):

a) Please reconcile the debt that Toronto Hydro stated was issued on August 28, 2023 with the debt issuances shown in Appendix OB.

RESPONSE (A):

The all-in coupon rate of 4.93% for 30-year THC debt issuance as at August 28, 2023 was an indicative rate mentioned in the context of comparing credits spreads and absolute all-in-yields between 2022 and 2023. There was no actual issuance of THC debt on August 28, 2023.

QUESTION (B):

b) Please provide the promissory note for the debenture issued October 2, 2023 for $200,000,000, explain whether the rate was 5.00% or 5.25%, and update the evidence as required.

RESPONSE (B):

The promissory note issuances mentioned in Table 5 were forecasted long-term debt issuances. There was no THC promissory note issuance on October 2, 2023. Toronto Hydro issued $200M promissory note at an all-in coupon rate of 5.18% on October 12, 2023. Toronto Hydro has updated Appendix OA-OB to reflect the same, which is attached as Appendix A to this interrogatory response.

QUESTION (C):

c) If any debt instruments have been issued since the preparation of the pre-filed evidence for the current proceeding, please update the relevant evidence (including Appendix OA and Appendix OB), and provide a copy of the relevant promissory note(s).

RESPONSE (C):

Please see the attached Appendix A and B to this response.

QUESTION (D) AND (E):

d) For each promissory note shown on Appendix OB with rates greater than the current deemed long-term debt rate of 4.58%. please provide the following:
   i. The start date of the debt.
   ii. The deemed long-term debt rate in place at the time the debt was issued
   iii. The need for the debt and rationale supporting taking the debt at the rate offered

e) Please provide rationale supporting the need for the forecasted debt issues shown in Appendix OB, including any specific capital project(s) that the debt funding is for.

RESPONSE (D) – (E):

Toronto Hydro is assigned debt through promissory notes from its parent, Toronto Hydro Corporation. These promissory notes are written on the same market terms as the parent debt applicable to Toronto Hydro Corporation (plus an additional five basis points for an administration fee). Toronto Hydro has the following promissory notes with rates greater than 4.58 percent:

Description	Amount ($)	Rate (%)	Start Date of the debt	Deemed long-term debt rate at the time of issuance (%)	Issuance - Actual/ Forecast
2022 Series 19	300,000,000	5.00%	13-Oct-22	3.49%	Actual
2023 Series 20	250,000,000	4.66%	14-Jun-23	4.88%	Actual
2023 Series 21	200,000,000	5.18%	12-Oct-23	4.88%	Actual
2024 Series 22	200,000,000	5.85%	01-Nov-24	4.58%	Forecast
2025 Series 23	300,000,000	5.45%	07-Jul-25	NA	Forecast

Toronto Hydro issues debt to fund its capital and operational requirements and to refinance its maturing debt. For actual issuances, the rate reflects market conditions at the time of issuance. The variance to the deemed long-term debt rate issued by OEB is mainly due to timing differences, as OEB issued rates are calculated based on bond yields during the month of September for the prior year.

QUESTION (F):

f) Please confirm that to determine the final revenue requirement for 2025 and the subsequent years (i.e., 2026-2029), Toronto Hydro intends to use a long-term rate of 3.95%, or a different rate as updated through interrogatories. If this is not the case, please explain.

RESPONSE (F):

To determine the final revenue requirement for the 2025-2029 rate period, the utility intends to use a single long-term ("LT") debt rate, which is currently 3.95% as supported by the evidence in Exhibit 6, Tab 1, Schedules 2-6. If during the course of the proceeding there are any updates or material changes to the evidence supporting the deemed LT rate during the course of the proceeding, Toronto Hydro intends to update the rate accordingly and flow through the impact to the revenue requirement impacts at the time of the Draft Rate Order process. /C

RESPONSES TO ONTARIO ENERGY BOARD STAFF INTERROGATORIES

INTERROGATORY 5-STAFF-314

References: Exhibit 5, Tab 1, Schedule 1, Page 1
EB-2009-0084, OEB Report, Report of the Board on the Cost of Capital for Ontario's Regulated Utilities, December 11, 2009, Page 50
Filing Requirements For Electricity Distribution Rate Applications - 2023 Edition for 2024 Rate Applications, Chapter 2 Cost of Service, December 15, 2022, Page 36

Preamble:

Toronto Hydro proposes to set its capital structure for ratemaking purposes in accordance with the OEB's cost of capital policy (EB-2009-0084) issued on December 11, 2009 (OEB Report). Toronto Hydro's debt to equity split for the test years is set at 60:40, with the debt component including a deemed 4% short-term debt component.

The OEB's filing requirements require explanations for material changes in actual capital structure or material differences between actual and deemed capital structure.

QUESTION (A) - (C):

a) Please provide Toronto Hydro's actual debt to equity ratio for each year 2020 to 2023.
b) Please explain any material differences between the actual debt to equity ratio for each year 2020 to 2023 and the deemed ratio of 60:40 previously used to set rates.
c) Please explain any material changes in the actual capital structure for the period 2020 to 2023, year-over-year.

RESPONSE (A) – (C):

Please see the table below for Toronto Hydro Consolidated (THC) debt-to-capital and debt-to-equity ratios. Toronto Hydro manages these ratios are the consolidated company level for the purpose of

enabling public debt issuances. As shown below, the average ratios over the current rate period are aligned with the OEB deemed capital structure.

Table 1: Toronto Hydro Consolidated Debt-to-Capital and Debt-to-Equity Ratio

	2020	2021	2022	2023	Average
Debt-to-Capital	57.1%	57.8%	60.0%	61.5%	59.1%
Debt-to-Equity	1.33	1.37	1.50	1.60	1.45

For the 2025-2029 rate period, Toronto Hydro proposes to continue to set its capital structure with a deemed debt-to-capital split of 60:40, with the debt component continuing to reflect a 4% short-term debt and 56% long-term debt structure.

/C

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT3.2:

Reference(s): 2B-AMPCO-29

Provide the list of distribution capital projects that are greater than $5 million and those that show a variance of either +20% or -15% (relating to distribution capital).

RESPONSE:

Of the planned distribution capital projects identified in 2B-AMPCO-29, there are two projects that were greater than $5 million with a variance of either +20% or -15%. Please see Table 1 below for descriptions of the projects and summary of the variances.

Table 1: Planned Distribution Capital Projects greater than $5 million with +20% / -15% Variance

Project Description	Portfolio / Project Overview	Project Variance Summary	Design Estimate	Actual Costs	Variance	
Load Demand P-180695-ZZ129001 Phase 2-P18 Transfer A256DN from A5-6DN to A5-6W TOA256DN	To maintain the Dufferin A5-6DN bus loading within firm capacity and provide capacity for conversion of 4kV Dupont feeders, new cables & load transfer.	The original design estimate did not account for all required contractor costs. Additional civil and electrical work was also required due to unforeseen site conditions found during execution (increasing material and labour costs).	$3.5M	$5.2M	$1.6M	+65%
Load Demand P-150129-XD129001 Esplanade to Copeland Phase 3	Load transfer from Esplanade TS to Copeland TS for capacity planning.	Due to unforeseen site conditions found during execution, pumping of cable chambers and water removal services drove additional costs. City of Toronto requirements and customer coordination required work to be executed after hours, increasing labour costs.	$3.6M	$5.4M	$1.8M	+51%

/C

TORONTO HYDRO

Summary Report

Toronto Hydro-Electric System Limited
EB-2023-0195
Technical Conference
Schedule JT3.18
Appendix A
UPDATED: May 7, 2024
(91 Pages)

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Dat	WBS Responsible Cost	Designer Project DRP	Construction DRP
P-150129-XD129001	P0105264-X15308 Esplanade To Copeland Ph	09/10/2020	703620	FRANCIS SZTO	G HANLEY

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External		$1,924,060	$1,443,951	75.05%	$480,109
Labour		$21,388	$178,327	833.77%	-$156,939
Material		$1,655,651	$3,794,329	229.17%	-$2,138,678
Vehicle			$5,975	#DIV/0!	-$5,975
Sum:		**$3,601,099**	**$5,422,582**	**150.58%**	**-$1,821,483**

Gap Analysis Required on: Total: Material & Labour

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: March 03,2021

Project Execution Supervisor Signoff:

Francis Szto

Name:

Date: **March 03,2021**

Gap Root Report

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project
P-150129-XD129001	P0105264-X15308 Esplanade To Copeland Ph	09/10/2020	3620	FRANCIS SZTO

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External		$1,924,060	$1,443,951	75.05%	$480,109
Labour		$21,388	$178,327	833.77%	-$156,939
Material		$1,655,651	$3,794,329	229.17%	-$2,138,678
Vehicle		$0	$5,975	#DIV/0!	-$5,975
Total:		**$3,601,099**	**$5,422,582**	**150.58%**	**-$1,821,483**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☒	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		There is a Mapping issue in the financial numbers provided in this file. The project commenced construction in 2017 with packaging in Ellipse. With the transfer of actuals from Ellipse to SAP during migration, the labour cost has been captured as material. **Below is correct breakdown :** Planned Material Cost: $1,655,651 Actual Material Cost: $1,858,443 **There was additional material required during construction such as cable clamps, insulating cradle, Cable heat shrinks which was not estimated in original design** Planned External Labour Costs : $1,924,060 Actual External Labour Costs: $2,829,276 **The majority of the additional external labour cost overrun is coming from the following** **1. Due to Site conditions and priority to get the project ready for Copeland Station load transfer, pumping of Cable chambers along Queens Quay because of excessive water in Cable chambers being next to Lake Ontario was required and had to be transported away with tankers ($300K)** **2. Cable installation and removal at along Esplanade on nights because of high traffic during days. This was on request of City work zone coordinators ($279K)** **3. Load transfer of pilot wire feeders on weekends for Royal Bank Plaza to limit customer outage on regular work hours ($40K)** **4. Feeder Switching costs which were not incorporated in the original estimate ($110K)** **5. COVID Premiums which were implemented in 2020 (10% of labour costs) and were not included in original estimate ($62K)** **6. Addition Design Fee and Inspection fee due increase in labour and material Costs ($50K)** **7. Additional Pay Duty officer to meet MCR Requirements ($40K)** Planned Internal Labour Costs: $21,388 Actual Internal Labour costs : $178,327 **The increase of these costs came from transfer of stations cost of $109K for the support work for this project. The remaining $68K increase was in the internal project management charges which were under estimated in the original estimate.**
Options / Solutions	♦	Incorporate Overtime and Switching Requirements in design stage
Recommendation	♦	Monitor Take-off sheets to include switching and OT units as required
Implementation Plan	♦	Discuss with Contractor designers to involve construction groups in creating estimates ,account for any planned OT to obtain accurate estimates
	♦	**Planned Date of Implementation** — March 31-2021
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project
P-150129-XD129001	P0105264-X15308 Esplanade To Copeland Ph	09/10/2020	3620	FRANCIS SZTO

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		There is a Mapping issue in the financial numbers provided in this file. The project commenced construction in 2017 with packaging in Ellipse. With the transfer of actuals from Ellipse to SAP during migration, the labour cost has been captured as material. Planned External Labour Costs : $1,924,060 Actual External Labour Costs: $2,829,276 **The majority of the additional external labour cost overrun is coming from the following** **1. Due to Site conditions and priority to get the project ready for Copeland Station load transfer, pumping of Cable chambers along Queens Quay because of excessive water in Cable chambers being next to Lake Ontario was required and had to be transported away with tankers ($330K)** **2. Cable installation and removal at along Esplanade on nights because of high traffic during days. This was on request of City work zone coordinators ($279K)** **3. Load transfer of pilot wire feeders on weekends for Royal Bank Plaza to limit customer outage on regular work hours ($40K)** **4. Feeder Switching costs which were not incorporated in the original estimate ($110K)** **5. COVID Premiums which were implemented in 2020 (10% of labour costs) and were not included in original estimate ($62K)** **6. Addition Design Fee and Inspection fee due increase in labour and material Costs ($50K)** **7. Additional Pay Duty officer to meet MCR Requirements ($40K)**
Options / Solutions	♦	Incorporate Overtime and Switching Requirements in design stage
Recommendation	♦	Monitor Take-off sheets to include switching and OT units as required
Implementation Plan	♦	Discuss with Contractor designers to involve construction groups in creating estimates ,account for any planned OT to obtain accurate estimates
	♦	**Planned Date of Implementation** — March 31-2021
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

Gap Root Report

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project
P-150129-XD129001	P0105264-X15308 Esplanade To Copeland Ph	09/10/2020	3620	FRANCIS SZTO

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☒	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		There is a Mapping issue in the financial numbers provided in this file. The project commenced construction in 2017 with packaging in Ellipse. With the transfer of actuals from Ellipse to SAP during migration, the labour cost has been captured as material. Planned Material Cost: $1,655,651 Actual Material Cost: $1,858,443 **There was additional material required during construction such as cable clamps, insulating cradle, Cable heat shrinks which was not estimated in original design**
Options / Solutions	♦	Verify Material requirements during design stage to account for any additional material not included in standards based on site and equipment condition
Recommendation	♦	Contractors should involve construction crews to obtain field feedback and requirements for material
Implementation Plan	♦	Discuss with Contractor designers to involve construction groups in creating estimates obtain accurate material requirements
	♦	**Planned Date of Implementation** — March 31-2021
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

Project Report Card

PDG-TMP-034 R1

TORONTO HYDRO

Scope #: W10118
Project Name Mosque Shalom DB UG Rebuild **Month Attained:** June 2020 **Project - RC:** PSO W

Ellipse Project #: P0129239 **Project DRP:** S. Remtulla / A. Shaikh **Construction DRP:** G. Hanley

SAP Project #: P-170183-WD102001 Valard (Designer)

Project Total Estimate $ 2,639,063.00 **Project Total Actuals** $ 4,436,070.00 168.09% % Actual of Estimate

	Estimate	Actuals	$ Variance	% Variance
Labour	$ 8,255.89	$ 72,642.00	$ 64,386.11	879.88%
Material	$ 192,126.29	$ 1,838,718.00	$ 1,646,591.71	957.04%
Vehicle	$ 198.83	$ 763.00	$ 564.17	383.74%
Other	$ 2,438,481.99	$ 2,523,947.00	$ 85,465.01	103.50%
Total	$ 2,639,063.00	$ 4,436,070.00	$ 1,797,007.00	168.09%

Total Project Variance over (+) under (-)
68.09%

Note:

Labour Variance Report Printed → Not Applicable Variance %

Material Variance Report Printed → Not Applicable Variance %

Variance % is per the EMRT Report

	Yes	No	N/A
Gap Analysis Required on:	Total $$		

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date:

Total $ Variance > $100k? Yes ☐ No ☐

Change Request Approved and explains labour and cost variances? Yes ☐ No ☐

If yes, Change Request #:

Root Cause Analysis Req'd Yes ☐ No ☐

Root Cause Analysis Complete: 19/10/2020 (Date) Adeem (Sign off)

Analysis Complete: (Date) (Sign off)

(where applicable)

Project Execution Supervisor Signoff:

Adeem Shaikh
Name:
Date: **19/10/2020**

Project Variance Analysis

W10118

Project Name:	Mosque Shalom DB UG Rebuild	Project #:	SAP: P-170183-WD102001	Ellipse: P0129239
Project RC:	PSO W	Project DRP:	A. Shaikh	

Gap Analysis ☒ **Total $$** ☐ **Labour Variance** ☐ **Material Variance**

Root Cause Analysis ☐

Cost Analysis

Total Project $$: ☒

	Estimate	Actuals	Variance
Labour	$ 8,255.89	$ 72,642.00	879.88%
Material	$ 192,126.29	$ 1,838,718.00	957.04%
Vehicle	$ 198.83	$ 763.00	383.74%
Other	$ 2,438,481.99	$ 2,523,947.00	103.50%
Totals →	**$ 2,639,063.00**	**$ 4,436,070.00**	**168.09%**

Category of Variance *Note: More than one category may be selected.*	☑	**Change in Scope of Work/Accounting for Contingency** (Change in scope of work; e.g., scope change $ (re-phased); contingencies not accounted for)
	☐	**Site Related & Coordination Issues** (Issues related to the site; includes situations not foreseen prior to construction, as well as, situations that could have been avoided with thorough inspection and other actions; also includes projects that experienced variance due to coordination issues with customers or other THESL project)
	☐	**Incorrect or Missed Charges** (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accrued)
	☐	**Missed Estimate/Estimate Issues** (Missed estimates or other estimate related issues; e.g., refinement of design, discretionary estimate items, detailed design errors (missing/additional units), etc.)
	☐	**External and Regulatory Factors** (City's restrictions, policy changes from other utilities, etc. that could not be feasibly be anticipated at the design stage)
	☐	**Change from Internal to External** (Change from internal to external due to resource or scheduling constraints)
	☐	**Overtime** (No provision for overtime work)
	☐	**Rate Changes** (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	**Assembly Unit (AU)/Compatible Unit (CU) Errors** (Errors in the breakdown or composition of AUs/CUs)
	☐	**Incorrect/additional material ordered** (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details *(Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and represents $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)*		**This project was taken over by me (Adeem) from Safik when Safik retired in June 2020. However, I was involved in this project from the beginning from administrative point of view.** **Due to control room not approving our schematic based on the actual wording of the scope document, we had to expand the scope to convert Shalom Cres and rise up on Martin Grove Rd via Milkwood Ave in order to complete the 27.6kV loop and eliminate 4kV. This ended up being an entire project on its own, which is why the cost became double of what was estimated. I have attached an excel document which outlines the detailed estimate and the actual final estimate for both parts (completed under the same WBS so that we could have one set of drawings/schematic showing the entire area as per control room demand). Please see the "W10118 Variance Analysis" tab for a detailed cost breakdown for this project.**

Options / Solutions ◆
Recommendation ◆
Implementation Plan ◆

- ***Planned Date of Implementation*** _____
- ***Actual Date of Implementation*** _____

Analysis Completed _____ **Analysis By:** Adeem Shaikh on behalf of Safik Remtulla

All Implementations Completed _____

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180174-XD193001	X18447 **EMERGENCY** 263 Yonge St LOC 48	#	#	30/10/2020	703623	BIAGIO CERAMI	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$710,839	$1,266,054	$1,001,015	140.82%	-$290,176
Labour	$39,508	$43,380	$66,948	169.45%	-$27,440
Material	$285,675	$377,235	$398,791	139.60%	-$113,116
Vehicle	$653	$653	$563	86.16%	$90
Sum:	**$1,036,675**	**$1,687,322**	**$1,467,317**	**141.54%**	**-$430,642**

Gap Analysis Required on: **Material & Labour**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: **April 26 2024**

Project Execution Supervisor Signoff:

Mike Wu

Name:

Date: **April 26, 2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Constructio
P-180174-XD193001	X18447 **EMERGENCY** 263 Yonge St LOC 48	#	#	30/10/2020	703623	BIAGIO CERAMI	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$710,839	$1,266,054	$1,001,015	140.82%	-$290,176
Labour	$39,508	$43,380	$66,948	169.45%	-$27,440
Material	$285,675	$377,235	$398,791	139.60%	-$113,116
Vehicle	$653	$653	$563	86.16%	$90
Total:	**$1,036,675**	**$1,687,322**	**$1,467,317**	**141.54%**	**-$430,642**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☒	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		$113k additional material cost mainly due to: - Planning's direction to upsize original 2x 500kVA transformers to 2x 750kVA transformers. - Additional network secondary copper quad cables connecting to adjacent chambers previously missed from design. - Rate escalation from DSAP time of 2018 to actual construction year of 2020. $290k additional contractor cost mainly due to: - COVID premium cost from 2020 to cover additional contractor expenses as essential service. - Night time premium to work on Yonge Street in front of the Mirvish Theatre entrance, per City WZC requests. - Additional work in vault and adjacent chambers to re-connect and re-rack network secondary cables. - Rate escalation from DSAP time of 2018 to actual construction year of 2020. $27k additional internal labour cost mainly due to: - Additional time to review scope change for transformer size upgrade, and additional project DRP time
Options / Solutions	♦	Create new DSAP estimate with scope change (upsize TX) and condition change (COVID)
Recommendation	♦	Maintain close 3-way communication with Planning and PMO to update project estimate budget.
Implementation Plan	♦	Conduct regular current estimate vs. DSAP estimate checks to flag changes
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Constructio
P-180174-XD193001	X18447 **EMERGENCY** 263 Yonge St LOC 48	#	#	30/10/2020	703623	BIAGIO CERAMI	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☒	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		$113k additional contractor cost mainly due to: - COVID premium cost from 2020 to cover additional contractor expenses as essential service. - Night time premium to work on Yonge Street in front of the Mirvish Theatre entrance, per City WZC requests. - Additional work in vault and adjacent chambers to re-connect and re-rack network secondary cables. - Rate escalation from DSAP time of 2018 to actual construction year of 2020.
Options / Solutions	♦	Create new DSAP estimate with scope change (upsize TX) and condition change (COVID)
Recommendation	♦	Maintain close 3-way communication with Planning and PMO to update project estimate budget.
Implementation Plan	♦	Conduct regular current estimate vs. DSAP estimate checks to flag changes
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Constructio
P-180174-XD193001	X18447 **EMERGENCY** 263 Yonge St LOC 48	#	#	30/10/2020	703623	BIAGIO CERAMI	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
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	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		$113k additional material cost mainly due to: - Planning's direction to upsize original 2x 500kVA transformers to 2x 750kVA transformers. - Additional network secondary copper quad cables connecting to adjacent chambers previously missed from design. - Rate escalation from DSAP time of 2018 to actual construction year of 2020.
Options / Solutions	♦	Create new DSAP estimate with scope change (upsize TX) and condition change (COVID)
Recommendation	♦	Maintain close 3-way communication with Planning and PMO to update project estimate budget.
Implementation Plan	♦	Conduct regular current estimate vs. DSAP estimate checks to flag changes
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180593-WD151001	P0139647-W14144 OH Rehab - Rockford/Ceda	#	#	28/08/2020	703620	AKIFF MAREDIA	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$889,313	$1,722,801	$1,572,834	176.86%	-$683,520
Labour	$0	$6	$71,382	44,614,000.00%	-$71,382
Material	$470,212	$583,400	$674,672	143.48%	-$204,459
Vehicle			$285		-$285
Sum:	**$1,359,526**	**$2,306,207**	**$2,319,172**	**170.59%**	**-$959,646**

Gap Analysis Required on: Total

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 01/05/2024

Project Execution Supervisor Signoff:

Adeem Shaikh

Name:

Date: **01/05/2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180593-WD151001	P0139647-W14144 OH Rehab - Rockford/Ceda	#	#	28/08/2020	703620	AKIFF MAREDIA	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$889,313	$1,722,801	$1,572,834	176.86%	-$683,520
Labour	$0	$6	$71,382	44,614,000.00%	-$71,382
Material	$470,212	$583,400	$674,672	143.48%	-$204,459
Vehicle			$285		-$285
Total:	**$1,359,526**	**$2,306,207**	**$2,319,172**	**170.59%**	**-$959,646**

Total Variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	X	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	X	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Several factors led to substantial increase in costs for this project. See breakdown below for labour and material cost overruns: Labour: Majority of the labour cost overrun was due to COVID-19 Labour premiums applied to all units, which was not accounted for in the planning estimate ($650K). Additional cost overruns are attributed to change in scope with addition for new primary conductor on Rockford Rd; string units and primary farming units, change to secondary bus from lashed to multiplex, tree-trimming, replacement of old poles in side street, Missing civil units and the additional civil portion at vault JMN ($200K) Material: Majority of the material cost overrun was due to additional poles, wires, cables/conductors that were required due to expansion of scope of work as outlined in the Labour cost overrun section above ($100K)
Options / Solutions	♦	Cost overrun accommodated with discussions from planning by offsetting lower priority scopes
Recommendation	♦	contractor must perform a thorough site visit to confirm scope of work before finalizing detailed estimate
Implementation Plan	♦	Change orders were submitted for all additional work due to scope change, and all COVID premiums paid.
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180605-WS170001	WPKG P0138927-S19246 Chapman MS Switchgear	#	#	15/07/2020	703310	ERIC ZHANG	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$317,359	$982,830	$1,027,952	323.91%	-$710,593
Labour	$219,254	$210,649	$59,938	27.34%	$159,316
Material	$624,393	$760,357	$805,525	129.01%	-$181,131
Vehicle	$9,083	$15,034	$603	6.64%	$8,480
Sum:	**$1,170,089**	**$1,968,870**	**$1,894,018**	**161.87%**	**-$723,929**

Gap Analysis Required on: **Total: Labour & Material**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: **April 26 2024**

Project Execution Supervisor Signoff:

Andrew Sandrasagra

Name:

Date: **26 April, 2024**

TORONTO HYDRO

Gap Root Report

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180605-WS170001	WPKG P0138927-S19246 Chapman MS Switchgear	#	#	15/07/2020	703310	ERIC ZHANG	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$317,359	$982,830	$1,027,952	323.91%	-$710,593
Labour	$219,254	$210,649	$59,938	27.34%	$159,316
Material	$624,393	$760,357	$805,525	129.01%	-$181,131
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Total:	**$1,170,089**	**$1,968,870**	**$1,894,018**	**161.87%**	**-$723,929**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
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Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		This is a legacy that was constructed during peak COVID pandemic period which resulted in unforeseen overruns in the form of switchgear assembly, materials, labour rates & scheduling. - $700K extra in missed estimate for Switchgear Assembly. - $159K in reduced internal labour because it was directed to external due to the pandemic. - $8.5K reduction in Vehicle costs due to labour being directed externally - $181K additional charges for extra switchgear materials due to the purchase of additional tools & parts that were missed in the detailed estimate.

Options / Solutions	♦		For complex downtown projects have additional buffer due to unpredictable nature of the site.
Recommendation	♦		Not applicable, pandemic is not possible to foresee.
Implementation Plan	♦		Going forward stations managers will ensure an additional buffer for large scale projects.
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180605-WS170001	WPKG P0138927-S19246 Chapman MS Switchgear	#	#	15/07/2020	703310	ERIC ZHANG	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
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Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		This is a legacy that was constructed during peak COVID pandemic period which resulted in unforeseen overruns in the form of switchgear assembly, materials, labour rates & scheduling. - $700K extra in missed estimate for Switchgear Assembly. - $159K in reduced internal labour because it was directed to external due to the pandemic. - $8.5K reduction in Vehicle costs due to labour being directed externally
Options / Solutions	♦	For complex downtown projects have additional buffer due to unpredictable nature of the site.
Recommendation	♦	Not applicable, pandemic is not possible to foresee.
Implementation Plan	♦	Going forward stations managers will ensure an additional buffer for large scale projects.
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180605-WS170001	WPKG P0138927-S19246 Chapman MS Switchgear	#	#	15/07/2020	703310	ERIC ZHANG	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		This is a legacy that was constructed during peak COVID pandemic period which resulted in unforeseen overruns in the form of switchgear assembly, materials, labour rates & scheduling. - $181K additional charges for extra switchgear materials due to the purchase of additional tools & parts that were missed in the detailed estimate.

Options / Solutions	♦		For complex downtown projects have additional buffer due to unpredictable nature of the site.
Recommendation	♦		Not applicable, pandemic is not possible to foresee.
Implementation Plan	♦		Going forward stations managers will ensure an additional buffer for large scale projects.
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180712-XD154003	X18365-Danforth 4kV Conv B4DA B1DA Part B	#	#	31/08/2020	703110	DUNCAN LEUNG	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$855,935	$1,686,884	$1,587,719	185.50%	-$731,784
Labour	$390,330	$229,292	$339,445	86.96%	$50,885
Material	$294,408	$269,245	$340,447	115.64%	-$46,039
Vehicle	$38,057	$19,181	$41,224	108.32%	-$3,167
Sum:	**$1,578,731**	**$2,204,601**	**$2,308,835**	**146.25%**	**-$730,105**

Gap Analysis Required on: **Total: Labour & Material**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: **April 28 2024**

Project Execution Supervisor Signoff:

Darar Abdissa

Name:

Date: **28 April, 2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180712-XD154003	X18365-Danforth 4kV Conv B4DA B1DA Part B	#	#	31/08/2020	703110	DUNCAN LEUNG	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
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Total:	**$1,578,731**	**$2,204,601**	**$2,308,835**	**146.25%**	**-$730,105**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☒	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		A total external variance of **$731,784** was due to additional external resource requirements during the construction of this project. Due to this project being located in the middle of the road on Danforth Ave, the work was completed after hours thus incurred an additional **$32,118** for shift premium and **$35,043.49** for paid duty. There as an additional **$90,345** accrued for road cut restoration due to the additional work that was required such as the following: **$50,036** for additional break & ties as well as handling asbestos ducts. **$261,167** for breaking out and rebuilding cable chambers (CC) and CC necks during construction. **$162,407** for additional test pits, duct relocations, extra depth requirements, pump and wash, core drilling, providing out ducts by man drilling, etc. **$149,319** for additional removal of abandoned gas mains and concrete structures below grade. **$63,670** for cable installation that was originally issued to internal crews. **$37,319** for additional auditor cost associated with the additional contractor cost. **$5,475** for Covid-19 premium
Options / Solutions	♦	Determine the resource requirements such as external contractors prior to finalizing the detailed estimate in SAP. Preform test pits and inspections during the design stage to ensure that all of the required additional work can be added to the scope of work via the change request process. This would reduce the requirement to rebuild chambers during construction, and the additional road cut restoration required. Also, since the location of the project is known to be a high traffic area, estimate for shift premium, paid duty and OTS in the detailed estimate.
Recommendation	♦	Review the drawing, detailed estimate and external labour resources with design / construction manager and contractor before DSAP. Verify construction responsibilities prior to issuing the project to capture any contractor resources prior to DSAP. Preform test pits and inspections to better understand the construction feasibility prior to construction.
Implementation Plan	♦	Account for external labour resources during the material finalization meeting, and JIS review with contractors for all future projects.
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180712-XD154003	X18365-Danforth 4kV Conv B4DA B1DA Part B	#	#	31/08/2020	703110	DUNCAN LEUNG	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☒	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		A labour variance of **($50,885)** was due to the combination of changing resources from internal crews to contractors for cable installation and overtime requirement to complete the work. This project required full lane closures on Danforth Ave for our crews to splice the cable at the cable chambers thus was scheduled afterhours and incurred overtime charges. A vehicle variance of **$3,167** was due to COVID-19 vehicle sharing restrictions. Each crew member had to take their own vehicle to site.
Options / Solutions	♦	Determine the labour resources requirements prior to finalizing the detailed estimate in SAP. If the resource is to be reallocated from internal crews to contractors, a re-DSAP should be captured and a change request submitted as required.
Recommendation	♦	Complete the estimate, with a non-wrench time and have a Material Finalization meeting with the design and construction manager to review all labour requirements prior to design attainment. Re-DSAP as required.
Implementation Plan	♦	Account for internal labour resources during the material finalization meeting for all future projects.
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180712-XD154003	X18365-Danforth 4kV Conv B4DA B1DA Part B	#	#	31/08/2020	703110	DUNCAN LEUNG	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☒	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Approximately **$46,000.00** of additional material (i.e.. 500 Kcmil Cu, Splice Kits, Cable Racking, …) was issued during construction. The additional 500 kcmil Cu cable that was issued was not returned to this project prior to project closeout in SAP as the cable was originally issued to internal crews but due to resource balancing, contractors ended up installing the cable. This transfer of cable also attributed to the missing / unreturned cable. Some of the additional material like cable, splice kits and cable racking was required during construction to complete the project.
Options / Solutions	♦	Determine the material resource requirements such as underground cable, racking in cable chambers, and splice kit quantities prior to finalizing the detailed estimate in SAP.
Recommendation	♦	Conduct field measurements to determine cable lengths and material requirements with the construction manager / contractor as required. Complete a Material Finalization meeting with the design and construction manager to review all material prior to design attainment.
Implementation Plan	♦	Create a take off list to verify all material quantity prior to DSAP for future projects. This list can be used to verify the material estimated quantities and to verify the actuals and material returns. Have a post-construction meeting to ensure all of the extra material is returned prior to TECO.
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-212222-WD124001	W17257 Horner TS Egress Ph-01/CIVIL	25/11/2020	703160	JOHN TRYBEL	JOHN TRYBEL

Cost Category	Planned Cost (DSAP)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$2,592,405	$3,983,671	153.67%	-$1,391,265
Labour	$26,169	$150,861	576.49%	-$124,692
Material		$851	#DIV/0!	-$851
Vehicle		$2,564	#DIV/0!	-$2,564
Sum:	**$2,618,574**	**$4,137,947**	**158.02%**	**-$1,519,373**

Gap Analysis Required on: **Total $$**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 30 April, 2022

Project Execution Supervisor Signoff:

John Trybel

Name:

Date: **30 April, 2022**

WBS Element Level 2	WBS Element Level 2 Description		WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-212222-WD124001	W17257 Horner TS Egress Ph-01/CIVIL		703160	JOHN TRYBEL	JOHN TRYBEL

Cost Category	Planned Cost (DSAP)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$2,592,405	$3,983,671	153.67%	-$1,391,265
Labour	$26,169	$150,861	576.49%	-$124,692
Material		$851	#DIV/0!	-$851
Vehicle		$2,564	#DIV/0!	-$2,564
Total:	**$2,618,574**	**$4,137,947**	**158.02%**	**-$1,519,373**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. Additional Contractor charges due to digging in shale 2. Additional Contractor charges due to greater civil work on the corner of Horner Ave and Kipling Ave 3. Additional Contractor charges due to overtime. 4. Additional Contractor charges due to 10% Covid premium. 5. Additional Contractor charges due to dewatering in project area. 6. Additional Contractor charges for cable chamber digging and grounding.
Options / Solutions	♦	1. Amend the unit price contract to include proper unit for digging in shale
Recommendation	♦	
Implementation Plan	♦	Communicate out PVA issues and resolutions at next design meeting.
	♦	**Planned Date of Implementation** 01-Jun-22
	♦	**Actual Date of Implementation**
Analysis Completed	Yes	
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-170127-XD175004	P0130789-X11423 Stage 10&11	11/11/2021	703160	JOHN TRYBEL	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,032,997	$1,098,127	$964,505	93.37%	$68,492
Labour	$119,865	$119,859	$1,842,118	1,536.83%	-$1,722,253
Material	$296,524	$184,381	$593,072	200.01%	-$296,548
Vehicle	$22,332	$22,921	$160,903	720.52%	-$138,572
Sum:	**$1,471,717**	**$1,425,289**	**$3,560,598**	**241.93%**	**-$2,088,881**

Gap Analysis Required on: **$3,560,598**

Out of $3.6M, only $1.5M is DCW charges to this project. Rest are stations and PMO transfers.

Gap Analysis Completion Date: 05-Jul-22

Project Execution Supervisor Signoff:

Alli Jenkins

Name:

Date: **5-July-2022**

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-170127-XD175004	P0130789-X11423 Stage 10&11	11/11/2021	703160	JOHN TRYBEL	#

Table 1- Current PVA Table with Stations Cost not excluded

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,032,997	$1,098,127	$964,505	93.37%	$68,492
Labour	$119,865	$119,859	$1,842,118	1,536.83%	-$1,722,253
Material	$296,524	$184,381	$593,072	200.01%	-$296,548
Vehicle	$22,332	$22,921	$160,903	720.52%	-$138,571
Total:	**$1,471,717**	**$1,425,289**	**$3,560,598**	**241.93%**	**-$2,088,881**

Table 3- Summary of PVA Trigger

Stations + DCW Cost	$ 3,555,089.00
DCW Charges to X11423 St 10 & 11	$ 1,543,974.00
Approximate Station Charges	$ 2,011,115.00

These charges are coming from the WBS level. DCW is responsible for PM order charges, CJI3 with WBS level charges has been provided in CJI3 Extract Tab highlighted yellow

Table 2-DCW charges only (PM order Level)

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,032,997	$1,098,127	$726,391	70.32%	$306,606
Labour	$119,865	$119,859	$454,100	378.84%	-$334,235
Material	$296,524	$184,381	$297,425	100.30%	-$901
Vehicle	$22,332	$22,921	$66,058	295.81%	-$43,727
Total:	**$1,471,717**	**$1,425,288**	**$1,543,974**	**104.91%**	**-$72,257**

Total Variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	X	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	X	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
		Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	X	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1) Charges were transferred into X11423 Stage 10/11 (P-170127-XD175004) from stations project P-170383-XS129001 . These charges were not identified at the time the PVA was triggered. 2) Please see table 2 above and table 3 for details as to DCW charges for project X11423 being $1.54M. 3) EAR + AFUDC for the entire project adds up to $705k. 4) Hence there were $2M of charges added to the WBS P-170127-XD175004 which should not be counted in the DCW PVA. 5) Table 2 is formulated from only DCW charges to this project using PM order data, which shows that our overall variance from plan is 4% higher than actual. 6) Please remove PVA requirement for this project as well as update KPI as variance is 4% and less than the required 20% for PVA.
Options / Solutions	♦	1) PMO to separate station costs before triggering PVA.
Recommendation	♦	1) PMO to separate station costs before triggering PVA.
Implementation Plan	♦	1) PMO to separate station costs before triggering PVA.
	♦	**Planned Date of Implementation** 05-Jul-22
	♦	**Actual Date of Implementation** 05-Jul-22
Analysis Completed	Y	
All Implementations Completed	Y	

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-170127-XD175004	P0130789-X11423 Stage 10&11	11/11/2021	703160	JOHN TRYBEL	#

Table 1- Current PVA Table with Stations Cost not excluded

Table 3- Summary of PVA Trigger

Labour variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
		Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
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		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	X	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1) Internal labour charges were $334k over estimate resulting in internal labour charges of $454k. 2) External Labour charges were $306k under estimate resulting in external labour charges of $726k. 3) Due to the nature of this project, it was being designed at the same time as construction was on going. However, internal overages and external overestimates more or less cancel each other out on the dollar value scale. 4) Hence overall variance % in table 2 above is 4% above estimate cost. 5) Due to nature of project, in front of CN tower, and internal employees retiring during course of project caused the internal/external labour ratio to alter, due to access issues, evenings would be required.
Options / Solutions	♦	1) Keep additional buffer for downtown projects in case there is conflict with third parties during construction. 2) Keep in mind, staff turnover when planning the project.
Recommendation	♦	1) Keep additional buffer for downtown projects in case there is conflict with third parties during construction.
Implementation Plan	♦	1) Will ask planning for contingencies for high profile downtown projects at the time of issuance.
	♦	**Planned Date of Implementation** 05-Jul-22
	♦	**Actual Date of Implementation** 05-Jul-22
Analysis Completed	Y	
All Implementations Completed	Y	

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-170127-XD175004	P0130789-X11423 Stage 10&11	11/11/2021	703160	JOHN TRYBEL	#

Table 1- Current PVA Table with Stations Cost not excluded

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1) DCW material charges on pm order level were $297,425 which is only 0.3% above the DSAP value for material charges. Hence the material section does not require PVA. 2) Reason PVA is triggered on material is that stations project costs P-170383-XS129001 were transferred in to DCW project P-170127-XD175004 which should have been flagged before starting PVA.
Options / Solutions	♦	1) PMO to separate station costs before triggering PVA.
Recommendation	♦	1) PMO to separate station costs before triggering PVA.
Implementation Plan	♦	1) PMO to separate station costs before triggering PVA.
	♦	**Planned Date of Implementation** 05-Jul-22
	♦	**Actual Date of Implementation** 05-Jul-22
Analysis Completed	Y	
All Implementations Completed	Y	

Table 3- Summary of PVA Trigger

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-170287-XD154002	X18331 Convert Runnymede MS B2RD from 4k	31/05/2021	703620	ANGELA LI	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$2,248,217	$3,089,625	$3,402,828	151.36%	-$1,154,611
Labour	$20,982	$20,982	$51,972	247.69%	-$30,990
Material	$465,145	$490,055	$676,180	145.37%	-$211,035
Vehicle	$392	$392	$123	31.40%	$269
Sum:	**$2,734,736**	**$3,601,055**	**$4,131,103**	**151.06%**	**-$1,396,367**

Gap Analysis Required on: **Total $$, Labour, & Material Variance**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 21 October, 2021

Project Execution Supervisor Signoff:

Angela Li (signed)

Name:

Date: **21 October, 2021**

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	onstruction DR
P-170287-XD154002	X18331 Convert Runnymede MS B2RD from 4k	31/05/2021	703620	ANGELA LI	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$2,248,217	$3,089,625	$3,402,828	151.36%	-$1,154,611
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Total:	**$2,734,736**	**$3,601,055**	**$4,131,103**	**151.06%**	**-$1,396,367**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☒	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1.Box premium which is not part of the UPCMS contract but is paid based on % of the units involving conversion of box poles to new standard installations- $118k 2. COVID premiums are not factored in the estimate but are paid based on construction cost: $110K 3. Design Estimate include TRXLPE cable removal where as actual cable removed was PILC, the variance was $117K 4. Due to condition of existing services unknown at the time of design causing potential hazard to the public, 204 services had to updated during construction, 10 services were included in estimate, rest charged as a change order causing a variance of $143K 5. Underestimated pay duty officer hrs- Variance of $35K 6. Because of the field conditions, additional material was required to replace poles and services: $213K 7.Pole 759 had to be replaced because of site conditions - $60K 8. Increased the design and inspection cost based on the project cost increase 9. Customer issues during the project, had to accommodate the requests resulting in additional cost -$44K 10.Third party pole accrual was higher than planned -26K
Options / Solutions	♦	1.Discuss estimate quality with contractors. Incorporate site conditions as much as possible 2. Capture COVID Premium estimates in SAP before DSAP
Recommendation	♦	1.Discuss estimate quality with contractors. Incorporate site conditions as much as possible 2. Capture COVID Premium estimates in SAP before DSAP
Implementation Plan	♦	Discuss estimates with contractors in the next design meeting
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	onstruction DR
P-170287-XD154002	X18331 Convert Runnymede MS B2RD from 4k	31/05/2021	703620	ANGELA LI	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1.Box premium which is not part of the UPCMS contract was agreed to be paid based on % of the units involving conversion of box poles to new standard installations $118k 2. COVID premiums were not factored in the estimate but are paid based on construction cost: $110K 3. Design Estimate include TRXLPE cable removal where as actual cable removed was PILC, the variance was $117K 4. Due to condition of existing services unknown at the time of design causing potential hazard to the public, 204 services had to updated during construction, 10 services were included in estimate, rest charged as a change order causing a variance of $143K 5. Underestimated pay duty officer hrs- Variance of $35K 6. Materials missed in the original BOM and additional materials based on field condition (service wires, poles, miniwedges, ampact connectors): $213K 7. Legacy duct structure required replacement relocation at base of P759 due to proximity to pole $60K 8. Increased design and inspection cost based on the project cost increase 9.Third party pole accrual was higher than planned 26K
Options / Solutions	♦	1.Discuss estimate quality with contractors. Incorporate site conditions as much as possible 2. Capture COVID Premium estimates in SAP before DSAP
Recommendation	♦	1.Discuss estimate quality with contractors. Incorporate site conditions as much as possible 2. Capture COVID Premium estimates in SAP before DSAP
Implementation Plan	♦	Discuss estimates with contractors in the next design meeting Bring up COVID premium estimation plan with CPW team during next OSR
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	onstruction DR
P-170287-XD154002	X18331 Convert Runnymede MS B2RD from 4k	31/05/2021	703620	ANGELA LI	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
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	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☒	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Additional Material required upgrade old/damaged assets
Options / Solutions	♦	1.Discuss estimate quality with contractors. Incorporate site conditions as much as possible
Recommendation	♦	1.Discuss estimate quality with contractors. Incorporate site conditions as much as possible
Implementation Plan	♦	Discuss estimates with contractors in the next design meeting
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180268-WD151001	P0135844-W14665 Royal York and Westridge	#	#	29/10/2021	703620	SAFIK REMTULLA	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$829,231	$775,427	$1,123,123	135.44%	-$293,893
Labour			$60,732		-$60,732
Material	$513,696	$459,892	$659,438	128.37%	-$145,742
Vehicle			$251		-$251
Sum:	**$1,342,927**		**$1,843,544**	**137.28%**	**-$500,617**

Gap Analysis Required on: **Total**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: **April 26 2024**

Project Execution Supervisor Signoff:

on behalf of Safik Remtulla as execution CA

Name: Angela Li

Note: The project was executed throughout 2018 to 2020 under execution CA, however not attained or closed out for approx. 1 year, a small portion due to Covid (minimal customer outages allowed). Upon Safik's retirement, the unfinished portion was carved out to formulate Part 2 of the project and this phase was financially closed out in 2021 to minimize aged CWIP.

Date: April 26, 2024

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180268-WD151001	P0135844-W14665 Royal York and Westridge	#	#	29/10/2021	703620	SAFIK REMTULLA	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$829,231		$1,123,123	135.44%	-$293,893
Labour			$60,732		-$60,732
Material	$513,696		$659,438	128.37%	-$145,742
Vehicle			$251		-$251
Total:	**$1,342,927**		**$1,843,544**	137.28%	**-$500,617**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
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Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		**The project was packaged (detailed design) in Ellipse in 2018 before SAP was implemented. The High level Planning estimate was $1.087m where as the detailed estimate was $1.34m which was approved through a change request. The transition to ellipse happened in 2018/2019 and the project costs were moved to SAP. However, the DSAP estimate was never updated. The numbers are manually updated in above table such that a comparison can be completed from the detailed estimate to the actual cost** **The project was executed throughout 2018 to 2020 under execution CA, however not attained or closed out for approximately 1 year, a small portion due to Covid (minimal customer outages allowed). Upon execution CA's retirement, the unfinished portion was carved out to formulate Part 2 of the project and this phase was financially closed out in 2021 to minimize aged CWIP.** **External Costs variance:** **There were additional change orders for the either increase in the scope of work ($159K) for additional work due to site conditions ($100K). There were OT request for Weekend outages to accommodate multiple customers (multi-residential and commercial) to prevent outages during business hours that led to additional costs as well ($75K). The additional electrical and civil work due to site conditions or scope changes included** **1. Installing /Removing the submersible transformers and vaults as per revised design due to site conditions** **2. Installing temporary transformers to generate power for the contractor building the high rise,** **3. Reframing the poles to provide extra clearance for stringing** **4. Additional streetlighting transfer** **5. Installing splice box to existing direct buried cable** **6. Additional pole install required based on revised design and on site pole conditions** **7. Side walk restoration to ensure pedestrian safety** **Material Costs variance:** **Due to the increase in the scope and site conditions additional material such as transformers were required during construction that led to an increase in the material costs**
Options / Solutions	♦	Additional site inspections during design to avoid scope expansion during execution
Recommendation	♦	Discuss importance of inspection with designers during design and scope validation with Planning
Implementation Plan	♦	Discuss the recommendation at next design meeting
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-183220-XD183260	X18326 - G&D NW Automation - Phase 3	25/03/2021	703621	ROBERT FANONE	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$526,868	$872,244	$844,258	160.24%	-$317,389
Labour	$41,052	$40,883	$125,143	304.84%	-$84,092
Material	$771,309	$1,067,150	$939,481	121.80%	-$168,172
Vehicle			$15,471		-$15,471
Sum:	**$1,339,229**	**$1,980,277**	**$1,924,353**	**143.69%**	**-$585,124**

Gap Analysis Required on: **Total $$, Labour Variance**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 24-Nov-21

Project Execution Supervisor Signoff:

Robert Fanone

Name:

Date: Nov 24, 2021

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-183220-XD183260	X18326 - G&D NW Automation - Phase 3	25/03/2021	703621	ROBERT FANONE	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$526,868	$872,244	$844,258	160.24%	-$317,389
Labour	$41,052	$40,883	$125,143	304.84%	-$84,092
Material	$771,309	$1,067,150	$939,481	121.80%	-$168,172
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Total:	**$1,339,229**	**$1,980,277**	**$1,924,353**	**143.69%**	**-$585,124**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. Material Cost rate inflation. Defective Communication boxes and relays which caused the cost increase $185,605.46 in Materials. 2. Labour Cost rate inflation. Covid Premium cost since work was done during 2021 covid time. Station commissioning cost was underestimated in HL estimate. - Detailed estimate and actual cost are very close.
Options / Solutions	♦	1 Covid Premium cost will be reduced as situation gets better
Recommendation	♦	2. Work with stations and planning to determine an accurate estimate for station commissioning cost.
Implementation Plan	♦	
	♦	**Planned Date of Implementation** 24-Nov-21
	♦	**Actual Date of Implementation** 24-Nov-21
Analysis Completed		24-Nov-21
All Implementations Completed	Ongoing	

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-183220-XD183260	X18326 - G&D NW Automation - Phase 3	25/03/2021	703621	ROBERT FANONE	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)	
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)	
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	☑	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)	
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)	
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)	
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Material Cost rate inflation. Defective Communication boxes and relays need to be reordered which caused the cost increase $185,605.46 in Materials.	
Options / Solutions	♦		Order new materials to replace defective equipment
Recommendation	♦		Communication Boxes and relays should be testing in 500 Commissioners Tank before issuing
Implementation Plan	♦		Have defective equipment returned.
	♦	**Planned Date of Implementation**	24-Nov-21
	♦	**Actual Date of Implementation**	24-Nov-21
Analysis Completed		**24/11/2021**	
All Implementations Completed	Ongoing		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-183220-XD183260	X18326 - G&D NW Automation - Phase 3	25/03/2021	703621	ROBERT FANONE	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
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	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Labour Cost rate inflation. Covid Premium cost since work was done during 2021 covid time. Station commissioning cost was underestimated in HL estimate.
Options / Solutions	♦	Work with stations to get an accurate commissioning cost and have planning included in HL estimates
Recommendation	♦	PMO is working on analyzing unit price to commission 1 location.
Implementation Plan	♦	
	♦	**Planned Date of Implementation** 24-Nov-21
	♦	**Actual Date of Implementation** 24-Nov-21
Analysis Completed	Y	**24/11/2021**
All Implementations Completed	Ongoing	

TORONTO HYDRO

Summary Report

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190206-XD193001	X16745 4298 Vault Decommissioning and Sec	16/12/2021	703623	TSEGAYE BIRRU	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,396,459	$2,164,042	$1,901,002	136.13%	-$504,543
Labour	$28,906	$22,515	$124,764	431.61%	-$95,857
Material	$174,314	$467,368	$480,621	275.72%	-$306,307
Vehicle	$522	$850	$105	20.13%	$417
Sum:	**$1,600,202**	**$2,654,775**	**$2,506,492**	**156.64%**	**-$906,290**

Gap Analysis Required on: **Total $$**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 27-May-22

Project Execution Supervisor Signoff:

Tsegaye Birru

Name:

Date: **May 27, 2022**

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190206-XD193001	X16745 4298 Vault Decommissioning and Sec	16/12/2021	703623	TSEGAYE BIRRU	#

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Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. Planned cost (DSAP) is inaccurate due to site related restrictions on the road cut permit from the city, due to this project being in a highly congested area (Bay St. & King St. W.) and therefore the condition of the road cut permits from the city is night time only OT work, driving up the labour costs. Also, a portion of the estimate was missed due to detailed design errors, and later included, adding to the gap. Overall the premium and missed portion accounts for approx. $637,372.89 labour cost increase. 2. This project was initially designed in 2019, and material ordered at the time in preparation for work. However, the project did not go until 2021, and this resulted in material requiring reordering due to misplacement and changes in material requirement through design updates.
Options / Solutions	♦	1. Discussed with planning and contractors to ensure in the future site related issues are planned for in advance by understanding the location of work, such as highly congested areas requiring special requirements to work in.
Recommendation	♦	2. DSAP process has been reviewed internally and finalized to ensure the status is changed once all estimates and materials are in place to avoid missing estimate issues in the future. And that material is not prematurely ordered until detailed design is confirmed.
Implementation Plan	♦	
	♦	**Planned Date of Implementation** May-27-22
	♦	**Actual Date of Implementation** May-27-22
Analysis Completed		Mircea Papuc
All Implementations Completed	Ongoing	

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Labour variance

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Options / Solutions	♦	1. Discussed with planning and contractors to ensure in the future site related issues are planned for in advance by understanding the location of work, such as highly congested areas requiring special requirements to work in.
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Material Variance

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Options / Solutions	♦	1. DSAP process has been reviewed internally and finalized to ensure the status is changed once all estimates and materials are in place to avoid missing estimate issues in the future. And that material is not prematurely ordered until detailed design is confirmed.
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation** May-27-22
	♦	**Actual Date of Implementation** May-27-22
Analysis Completed		Mircea Papuc
All Implementations Completed	Ongoing	

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190519-XD175001	X12414 - Strachan TS Feeder Transfer fro	30/06/2021	703160	FEI CHEN	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$569,234	$1,688,841	$1,141,219	200.48%	-$571,985
Labour	$163,092	$112,092	$1,312,036	804.48%	-$1,148,944
Material	$764,925	$835,729	$1,012,431	132.36%	-$247,506
Vehicle	$6,700	$9,810	$114,245	1,705.19%	-$107,545
Sum:	**$1,503,950**	**$2,646,473**	**$3,579,930**	**238.04%**	**-$2,075,981**

Gap Analysis Required on: **Total $$, Labour, & Material**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: Nov.17, 2021

Project Execution Supervisor Signoff:

Faye Chen

Name:

Date: **Nov.17, 2021**

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190519-XD175001	X12414 - Strachan TS Feeder Transfer fro	30/06/2021	703160	FEI CHEN	#

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Total Variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
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Options / Solutions	♦	
Recommendation	♦	1. Add contingency costs in the project estimate 2. Ensure major category of costs are captured such as vehicles, external services 3. Ensure major assets such as cables and splices are captured in the design phase.
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed	Yes	
All Implementations Completed	Yes	

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P-190519-XD175001	X12414 - Strachan TS Feeder Transfer fro	30/06/2021	703160	FEI CHEN	#

Labour variance

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Options / Solutions	♦	
Recommendation	♦	Need to be consulted with construction supervisor during the planning and designing stage to confirm the approximate resource hour to do the job, specially the time required for isolating and restoring multiple feeders.
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
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Material Variance

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Options / Solutions	♦	
Recommendation	♦	Material finalization meeting should be held in case of complicated project like this.
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-193004-ZD161004	X18042 DAFOE STRACHAN PH4 Pt D	30/12/2021	703110	SUNNY PATEL	WILLIAM GRAHAM

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$366,073	$539,290	$562,906	153.77%	-$196,833
Labour	$331,922	$311,793	$678,217	204.33%	-$346,295
Material	$217,972	$340,889	$354,268	162.53%	-$136,296
Vehicle	$95,049	$96,428	$177,360	186.60%	-$82,311
Sum:	**$1,011,016**	**$1,288,400**	**$1,772,751**	**175.34%**	**-$761,735**

Gap Analysis Required on: **Total $$ & Labour Variance**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 27-May-22

Project Execution Supervisor Signoff:

Sunny Patel

Name:

Date: **27 May, 2022**

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-193004-ZD161004	X18042 DAFOE STRACHAN PH4 Pt D	30/12/2021	703110	SUNNY PATEL	WILLIAM GRAHAM

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Options / Solutions	♦		Investigate alternate methods to construct projects and add additional labour and vehicle hours to accommodate the crew size. Also, investigate if there are any additional work required by the contractor prior to construction.
Recommendation	♦		Determine construction execution steps prior to issuing to include labour, vehicle and material. Also, consult with contractor for any additional work required prior to construction.
Implementation Plan	♦		Review with planning group to include within the scope of work the construction method to utilize with the input of the outside staff
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-193004-ZD161004	X18042 DAFOE STRACHAN PH4 Pt D	30/12/2021	703110	SUNNY PATEL	WILLIAM GRAHAM

Labour variance

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	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		**There were several factors that drove the variance in SAP for this project.** **+$346.295k variance for Labour** - incremental construction labour costs due to Typical AUs account for one CCL+2 journeypersons. Realistically for the construction DRP, crews are a minimum of one CCL + 3 journeypersons + 2 L1 apprentices. Labour rates in SAP were updated as well. - incremental construction labor costs are also due to a significant amount of coordination involved with TTC to complete the conversion. TTC was required to transfer their trolley and feeder cables to our proposed poles prior to our secondary bus. - incremental of administrative support costs against project due to a huge amount of coordination with the contractor and the city for cut permit applications for unexpected civil work on Queen St W for clearing existing duct banks blockages on Queen St W.
Options / Solutions	♦	Investigate alternate methods to construct projects and add additional labour and vehicle hours to accommodate the crew size
Recommendation	♦	Determine construction execution steps prior to issuing to include labour, and vehicle.
Implementation Plan	♦	Review with planning group to include within the scope of work the construction method to utilize with the input of the outside staff
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-193004-ZD161004	X18042 DAFOE STRACHAN PH4 Pt D	30/12/2021	703110	SUNNY PATEL	WILLIAM GRAHAM

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		**There were several factors that drove the variance in SAP for this project.** **+137.3K variance for Material.** - in material costs due to additional primary and secondary cable replacement as recommended by construction DRP to reduce outages, as well as redesign due to ongoing new customer developments in the area since the original design and overall material price changes over the last couple years while in construction.

Options / Solutions	♦		Investigate alternate methods to construct projects and add additional material.
Recommendation	♦		Determine construction execution steps prior to issuing to include material.
Implementation Plan	♦		Review with planning group to include within the scope of work the construction method to utilize with the input of the outside staff
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-210166-XD139012	X21041 Charles Automation 2021 PSOE Ph1	#	#	20/09/2021	703623	ROBERT FANONE	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External		$1,373,673	$1,201,741	87.48%	$171,932
Labour		$20,698	$1,725	8.33%	$18,973
Material		$12,818	$1,094,137	8,536.01%	-$1,081,319
Sum:		**$1,407,188**	**$2,297,603**	**163.28%**	**-$890,415**

Gap Analysis Required on: **Total**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: **April 25 2024**

Project Execution Supervisor Signoff:

Sophia Jiang

Name:

Date: **April 25 2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-210166-XD139012	X21041 Charles Automation 2021 PSOE Ph1	#	#	20/09/2021	703623	ROBERT FANONE	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External		$1,373,673	$1,201,741	87.48%	$171,932
Labour		$20,698	$1,725	8.33%	$18,973
Material		$12,818	$1,094,137	8,536.01%	-$1,081,319
Total:		**$1,407,188**	**$2,297,603**	**163.28%**	**-$890,415**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		When project got created, it was under RC 703622 Grid Maintenance. During the construction, project got transferred over to 703623 Capital Project East. The planned costs are split between 2 RCs and 2 WBS P-210166-XD139011 and P-210166-XD139012. The total planned cost is $2,358,977.19 between 2 WBS. The variance between total planned cost $2,358,977.19 and total actual cost $2,297,602.98 is only 2.6%.
Options / Solutions	♦	Add the planned costs to the WBS P-210166-XD139012 which has all the actual costs.
Recommendation	♦	Ensure planned costs are properly allocated to the same WBS.
Implementation Plan	♦	Check planned costs in SAP.
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-210166-XD139034	X21043 Charles Automation 2021 PSOE Ph3	#	#	29/10/2021	703623	ROBERT FANONE	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$894,439		$877,767	98.14%	$16,672
Labour	$20,698		$418	2.02%	$20,280
Material	$202,457		$616,578	304.55%	-$414,121
Sum:	**$1,117,594**		**$1,494,763**	**133.75%**	**-$377,169**

Gap Analysis Required on: **Total**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: April 25 2024

Project Execution Supervisor Signoff:

Sophia Jiang

Name:

Date: **April 25 2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-210166-XD139034	X21043 Charles Automation 2021 PSOE Ph3	#	#	29/10/2021	703623	ROBERT FANONE	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$894,439		$877,767	98.14%	$16,672
Labour	$20,698		$418	2.02%	$20,280
Material	$202,457		$616,578	304.55%	-$414,121
Total:	**$1,117,594**		**$1,494,763**	**133.75%**	**-$377,169**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		When project got created, it was under RC 703622 Grid Maintenance. During the construction, project got transferred over to 703623 Capital Project East. The planned costs are split between 2 RCs and 2 WBS P-210166-XD139033 and P-210166-XD139034. The total planned cost is $1,557,229.06 between 2 WBS. The variance between total planned cost $1,557,229.06 and total actual cost $1,494,762.61 is only 4%.
Options / Solutions	♦	Add the planned costs to the WBS P-210166-XD139034 which has all the actual costs.
Recommendation	♦	Ensure planned costs are properly allocated to the same WBS.
Implementation Plan	♦	Check planned costs in SAP.
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

TORONTO HYDRO

Summary Report

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180021-XD155001	X18319 Hammersmith Network Conv	31/03/2022	703620	FANGXIN XU	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,033,286	$2,318,425	$1,750,354	169.40%	-$717,068
Labour	$0	$0	$75,641	47,275,531.25%	-$75,641
Material	$1,685,629	$1,899,677	$2,150,199	127.56%	-$464,570
Vehicle			$3,394		-$3,394
Sum:	**$2,718,915**	**$4,218,102**	**$3,979,587**	**146.37%**	**-$1,260,672**

Gap Analysis Required on: **Total $$, Labour, and Material**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 23 August, 2022

Project Execution Supervisor Signoff:

Francine Xu

Name:

Date: **23 August, 2022**

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180021-XD155001	X18319 Hammersmith Network Conv	31/03/2022	703620	FANGXIN XU	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,033,286	$2,318,425	$1,750,354	169.40%	-$717,068
Labour	$0	$0	$75,641	47,275,531.25%	-$75,641
Material	$1,685,629	$1,899,677	$2,150,199	127.56%	-$464,570
Vehicle			$3,394		-$3,394
Total:	**$2,718,915**	**$4,218,102**	**$3,979,587**	**146.37%**	**-$1,260,672**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. Civil & electrical labour costs were using 2018 rates when the job was ready for construction but the construction was in 2021; hence, there was an increase in labour rates over the three years 2. Planning requested relocation of secondary services from TTC pole in December 2020, resulting in a restoration cost of $24k which was not accounted for in the estimate 3. $50k variance in civil labour due to approved STAMP request to install concrete raised slab to install above grade tap box 4. $550k variance to electrical labour because 24 Cable Chambers were re-inspected after 3 years to capture any changes, switching cost for 4 feeders and 12 network transformers was difficult to accurately estimate during estimate, additional cost of extra crane to deliver material from THESL warehouse to Contractor's yard (as typically, the crane permit is only issued during weekends by the City, there was an additional OT cost as well), additional cost due to change of Standards (STD 16-0340 requirement of extra transition joints to do TRXPLE WYE point - 3 joints), new cables had to be pieced out and sleeved during construction as Primary XLPE cable was not long enough for new vac switch locations and cable racking units which were not accounted for in estimate were required for the 24 cable chambers and 6 vaults 5. There is a $220k material handling fee by warehouse which accounts for 48% of material variance 6. $88k variance due to legacy material as this job was packaged in Ellipse before. 7. $15k variance resulting from network transformers and protectors which were mounted and tested by internal staff that was not accounted for in estimate 8. Internal support shows as $0 as planned in SAP. However, it seems like this is an Ellipse/SAP migration problem as this job was packaged in Ellipse in March 2018. Please see supporting documents (Ellipse screenshot, manual DSAP for internal support hours screenshot). The actual variance for the internal support was $75k - $53k - $15k = $7k (i.e. CA, FA, students, COCO) over the three years.
Options / Solutions	♦	The construction should be completed after the design is attained. Delays beyond a year should be avoided due to changes in site conditions, Standards changes or conflicts with other projects that may occur.
Recommendation	♦	The construction should be completed after the design is attained. Delays beyond a year should be avoided due to changes in site conditions, Standards changes or conflicts with other projects that may occur.
Implementation Plan	♦	We have a change request (CR#400002603) that has been approved by Planning Manager and PMC
	♦	**Planned Date of Implementation** 23/08/2022
	♦	**Actual Date of Implementation** 23/08/2022
Analysis Completed	19/08/2022	
All Implementations Completed	23/08/2022	

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180021-XD155001	X18319 Hammersmith Network Conv	31/03/2022	703620	FANGXIN XU	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. $15k variance resulting from network transformers and protectors which were mounted and tested by internal staff that was not accounted for in estimate 2. Internal support shows as $0 as planned in SAP. However, it seems like this is an Ellipse/SAP migration problem as this job was packaged in Ellipse in March 2018. Please see supporting documents (Ellipse screenshot, manual DSAP for internal support hours screenshot). The actual variance for the internal support was $75k - $53k - $15k = $7k (i.e. CA, FA, students, COCO) over the three years.
Options / Solutions	♦	Internal support was estimated but due to Ellipse/SAP migration issue, it was not shown as planned.
Recommendation	♦	Internal support was estimated but due to Ellipse/SAP migration issue, it was not shown as planned.
Implementation Plan	♦	Internal support was estimated but due to Ellipse/SAP migration issue, it was not shown as planned.
	♦	**Planned Date of Implementation** 23/08/2022
	♦	**Actual Date of Implementation** 23/08/2022
Analysis Completed	19/08/2022	
All Implementations Completed	23/08/2022	

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180021-XD155001	X18319 Hammersmith Network Conv	31/03/2022	703620	FANGXIN XU	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
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	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. There is a $220k material handling fee by warehouse which accounts for 48% of material variance 2. $88k variance due to legacy material as this job was packaged in Ellipse before.
Options / Solutions	♦	Sometime material cost changes overtime, especially over a period of three years
Recommendation	♦	Sometime material cost changes overtime, especially over a period of three years
Implementation Plan	♦	Sometime material cost changes overtime, especially over a period of three years
	♦	**Planned Date of Implementation** 23/08/2022
	♦	**Actual Date of Implementation** 23/08/2022
Analysis Completed	19/08/2022	
All Implementations Completed	23/08/2022	

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180695-ZZ129001	X13470-X13470 Transfer A256DN to A5-6W 2	#	#	31/10/2022	703620	FRANCIS SZTO	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$2,412,111	$4,316,047	$4,003,194	165.96%	-$1,591,083
Labour	$48,677	$48,677	$277,010	569.08%	-$228,333
Material	$1,076,223	$748,451	$851,662	79.13%	$224,561
Vehicle	$1,294	$1,294	$26,289	2,031.27%	-$24,995
Sum:	**$3,538,305**	**$5,114,470**	**$5,158,155**	**145.78%**	**-$1,619,850**

Gap Analysis Required on: **Total $$, Labour and Material**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 30-Mar-23

Project Execution Supervisor Signoff:

Francis Szto

Name:

Date: **Mar 30, 2023**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180695-ZZ129001	X13470-X13470 Transfer A256DN to A5-6W 2	#	#	31/10/2022	703620	FRANCIS SZTO	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$2,412,111	$4,316,047	$4,003,194	165.96%	-$1,591,083
Labour	$48,677	$48,677	$277,010	569.08%	-$228,333
Material	$1,076,223	$748,451	$851,662	79.13%	$224,561
Vehicle	$1,294	$1,294	$26,289	2,031.27%	-$24,995
Total:	**$3,538,305**	**$5,114,470**	**$5,158,155**	**145.78%**	**-$1,619,850**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☒	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		See Labour variance and material variance details
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180695-ZZ129001	X13470-X13470 Transfer A256DN to A5-6W 2	#	#	31/10/2022	703620	FRANCIS SZTO	#

Labour variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
		Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	X	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
	X	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		$ 725,000 Electrical – Valard had misquoted cost of PILC removal unit 16-0304. An agreement was reached between TH and Valard management to compensate Valard for cost of this labour under the corrected cost as opposed to the original costs. $ 149,000 Electrical – Additional PILC removal units paid under updated unit pricing $ 242,000 Electrical – Framing, cable slices, guying installs and other misc. units not included on initial takeoff $ 72,000 Electrical – Nomenclature work required to relabel CCs the feeders within them. Work in CC 4751, 4752 for cable pulling, installation of splices and racking. Removal of A32W $ 62,000 Electrical – Work in Dufferin station to remove potheads and PILC, pulling in corresponding XLPE. Work in Dupont to abandon cable. In support of this, splicing in CC5631 and 15923 $ 37,000 Electrical – Work in Wiltshire Station and various CCs to pull new TRXLPE cable. Work to pull in 250kcmil 600V. Work in CCs 9889, 6401, 15923, 4939, 4938, for installation of splices $ 18,000 Electrical – Install wye joints and straight joints in CC 15922, CC15923 and CC5631 $ 16,000 Electrical – Sub-contractor invoicing for tree trimming, private restoration work $ 42,000 Civil – Additional work for break&tie and pole install due to existing hydro structure sitting at deep depth $ 28,000 Civil – Streetlight transfers and pole concrete bases not captured on initial takeoff $ 12,000 Civil – Cost paid as part of COVID-19 premiums $ 33,000 Electrical + Civil – This project requires the removal of this working dead-end which was installed by Entera on a previous project. As a dead-end has to be removed by the same people who installed it, these costs were paid to compensate Entera. $ 81,000 Design – Additional Design costs in accordance with increase in material and labour $ 76,000 Transfer – Stations transfer costs $ 68,000 Permanent Restoration – Perm Restoration costs and deferred pole accrual costs $ 49,000 Inspection – Increase inspection costs as in accordance with increase in labour
Options / Solutions	♦	Create new unit to capture the true cost and true scope of work for PILC cable removals
Recommendation	♦	Supply Chain to implement into SAP system
Implementation Plan	♦	New unit 16-0306 created and fully implemented into the contracts and will be used for all PILC removal going forward
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180695-ZZ129001	X13470-X13470 Transfer A256DN to A5-6W 2	#	#	31/10/2022	703620	FRANCIS SZTO	#

Material Variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
		Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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		Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	X	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Additional connectors, sleeves and splice kits required Cable caps, tags, grounding kits and other misc. items
Options / Solutions	♦	Fully capture all material on material required during design stage
Recommendation	♦	Ensure all items entered into SAP at time of project DSAP
Implementation Plan	♦	Review projects drawings and make provisions for possible additional materials as a result of field conditions
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180704-WD161001	WPKG W12767 P21 Urgent PILC Cable Repl	#	#	27/09/2022	703620	SARIM HUMAYUN	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$711,747	$1,613,937	$1,550,241	217.81%	-$838,495
Labour	$31,596	$36,874	$115,259	364.80%	-$83,664
Material	$474,634	$545,199	$504,813	106.36%	-$30,180
Vehicle	$522	$425	$1,261	241.41%	-$739
Sum:	**$1,218,498**	**$2,196,435**	**$2,171,575**	**178.22%**	**-$953,077**

Gap Analysis Required on: **Total $$ & Material**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 21/02/2023

Project Execution Supervisor Signoff: 

Name: Sarim Humayun

Date: 21/02/2023

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180704-WD161001	WPKG W12767 P21 Urgent PILC Cable Repl	#	#	27/09/2022	703620	SARIM HUMAYUN	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$711,747	$1,613,937	$1,550,241	217.81%	-$838,495
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Total:	**$1,218,498**	**$2,196,435**	**$2,171,575**	**178.22%**	**-$953,077**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
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	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
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Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Major cost variance was due to increase in external labour costs. Details are given in Labour section below
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180704-WD161001	WPKG W12767 P21 Urgent PILC Cable Repl	#	#	27/09/2022	703620	SARIM HUMAYUN	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		$280K of Stations labour cost in support of decommissioning old PILC and commissioning new TRXLPE feeder in Palmwood station. This was labelled as external costs within SAP $247K of labour variance was caused by the construction of new civil infrastructure not included in original scope. Ducts under Valhalla Inn Road were in very poor state. There was a great risk that the existing feeders could not be removed from them, or the ducts would collapse after them. No spare ducts were available in existing duct bank. New ducts were constructed to allow the new feeders to be pulled while keeping existing feeders energized. $206K of labour variance caused by labour unit cost escalation. Contractor had misquoted on various cable pulling and splicing units and an escalation process was approved by Procurement to compensate contractor to negotiated unit cost levels. $84K in permanent restoration was accrued to the project. The initial scope did not have civil work as detailed above.
Options / Solutions	♦	Increase the estimate of stations work to support decommissioning and commissioning of feeders. Request for through investigation of state of civil structure during planning phase
Recommendation	♦	Break up and re-issue scopes into civil and electrical phases so that relevant issues can be isolated to their respective projects. Perform civil inspection work during Planning and design phase
Implementation Plan	♦	Rod and mandrel ducts during design phase of upcoming Palmwood conversion scopes
	♦	**Planned Date of Implementation** 06/06/2023 (DD/MM/YY) according to design timelines of civil scopes
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180704-WD161001	WPKG W12767 P21 Urgent PILC Cable Repl	#	#	27/09/2022	703620	SARIM HUMAYUN	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☒	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Additional splice kits required for #2 PILC cable on the laterals
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190022-ED161002	WPKG E15593 Port Royal Circuit Reconfig.	#	#	29/11/2022	703110	Darar Abdissa	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,728,762	$3,024,605	$2,938,851	170.00%	-$1,210,089
Labour	$105,954	$105,954	$164,594	155.35%	-$58,640
Vehicle			$934		-$934
Sum:	**$1,834,716**	**$3,130,559**	**$3,104,379**	**169.20%**	**-$1,269,663**

Gap Analysis Required on: **Total $$ & Labour Variance**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 27 April, 2024

Project Execution Supervisor Signoff:

Darar Abdissa

Name: **27 April, 2024**

Date:

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190022-ED161002	WPKG E15593 Port Royal Circuit Reconfig.	#	#	29/11/2022	703110	Darar Abdissa	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,728,762	$3,024,605	$2,938,851	170.00%	-$1,210,089
Labour	$105,954	$105,954	$164,594	155.35%	-$58,640
Vehicle			$934		-$934
Total:	**$1,834,716**	**$3,130,559**	**$3,104,379**	**169.20%**	**-$1,269,663**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
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Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		**The total cost variance of $1,269,663 for this project was due to increased external, labour, material and vehicle resources for this project. See breakdown below and note that this project has an approved CR400002811.** (X:\Change Requests\1. CR Pre-Submission Approvals\Year of 2022\DCE - 3110\400002811) - A total external resource cost variance of **$1,210,089** was due to additional external resources required due to underground utilities that were in conflict with the original records that were provided by the Utilities for permitting. This led to additional road/sidewalk cuts and repair. Also, asbestos was identified in the field and required additional change orders to dispose remove and dispose. - A total labour cost variance of **$58,640** was due to the requirement of additional design resources during construction to update/issue revisions, support contractors during construction and engaging standards. - A total vehicle variance of **$934** was due to zero hours being estimated since the work was going to be fully executed by contractors, but pool vehicle were required for design and construction support. There was also TH construction crews site meetings and support required during the project that was not identified prior to project start.
Options / Solutions	♦	Determine the resource requirements such as external resources, field conditions, inspect the existing civil, and design time (based on the complexity of the project) prior to finalizing the detailed estimate in SAP (DSAP). Also, ensure all lagging costs are identified upfront.
Recommendation	♦	Conduct field visits with the project DRP, TH crews and external stakeholders during the project detailed estimate stage to identify and address all potential issues. The designer and design supervisor should review the detailed estimate thoroughly prior to packaging and approving the design. The detailed design cost should be updated to reflect the actual design time prior to finalizing the detailed estimate. Any time there is a business process change, change management process for in-flight projects should be implemented.
Implementation Plan	♦	Account for labour hours and material requirements based on field consultation and coordination meetings with all internal and external stakeholders for all future projects. Capture all legacy design/construction cost in the WBS prior to DSAP. Submit CR if required.
	♦	**Planned Date of Implementation** Future U/G Civil Rebuild Projects.
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

TORONTO HYDRO

Summary Report

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190182-XD154010	X18291 Danforth 4kV Conv Ph3-Pt 1-Ph B	#	#	16/12/2022	703110	SCOTT WILGOSH	Sean Fletcher

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$429,864	$583,007	$577,159	134.27%	-$147,294
Labour	$449,769	$450,565	$927,549	206.23%	-$477,780
Material	$442,449	$589,745	$548,035	123.86%	-$105,586
Vehicle	$162,831	$163,103	$241,663	148.41%	-$78,833
Sum:	**$1,484,914**	**$1,786,420**	**$2,294,407**	**154.51%**	**-$809,493**

Gap Analysis Required on: **Total $$ & Labour Variance**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 17-May-23

Project Execution Supervisor Signoff:

Scott Wilgosh

Name:

Date: **May 17, 2023**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190182-XD154010	X18291 Danforth 4kV Conv Ph3-Pt 1-Ph B	#	#	16/12/2022	703110	SCOTT WILGOSH	Sean Fletcher

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
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Vehicle	$162,831	$163,103	$241,663	148.41%	-$78,833
Total:	**$1,484,914**	**$1,786,420**	**$2,294,407**	**154.51%**	**-$809,493**

Total Variance

Category of Analysis Note: More than one category may be selected.	[x]	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	[x]	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	[ ]	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
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Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		**The Total Project Variance from DSAP ($1,484,914) to Actual ($2,294,407) = $809,493 or 55%.** For eight PM orders, 1000344959, 100344987, 1000344997, 1000345065, 1000345105, 1000345108, 1000271587 & 1000345109 the planned costs were $113,835.65 and the actual costs $879,520.84.19 for a variance of $765,685.19 for labor, materials and vehicle. - The labour variance is related to this project being a box construction project and not having the experience staff to safely execute the work so additional time has been incurred using the apprentices on the crew to execute the work. - The material variance is for additional cost incurred by the crews to remove the box construction and complete a 4kv underbuilt on new cross arms and install all 55ft poles to allow additional height to safely execute the voltage conversion. - The vehicle variance is a result of the staff having to travel to the site is separate vehicles to due to the COVID restrictions of one employee per vehicle. For PM order 1000271587 DCE Design the estimated cost was $30,718.62 to actual $118,254.92 for a variance of $87,536.30. - The designer for this project had to address numerous customer questions regarding the pole installation.
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed	Scott Wilgosh / Eugene Posada	
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190182-XD154010	X18291 Danforth 4kV Conv Ph3-Pt 1-Ph B	#	#	16/12/2022	703110	SCOTT WILGOSH	Sean Fletcher

Labour variance

Category of Analysis Note: More than one category may be selected.	x	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	x	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
		Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		**The Total Project Variance from DSAP ($1,484,914) to Actual ($2,294,407) = $809,493 or 55%.** For eight PM orders, 1000344959, 100344987, 1000344997, 1000345065, 1000345105, 1000345108, 1000271587 & 1000345109 the planned costs were $113,835.65 and the actual costs $879,520.84.19 for a variance of $765,685.19 for labor, materials and vehicle. - The labour variance is related to this project being a box construction project and not having the experience staff to safely execute the work so additional time has been incurred using the apprentices on the crew to execute the work. - The material variance is for additional cost incurred by the crews to remove the box construction and complete a 4kv underbuilt on new cross arms and install all 55ft poles to allow additional height to safely execute the voltage conversion. - The vehicle variance is a result of the staff having to travel to the site is separate vehicles to due to the COVID restrictions of one employee per vehicle. For PM order 1000271587 DCE Design the estimated cost was $30,718.62 to actual $118,254.92 for a variance of $87,536.30. - The designer for this project had to address numerous customer questions regarding the pole installation.
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed	Scott Wilgosh / Eugene Posada	
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190182-XD154010	X18291 Danforth 4kV Conv Ph3-Pt 1-Ph B	#	#	16/12/2022	703110	SCOTT WILGOSH	Sean Fletcher

Material Variance

Category of Analysis Note: More than one category may be selected.	x	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	x	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
		Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		**The Total Project Variance from DSAP ($1,484,914) to Actual ($2,294,407) = $809,493 or 55%.** For eight PM orders, 1000344959, 100344987, 1000344997, 1000345065, 1000345105, 1000345108, 1000271587 & 1000345109 the planned costs were $113,835.65 and the actual costs $879,520.84.19 for a variance of $765,685.19 for labor, materials and vehicle. - The labour variance is related to this project being a box construction project and not having the experience staff to safely execute the work so additional time has been incurred using the apprentices on the crew to execute the work. - The material variance is for additional cost incurred by the crews to remove the box construction and complete a 4kv underbuilt on new cross arms and install all 55ft poles to allow additional height to safely execute the voltage conversion. - The vehicle variance is a result of the staff having to travel to the site is separate vehicles to due to the COVID restrictions of one employee per vehicle. For PM order 1000271587 DCE Design the estimated cost was $30,718.62 to actual $118,254.92 for a variance of $87,536.30. - The designer for this project had to address numerous customer questions regarding the pole installation.
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed	Scott Wilgosh / Eugene Posada	
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190193-XD124002	X19210 Gerrard Carlaw New Tie Feeders Ph	#	#	27/05/2022	703620	FRANCIS SZTO	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance	
External	$673,763	$2,571,846	$2,510,604	372.62%	-$1,836,841	3.726243269
Labour	$26,137	$27,965	$297,784	1,139.31%	-$271,647	
Material	$1,462,141	$1,793,075	$1,739,392	118.96%	-$277,252	
Vehicle			$14,075		-$14,075	
Sum:	**$2,162,041**	**$4,392,886**	**$4,561,856**	**211.00%**	**-$2,399,815**	

Gap Analysis Required on: **Labour**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: **April 24 2024**

Project Execution Supervisor Signoff:

Francis Szto

Name: Francis Szto

Date: **April 24,2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190193-XD124002	X19210 Gerrard Carlaw New Tie Feeders Ph	#	#	27/05/2022	703620	FRANCIS SZTO	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$673,763	$2,571,846	$2,510,604	372.62%	-$1,836,841
Labour	$26,137	$27,965	$297,784	1,139.31%	-$271,647
Material	$1,462,141	$1,793,075	$1,739,392	118.96%	-$277,252
Vehicle			$14,075		-$14,075
Total:	**$2,162,041**	**$4,392,886**	**$4,561,856**	**211.00%**	**-$2,399,815**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		The Project was DSAP'd in 2019 with white design folder with the new A7EK-A8EK feeders were routed through cable chambers on the south side of Gerrard Street E using empty ducts vacated by the removal of the old A9EK-A10EK and once the new A7EK-A8EK were installed and energized, the existing non-PILC 1000kCmil cables for the existing A7EK-A8EK feeders on the north side of Gerrard Street E would be removed. The cable removal units for existing A7EK-A8EK were planned as cable removal for non-PILC cable per circuit-metres. It was determined that the civil infrastructure where the new A7EK-A8EK were planned to be routed through using the vacated ducts from the old A9EK-A10EK feeders might not be accessible. Based on the site conditions and discussion with Planning Department, a new proposal was made to use the old A9EK-A10EK (planned removal under X18096) as temporary A7EK-A8EK while the existing A7EK-A8EK running on the north side of Gerrard St W in newer civil infrastructure were removed for the installation of the new A7EK-A8EK. Once the new A7EK-A8EK were energized, the temporary A7EK-A8EK (using the old A9EK-A10EK) were removed under this project. The temporary A7EK-A8EK cables were 1000kCmil single conductor PILC cables which could not be paid by circuit-metre removal units. A total approx. 7400m of single conductor 1000kCmil PILC cables were removal resulting in the contactor labour cost increases of approx. $1.66m. The remaining $178K increase came from the following increases: -Term Contract unit price escalation since project was packaged in 2019 and construction started in 2021 ($30K), -Pump and wash of cable chambers due to excessive water ($15K), -Cable testing (10K), Additional T&M units to work inside the station pit ($65K), -Switching costs($3K) and -Additional design/inspection fee due to increase in labour and material costs ($52K). During covid in 2020-2021, the cost of all materials went up by almost 20% which led to the increase in the cost of material planned for this project even though the material quantities especially for the cable were lower by 10% based on the revised drawings . There were also costs for material that the stations team required to complete the transfer($10K) This scope also involved stations engineering and construction crew involvement to complete work at the station level so we can energize the line(Project #P-190012XS175002). In order to capitalize, the station cost was transferred to this project ($289K). The request was approved by Stations and capital projects leaders
Options / Solutions	♦	Inspections should be performed before finalizing the design to avoid design changes
Recommendation	♦	Contractor to conduct inspections during design to avoid changes and not design in a rush to meet attainments
Implementation Plan	♦	To discuss importance of proper inspections during design stage
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190193-XD124002	X19210 Gerrard Carlaw New Tie Feeders Ph	#	#	27/05/2022	703620	FRANCIS SZTO	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		This scope also involved stations engineering and construction crew involvement to complete work at the station level so we can energize the line(Project #P-190012XS175002). In order to capitalize, the station cost was transferred to this project ($289K). The request was approved by Stations and capital projects leaders
Options / Solutions	♦	Collaborate with PMO to include Stations dependence in the forecast plan and include station spending in capital projects estimates ahead of time
Recommendation	♦	Collaborate with PMO to include Stations dependence in the forecast plan and include station spending in capital projects estimates ahead of time
Implementation Plan	♦	Collaborate with PMO to include Stations dependence in the forecast plan and include station spending in capital projects estimates ahead of time
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190301-ED151001	E20035 Whitehorn Kingslake Rd OH VC SS68	19/04/2022	703623	TSEGAYE BIRRU	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$664,005		$970,937	146.22%	-$306,932
Labour	$23,047		$15,763	68.39%	$7,285
Material	$385,596		$545,045	141.35%	-$159,448
Vehicle	$653				$653
Sum:	**$1,073,301**		**$1,531,744**	**142.71%**	**-$458,443**

Gap Analysis Required on: **Total $$ & Labour**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 30-Sep-22

Project Execution Supervisor Signoff:

Tsegaye Birru

Name:

Date: **September 30, 2022**

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190301-ED151001	E20035 Whitehorn Kingslake Rd OH VC SS68	19/04/2022	703623	TSEGAYE BIRRU	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$664,005		$970,937	146.22%	-$306,932
Labour	$23,047		$15,763	68.39%	$7,285
Material	$385,596		$545,045	141.35%	-$159,448
Vehicle	$653				$653
Total:	**$1,073,301**		**$1,531,744**	**142.71%**	**-$458,443**

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. Site related issues occurred during this project which involved Change Orders to be submitted during the construction timeline. These were related to the various duct work including rerouting, core-drilling, trenching, break and ties, and finally extending the ducts. This was not captured in the design stage of the work mainly due to many years having passed since DSAP was completed. This accounted for approximately $120,000 worth of extra labour and additional material cost. 2. The estimate and design were completed in 2020, which meant there was a requirement to refine the design to account for changes on the system and in the field that were not previously identified. There was a requirement to replace the concrete lids for two locations due the conversion from existing switchgear pad to splice vault, resulting in labour of approximately $135,000. As well as other portions of the project change requiring transformer material changes of up $40,000. 3. Also there was requirement for OT for the school portion of the work, as well as rates/material costs majorly changing from the time of DSAP to the time of the project being done. OT, rate changes, pole removal, cut repairs, and COVID premium portions accounted for $41,965, while the drastic material cost increase accounted for $60,405.
Options / Solutions	♦	1. Discussed with the contractors to ensure we will conduct more thorough inspection during the design stage, to avoid high cost Change Orders required during construction.
Recommendation	♦	2. Worked with PMO and forecasting team to ensure there is a smaller gap between the design and implementation stage of projects. This way we can avoid the design missing changes on the system which need to be accounted for later, and also avoid large rate changes not being accounted for during DSAP, which were especially prominent during the pandemic with premiums and supply chain issues.
Implementation Plan	♦	
	♦	**Planned Date of Implementation** Sept-30-2022
	♦	**Actual Date of Implementation** Sept-30-2022
Analysis Completed		Mircea Papuc
All Implementations Completed	Ongoing	

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190301-ED151001	E20035 Whitehorn Kingslake Rd OH VC SS68	19/04/2022	703623	TSEGAYE BIRRU	#

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. Site related issues caused Change Orders being required for further labour for duct work including rerouting, core-drilling, trenching, break and ties, and finally extending the ducts. This was not captured in the design stage of the work mainly due to many years having passed since DSAP was completed. This accounted for approximately $95,000 worth of extra labour. 2. The labour estimate and design were completed in 2020, which resulted in design refinement being required for field issues found that required further labour. Replacing of the concrete lids for two locations due the conversion from existing switchgear pad to splice vault, labour cost of approximately $135,000. 3. Overtime was required in terms of labour for the school portion of the work, as well as labour rates majorly changing from the time of DSAP to the time of the project being done. OT, rate changes, pole removal, cut repairs, and COVID premium portions accounted for approximately $41,965 increase.
Options / Solutions	♦	1. Discussed with the contractors to ensure we will conduct more thorough inspection during the design stage, to avoid high cost Change Orders required during construction.
Recommendation	♦	2. Worked with PMO and forecasting team to ensure there is a smaller gap between the design and implementation stage of projects. This way we can avoid the design missing changes on the system which need to be accounted for later, and also avoid large rate changes not being accounted for during DSAP.
Implementation Plan	♦	
	♦	**Planned Date of Implementation** Sept-30-2022
	♦	**Actual Date of Implementation** Sept-30-2022
Analysis Completed		Mircea Papuc
All Implementations Completed	Ongoing	

WBS Element Level 2	WBS Element Level 2 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190301-ED151001	E20035 Whitehorn Kingslake Rd OH VC SS68	19/04/2022	703623	TSEGAYE BIRRU	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
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	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
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	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		1. Site related issues caused Change Orders being required for duct work including rerouting, core-drilling, trenching, break and ties, and finally extending the ducts. This was not captured in the design stage of the work mainly due to many years having passed since DSAP was completed. This required any additional $25,000 worth of secondary and primary cable, and lugs to be ordered. 2. The estimate and design were completed in 2020, which meant there was a requirement to refine the design and order additional material due to field changes not previously found. Portions of the project change required transformer material changes of up $40,000. 3. Material costs majorly changed from the time of DSAP to the time of the project being done. This was mainly the pandemic increasing the costs on the supply chain side of various materials, the material cost increase accounted for $60,405.
Options / Solutions	♦	1. Discussed with the contractors to ensure we will conduct more thorough inspection during the design stage, to ensure accurate material ordering and avoid high cost additional material ordered during construction.
Recommendation	♦	2. Worked with PMO and forecasting team to ensure there is a smaller gap between the design and implementation stage of projects. This way we can avoid the design missing changes on the system which need to be accounted for later, and also avoid large material cost increases not including in DSAP, which were especially prominent during the pandemic with supply chain issues.
Implementation Plan	♦	
	♦	**Planned Date of Implementation** Sept-30-2022
	♦	**Actual Date of Implementation** Sept-30-2022
Analysis Completed		Mircea Papuc
All Implementations Completed	Ongoing	

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180710-WD152006	W21065-JAMESTOWN REAR LOT CONV. ELC. PH3	#	#	31/10/2023	703160	ALLISON JENKINS	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$614,752	$929,558	$811,981	132.08%	-$197,229
Labour	$217,209	$215,292	$577,869	266.04%	-$360,660
Material	$402,990	$619,499	$615,120	152.64%	-$212,130
Vehicle	$62,189	$61,302	$99,780	160.45%	-$37,591
Sum:	**$1,297,139**	**$1,825,651**	**$2,104,750**	**162.26%**	**-$807,611**

Gap Analysis Required on: **External, Internal, Material**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 24/04/2024

Project Execution Supervisor Signoff:

Ekundayo Ashwood

Name:

Date: **24/04/2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180710-WD152006	W21065-JAMESTOWN REAR LOT CONV. ELC. PH3	#	#	31/10/2023	703160	ALLISON JENKINS	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$614,752	$929,558	$811,981	132.08%	-$197,229
Labour	$217,209	$215,292	$577,869	266.04%	-$360,660
Material	$402,990	$619,499	$615,120	152.64%	-$212,130
Vehicle	$62,189	$61,302	$99,780	160.45%	-$37,591
Total:	**$1,297,139**	**$1,825,651**	**$2,104,750**	**162.26%**	**-$807,611**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☒	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		As per the below analysis: Total Variance: 836k Total Material Variance: 242k Total Internal Variance: 399k Total External Variance: 195k Total External Variance: Project was delayed multiple years causing rates to increase Jamestown Ph2 (electrical removal and installation) was carved out into this project causing additional required work Total unaccounted for CO's (minus contingency) 315k-120k = 195k
Options / Solutions	♦	Confirm with External crews required labour units before DSAP
Recommendation	♦	Confirm with External crews required labour units before DSAP
Implementation Plan	♦	Confirm with External crews required labour units before DSAP
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180710-WD152006	W21065-JAMESTOWN REAR LOT CONV. ELC. PH3	#	#	31/10/2023	703160	ALLISON JENKINS	#

Labour variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
		Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
		Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
	X	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Project was delayed multiple years causing rates to increase Jamestown Ph2 (electrical removal and installation) was carved out into this project causing additional required work - additional design work : 37k - additional electrical labour: 145k - additional internal inspection 60k
Options / Solutions	♦	Confirm with internal crews required labour units before DSAP
Recommendation	♦	Confirm with internal crews required labour units before DSAP
Implementation Plan	♦	Confirm with internal crews required labour units before DSAP
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-180710-WD152006	W21065-JAMESTOWN REAR LOT CONV. ELC. PH3	#	#	31/10/2023	703160	ALLISON JENKINS	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☒	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Project was delayed multiple years causing rates to increase Jamestown Ph2 (electrical removal and installation) was carved out into this project causing additional required work - additional materials required to complete additional work : 241k - additional tools required to complete work: 158k
Options / Solutions	♦	Confirm material units required before DSAP Add contingency for material inflation
Recommendation	♦	Confirm material units required before DSAP Add contingency for material inflation
Implementation Plan	♦	Confirm material units required before DSAP Add contingency for material inflation
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190128-XD124006	X20138 Cecil A5A6 Bus LD TRF Civ Part B	#	#	18/09/2023	703623	HACHIN HOWLADER	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,707,091	$3,112,449	$2,918,542	170.97%	-$1,211,450
Labour	$29,719	$29,719	$10,127	34.07%	$19,593
Material	$14,462	$14,462	$14,603	100.98%	-$142
Sum:	**$1,751,273**	**$3,156,630**	**$2,943,271**	**168.06%**	**-$1,191,999**

Gap Analysis Required on: Labour

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 22 February, 2024

Project Execution Supervisor Signoff:

Hachin Howlader

Name:

Date: **22 February, 2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190128-XD124006	X20138 Cecil A5A6 Bus LD TRF Civ Part B	#	#	18/09/2023	703623	HACHIN HOWLADER	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,707,091	$3,112,449	$2,918,542	170.97%	-$1,211,450
Labour	$29,719	$29,719	$10,127	34.07%	$19,593
Material	$14,462	$14,462	$14,603	100.98%	-$142
Total:	**$1,751,273**	**$3,156,630**	**$2,943,271**	**168.06%**	**-$1,191,999**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Extra work required due to close proximity of existing utilities such as gas, ttc, hydro one etc. ($330k) 1600 additional hours of traffic control and 250 hrs. of paid duty officer based on city work zone coordinator feedback ($370k) Overtime required due to working near TMU a key accounts customer ($71K) Additional 7.7m of cap & leg tunneling required due to conflict with other utilities ($106K) Additional concrete breakout as well as duct route change resulting in $40K of costs Disposal of contaminated water from site ($41k) Design and inspection costs were prorated to match this increase in labour ($88K) Additional tunnelling, concrete break-out on Gerrard St as well as on Gerrard & Church intersection ($145K)
Options / Solutions	♦	For complex downtown projects have additional buffer due to unpredictable nature of the site.
Recommendation	♦	Update estimate to capture this buffer effectively and have additional traffic support units.
Implementation Plan	♦	Ensure the aforementioned procedures are performed before DSAP
	♦	**Planned Date of Implementation** 22.02.2024
	♦	**Actual Date of Implementation** 22.02.2024
Analysis Completed	22.02.2024	
All Implementations Completed	22.02.2024	

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-190128-XD124006	X20138 Cecil A5A6 Bus LD TRF Civ Part B	#	#	18/09/2023	703623	HACHIN HOWLADER	#

Labour variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	X	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
		Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
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		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Extra work required due to close proximity of existing utilities such as gas, ttc, hydro one etc. ($330k) 1600 additional hours of traffic control and 250 hrs. of paid duty officer based on city work zone coordinator feedback ($370k) Overtime required due to working near TMU a key accounts customer ($71K) Additional 7.7m of cap & leg tunneling required due to conflict with other utilities ($106K) Additional concrete breakout as well as duct route change resulting in $40K of costs Disposal of contaminated water from site ($41k) Design and inspection costs were prorated to match this increase in labour ($88K) Additional tunnelling, concrete break-out on Gerrard St as well as on Gerrard & Church intersection ($145K)
Options / Solutions	♦	For complex downtown projects have additional buffer due to unpredictable nature of the site.
Recommendation	♦	Update estimate to capture this buffer effectively
Implementation Plan	♦	Ensure the aforementioned procedures are performed before DSAP
	♦	**Planned Date of Implementation** 22.02.2024
	♦	**Actual Date of Implementation** 22.02.2024
Analysis Completed	22.02.2024	
All Implementations Completed	22.02.2024	

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-210141-WD161000	W17061-BenjaminBoake UGReb Ele-85M24 Ph6	#	#	23/11/2023	703620	FANGXIN XU	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,627,034	$2,490,673	$2,378,252	146.17%	-$751,218
Labour	$23,987	$24,093	$82,012	341.91%	-$58,026
Material	$267,439	$951,154	$923,583	345.34%	-$656,144
Vehicle			$483		-$483
Sum:	**$1,918,459**	**$3,465,919**	**$3,384,330**	**176.41%**	**-$1,465,870**

Gap Analysis Required on: **Labour & Material**

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 25/04/2024

Project Execution Supervisor Signoff:

Francine XU

Name:

Date: **25/04/2024**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-210141-WD161000	W17061-BenjaminBoake UGReb Ele-85M24 Ph6	#	#	23/11/2023	703620	FANGXIN XU	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$1,627,034	$2,490,673	$2,378,252	146.17%	-$751,218
Labour	$23,987	$24,093	$82,012	341.91%	-$58,026
Material	$267,439	$951,154	$923,583	345.34%	-$656,144
Vehicle			$483		-$483
Total:	**$1,918,459**	**$3,465,919**	**$3,384,330**	**176.41%**	**-$1,465,870**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☒	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	Externaland Regulatory Factors (City's restriction,policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)		1. External Labour - The $ 542 K(approx) is accounted for meter base replacement . We had a meeting in the past with standards and planning to have the deviation of meter base height related to this area, however the height of the meters was not as per standards, we had to replace meterbases for almost entire neighorhood. The contractor designer did not do a good job for field inspeciton during design stage to identify these type of meterbase issue and this was not considered when detail design was finalized. This is the reason for more than 50 Change orders in the project related to meter base change. 2. Due to increase in labour cost for material base , the design fee approx 60K and 30 K Inspection also increased. 3. External Labour - The $110 K account for rate difference, The project was DSAPed with 2021 rates. Project started construction in 2023. The CR 400003436 has explained the variance. 4. Material - $ 582 K - Contractor missed adding primary and secondary cables required for the project at the time of design attainment and later added in Sep 2022. The CR 400003436 has explained the variance. **Note**: Executive Summary for CR 400003436 and supporting document related to meter base changes are attached to this PVA.
Options / Solutions	♦	
Recommendation	♦	*The Contractor Designer needs to do thorough field inspection during design stage instead of fixing issue during construction. This cost variance should be avoided if the designer identified the needs to replace meter base for the entire job. *The Contractor should submit both material units and labour units to THESL for review before finalizing design. Typically, this given contractor only submits labour units to THESL for review before finalizing design. Almost majority of the materials were missed during design finalization stage. They added materials into SAP half years later after design was fainalized without telling THESL. QUA-5172 was issued against this contractor regarding this.
Implementation Plan	♦	* Contractor needs to have thorough field inspection for rebuilt project in residential area, such as meter base * Contractor needs to entera all materials into SAP before finalizing the design.
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-210141-WD161000	W17061-BenjaminBoake UGReb Ele-85M24 Ph6	#	#	23/11/2023	703620	FANGXIN XU	#

Labour variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)
	X	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	X	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		Externaland Regulatory Factors (City's restriction,policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)		1. External Labour - The $ 542 K(approx) accounted for meter base replacement in this job . We had a meeting with standards and planning to have the deviation, however the height of the meters was not as per standards we had to replace meterbases. Also during the site inspections at design stage it was not noticed by the contractor and that is the reason for more than 50 Change orders in the project as well. 2. Due to increase in labour cost for material base , the design fee approx 60K and 30 K Inspection also increased. 3. External Labour - The $110 K account for rate difference, The project was DSAPed with 2021 rates. Project started construction in 2023. The CR 400003436 has explained the variance.
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-210141-WD161000	W17061-BenjaminBoake UGReb Ele-85M24 Ph6	#	#	23/11/2023	703620	FANGXIN XU	#

Material Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)
	☒	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
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	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☐	Overtime (No provision for overtime work)
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	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
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Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)		1.Material - $ 582 K - Contractor missed adding primary and secondary cables required for the project at the time of design attainment and later added in Sep 2022. The CR 400003436 has explained the variance.
Options / Solutions	♦	
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project D	Construction DRP
P-220035-WD151000	W19044 OH Rebuild 85M26	#	#	21/04/2023	703620	HUZEFA MIKAIL	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$784,600	$1,222,751	$1,222,590	155.82%	-$437,990
Labour	$19,216	$19,218	$33,548	174.58%	-$14,332
Material	$241,096	$375,249	$382,355	158.59%	-$141,259
Vehicle	$503	$503	$789	156.76%	-$286
Sum:	**$1,045,415**	**$1,617,721**	**$1,639,281**	**156.81%**	**-$593,866**

Gap Analysis Required on: Total: Labour & Material

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: 21 September, 2023

Project Execution Supervisor Signoff:

Huzefa Mikail

Name:

Date: **21 September, 2023**

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-220035-WD151000	W19044 OH Rebuild 85M26	#	#	21/04/2023	703620	HUZEFA MIKAIL	#

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimate)	Total Project Variance
External	$784,600	$1,222,751	$1,222,590	155.82%	-$437,990
Labour	$19,216	$19,218	$33,548	174.58%	-$14,332
Material	$241,096	$375,249	$382,355	158.59%	-$141,259
Vehicle	$503	$503	$789	156.76%	-$286
Total:	**$1,045,415**	**$1,617,721**	**$1,639,281**	**156.81%**	**-$593,866**

Total Variance

Category of Analysis Note: More than one category may be selected.	☒	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
	☒	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
	☐	External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	☒	Overtime (No provision for overtime work)
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	☒	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		The overall variance for this project was found to be due to the inclusion of COS portion and the carved out portion from the previous phase which could not be completed on time due to two poles (P62 and 58 Stadacona Dr), 1. Carved Out Portion: The location of the two poles being in the middle of Wilson Ave, the contractors were unable to energize the 4kv without completing the riser at these poles as there is no other option to feed from. 2. COS (now DCW) had a project which was to be completed prior to our work starting, as per agreement. However due to customer non-payment, they were unable to do so. With agreement from Engineer, we absorbed that portion to our scope of work. For the COS portion, as it is in the middle of both Ph2 and Ph3 (Between P1 Cadillac on W18077 and P31 Cadillac on W19044; as well as P396 Laurentian on W18077), it was decided with the permission of the Engineer to include this work in W19044 Ph3 project so the overhead cable can be installed and energized without disruption. If the COS portion could not be completed then they would have been unable to energize and continue on both W18077 and W19044 which will result in having both projects incomplete which can pose safety hazards and customer issues.
Options / Solutions	♦	Please see below
Recommendation	♦	
Implementation Plan	♦	
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-220035-WD151000	W19044 OH Rebuild 85M26	#	#	21/04/2023	703620	HUZEFA MIKAIL	#

Labour variance-EXTERNAL

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
		Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
		Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
	X	Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
	X	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		**For P62 Stadacona Dr. location:** •Existing cable was not long enough to meet standard on new pole so it was required to pull new cable to S1 in PT58903 •Duct structure ended at curb line, would not be able to finish duct structure over to new pole •PT58903 is slab on grade, had to change and add new foundation to have proper cable loop •Needed to change out PT58903 if decided to go that route existing pad mount will not cover access hole on new foundation •Cable to S2 at PT58903 was too short and so it was needed to pull new cable into vault room YHF, and was needed to find duct structure at curb line of Wilson and Stadacona Dr to connect both duct structures. **For P58 Stadacona Dr. Location:** •Existing cable had direct buried splice at base of pole so there was a need for splice kits •Duct at this location was direct buried so it was preferred to install splice vault to northwest of pole to splice onto existing cable. Duct that is there goes under patio of Marcelna's restaurant. 1. The total External labor increment for COS portion was **$108,041.88** (Elec+Civil Lab) 2. The change orders for the original project were worth **$134,260.18** This involves: i) Civil Change orders worth $57K including Trenching, Break and Tie, Labor rates etc. II) Electrical Change orders worth $76K which involved Labor units, PDO and UG Cable Termination, Joints & connector units 3. Deferred pole removal labor was found to be worth **$110K** for both Wilson Ph2&3.
Options / Solutions	♦	No work package with formal cost breakdown was provided (was an older scope). Detailed work instructions along with project coordination with other RCs requested
Recommendation	♦	All scopes with older revision dates to be revised
Implementation Plan	♦	RC process implemented to reach out to planning for revision of older scopes
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible Cost Center	Designer Project DRP	Construction DRP
P-220035-WD151000	W19044 OH Rebuild 85M26	#	#	21/04/2023	703620	HUZEFA MIKAIL	#

Material Variance

Category of Analysis Note: More than one category may be selected.	X	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g., Scope change $ (re - phased); contingencies not accounted for)
		Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)
		Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)
		Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)
		External and Regulatory Factors (City's restriction, policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)
		Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)
		Overtime (No provision for overtime work)
		Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)
		Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)
		Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)
Root Cause Details (Note: Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If needed, please discuss with your Supervisor.)		Due to addition in the scope, the contractor has to add material for the extra work to be done. The additional material was worth $124K for the COS portion.
Options / Solutions	♦	No work package with formal cost breakdown was provided (was an older scope). Detailed work instructions along with project coordination with other RCs requested
Recommendation	♦	All scopes with older revision dates to be revised
Implementation Plan	♦	RC process implemented to reach out to planning for revision of older scopes
	♦	**Planned Date of Implementation**
	♦	**Actual Date of Implementation**
Analysis Completed		
All Implementations Completed		

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO

UNDERTAKING NO. JT3.18:

Reference(s): 2B-AMPCO-29

For each of the years 2020 to 2024, to provide copies of the project variance reports for projects greater than $1 million, where the cost variance is 30 percent or greater, including if there were multiple reports for a project, so a multiyear project that has individual project variance reports; to advise which of the project variance reports provided required approval from senior management and executive team, due to the change in cost.

RESPONSE:

In reviewing the transcript, Toronto Hydro notes that this undertaking does not accurately capture the scope of the request. The scope of the undertaking was to provide the requested information for the years 2020-2023.

As shown in the tables below, Toronto Hydro executes hundreds of planned distribution capital projects each year as part of its execution work plan (EWP). Project variances are commonly attributable to the following types of execution challenges and complexities associated with doing work in Toronto Hydro's dense urban service territory:

- Additional work zone coordination requirements from the City of Toronto, including additional traffic control, coordination for CafeTO, work after hours and on weekends
- Unforeseen site conditions, including infrastructure conflicts with other entities, water in cable chambers, shale requiring increased depth due to soil conditions,

clearing duct bank blockages, new duct banks required for alternative routes, duct rebuilds, duct rerouting, contaminated soil, asbestos removal

- Additional scope transferred from other project (projects combined or consolidated, customer delays and changes in requirements)
- Change in standards since original design
- Additional costs required when working with legacy assets or systems such as box construction and paper-insulated lead-covered ("PILC") due to complexity and safety considerations
- Additional costs due to COVID-related work restrictions including extra vehicle and labour hour costs due to social distancing requirements (see Exhibit 1B, Tab 3, Schedule 3 at pages 9-11 for more details).
- Additional costs due to inflationary pressures, including rising costs of materials as described in Exhibit 1B, Tab 3, Schedule 3 at pages 11-13 and as shown in Exhibit 2B, Section D2 at page 14.

Tables 1 and 2 below summarize the completed projects from 2020 to 2023 with a value greater than $1 million and where the cost variance between the initial design estimate and the final project cost was +30% or greater. For additional context, Table 3 provides the total value of the cost variances relative to the total value of the work program for each year from 2020 to 2023. The project costs shown in the tables below are for the full life of the individual projects completed each year and the costs span multiple years for both design and construction. Additionally, Tables 4 and 5 below summarize completed projects from 2020 to 2023 with a value greater than $1 million and where the final project cost variance was underspent by 30% or greater. /C

Together, the tables below demonstrate Toronto Hydro successfully managed and executed its 2020-2023 distribution capital execution work program within very reasonable margins of variance.

Table 1: Distribution Capital Projects Greater than $1 million with +30% Variance

Year	# of Projects Completed	# Projects > $1 million and variance of +30%	% Projects > $1 million and variance of +30%
2020	274	7	2.6%
2021	286	9	3.1%
2022	286	7	2.4%
2023	314	4	1.3%
2020-2023	**1160**	**27**	**2.3%**

Table 2: Distribution Capital Projects Greater than $1 million with +30% Variance ($ Millions)

Year	$ Value of Projects Completed (Estimate)	Total $ Variances for Projects Greater than $1 million with +30% Variance	$ Variance for Projects Greater than $1 million with +30% as a % of Total Value of Projects Completed
2020	$195.5	$8.3	4.2%
2021	$206.6	$8.4	4.1%
2022	$238.2	$9.2	3.9%
2023	$193.0	$4.1	2.1%
2020-2023	**$833.2**	**$29.9**	**3.6%**

Table 3: Distribution Capital Execution Work Program Annual Variances ($ Millions)

Year	$ Value of Projects Completed (Estimate)	$ Value of Total Projects Actuals	Variance	% Variance
2020	$195.5	$212.1	$16.6	8.5%
2021	$206.6	$208.8	$2.3	1.1%
2022	$238.2	$234.2	-$4.0	-1.7%
2023	$193.0	$200.3	$7.3	3.8%
2020-2023	**$833.2**	**$855.3**	**$22.1**	**2.7%**

Table 4: Distribution Capital Projects Greater than $1 million with -30% Variance

Year	# of Projects Completed	# Projects > $1 million and variance of -30%	% Projects > $1 million and variance of -30%
2020	274	6	2.2%
2021	286	7	2.1%
2022	286	4	2.1%
2023	314	5	1.9%
2020-2023	**1160**	22	0.5%

Table 5: Distribution Capital Projects Greater than $1 million with -30% Variance ($ Millions)

Year	$ Value of Projects Completed (Estimate)	Total $ Variances for Projects Greater than $1 million with -30% Variance	$ Variance for Projects Greater than $1 million with -30% as a % of Total Value of Projects Completed
2020	$195.5	-$5.3	-2.7%
2021	$206.6	-9.5	-2.6%
2022	$238.2	-$4.4	-2.2%
2023	$193.0	-$2.8	-2.8%
2020-2023	**$833.2**	-$22.0	-0.6%

/C

Toronto Hydro has provided all 27 project variance analysis ("PVA") reports that are responsive to the requested information in consolidated format in Appendix A to this undertaking response. /C

In reviewing the information above it is important to note that in the last rate application (EB-2018-0165) Toronto Hydro put forward a five-year capital plan for 2020-2024 that was based on a programmatic approach, and did not include project level details except for major capital projects like Copeland Phase 2. It is also key to note that the funding approved by the OEB to enable the execution of the five-year capital plan reflects an approved capital envelope, within which Toronto Hydro has the flexibility to implement its plan and to respond to changes as needed.[1] As such, the project-level variances summarized in the tables should not be interpreted as variances between OEB-approved and actual capital expenditures; that information is summarized in Exhibit 2B, Section E4 and detailed in the programmatic evidence in Exhibit 2B, Section E5, E6, and E7. From a /C work execution perspective, the information above demonstrates that over the last four years (2020-2023), Toronto Hydro successfully managed the execution work challenges and considerations (discussed in Exhibit 1B, Tab 3, Schedule 3 at pages 2-15 and summarized above) and delivered over 1,100 projects within very reasonable margins of variance.

Toronto Hydro confirms that projects with a value greater than $100,000 with variances of +/- plus or minus 20% and > $100K, including the 49 projects listed above (27 – (+30%) variance and 22 – (-30%) variance), received senior management and executive approval of the cost variance throughout execution, in accordance with the utility's change management and governance process detailed in Exhibit 2B, Section D1 at page 26, lines /C

[1] EB-2018-0165, Decision and Order (December 19, 2019) at page 59.

3-9. This process is designed to identify, as projects are being designed and constructed, changes impacting project/program schedule, cost, and scope. /C

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT4.31:

Reference(s): 1B-Staff-12

For the projects identified in Part D, to update the figure and the table in Part A for the IRM scenario to illustrate the funding that would be available under the Capital Module.

RESPONSE:

The table below shows the funding associated with IRM plus Advanced Capital Module (ACM) associated with the projects identified in 1B-Staff-12(d).

$ in million	2025	2026	2027	2028	2029	Total
2025	978	991	1,005	1,019	1,034	5,028
2026		9	9	9	9	38
2027			11	11	11	33
2028				9	9	17
2029					6	6
Total	978	1,001	1,026	1,048	1,069	5,122

The table in 1B-Staff-12(a) is updated below including an additional line for IRM + ACM.

Revenue Requirement ($ million, two decimal places)	2025	2026	2027	2028	2029	Total
2025-2029 Investment Plan	978	1,031	1,077	1,176	1,221	5,483
IRM	978	991	1,005	1,019	1,034	5,028
IRM + ACM	978	1,001	1,026	1,048	1,069	5,122
Current Custom IR Formula (CPCI)	978	1,015	1,047	1,127	1,154	5,321
Proposed CRCI	978	1,024	1,061	1,152	1,186	5,401

As the revenue impact of growth in billing determinants is given back to customers through the current Custom Price Cap Index ("CPCI") rate formula and the proposed Custom Revenue Cap Index ("CRCI") rate formula, Toronto Hydro did not include the impact of growth in the other scenarios. If growth assumptions consistent with the billing determinants presented in the 2025-2029 load forecast detailed in Exhibit 3, Tab 1, Schedule 1 were included in the IRM and IRM plus ACM scenarios, the total 2025-2029 revenue in these scenarios would be approximately a $4 million lower. /C

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT5.10:

Reference(s): Exhibit 9, Tab 2, Schedule 1 (Updated April 2, 2024)

With reference to the Continuity Schedule, Row 60, updated April 2, to explain the increase to the Externally Driven Capital Variance Accounts, and what changed since the original filings.

RESPONSE:

Table 1 below summarizes the Externally Driven Capital Variance Account 2023 and 2024 revenue requirement variances between the evidence presented on November 17, 2023 in Exhibit 9, Tab 1, Schedule 1, Table 7 and the updated evidence filed on April 2, 2024. /C

Table 1: Externally Driven Capital Variance Account 2023 and 2024 Revenue Requirement Variance ($ Millions)

Difference	2020	2021	2022	2023	2024	Total
Rate Base	-	-	-	(1.7)	(5.3)	**N/A**
Return on equity	-	-	-	0.1	(0.2)	**(0.1)**
Interest	-	-	-	0.0	(0.1)	**(0.1)**
Depreciation	-	-	-	3.3	1.9	**5.3**
PILs	-	-	-	1.0	0.7	**1.7**
Revenue Requirement	**-**	**-**	**-**	**4.4**	**2.3**	**6.7**
Carrying Charges	-	-	-	0.0	0.3	**0.3**
Total	**-**	**-**	**-**	**4.4**	**2.6**	**7.0**

The increase in the total balance is associated with higher amounts of derecognition than forecast in 2023, which affects all components of the revenue requirement. Derecognition expenses are overwhelmingly reactive, even in the near term, because there are practical challenges in forecasting a precise and comprehensive view of all assets that will have to be removed from the system, especially in the context of an externally-driven relocation project. The initial forecast for the Externally Driven Capital Variance Account ("EDCVA") which was filed on November 17, 2023 was based on high-level assumptions derived from historical capital expenditures and derecognition expenses, whereas the updated balances filed on April 2, 2024 reflect actual derecognition impacts for 2023 based on major projects completed in 2023 and updated forecasts based on the carry-over impact of the 2023 actuals. The projects include the Eglinton Crosstown LRT and Finch West LRT, which involved the relocation of large volumes of assets to complete construction activities for both light rail transit projects. Please see Toronto Hydro's response to undertaking JT2.4 for additional information on derecognition triggered by Externally Initiated Plant Relocation projects. /C

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT5.13:

Reference(s): DVA Continuity Schedule

To file an updated version of the complete DVA Continuity Schedule.

RESPONSE:

Please refer to Appendix A to this response for the updated DVA Continuity Schedule, which includes the Group 1 rate riders. Toronto Hydro's derivation of Group 2 rate riders are provided as Appendix B. Below Toronto Hydro provides certain explanatory notes to assist with the review of the appendices.

Appendix A, Tab 2b – Innovation Fund

The 2b Continuity Schedule tab of Appendix A does not show any balances for the proposed Innovation Fund Variance Account ("IFVA") during the 2020-2024 rate period because the IFVA is a new Group 2 variance account that Toronto Hydro is proposing for the 2025-2029 rate period.[1] The utility has no balances to record in the IFVA for the current rate period.

Appendix A, Tab 2b – Lost Revenue Adjustment Mechanism ("LRAM") Variance Accounts

The 2b Continuity Schedule tab of Appendix A only shows balances related to 2015-2019 LRAM Variance Account ("LRAMVA") in the years 2017-2021. The reason for this is that Toronto Hydro's lost revenues in respect of conservation and demand management ("CDM") initiatives have crystallized as of 2022, following the wind-down of the

/C

[1] Exhibit 1B, Tab 4, Schedule 2; Exhibit 9, Tab 1, Schedule 1, lines 16-26 at p. 41.

Conservation First Framework ("CFF")[2] and the OEB's approval of Toronto Hydro's proposal to defer the clearance of the balance from the 2023 incentive rate proceeding to its rebasing application.[3] In addition, the calculation of the 2020-2024 LRAMVA balances will be subject to the resolution of the methodology question relating to the determination of the LRAMVA threshold that the utility has raised in its evidence.[4]

Appendix A, Tab 4 – Billing Determinants

- Toronto Hydro has updated Section C under this tab with metered kWh values for wholesale market participants ("WMP"), which had been inadvertently omitted from an earlier version of Appendix A.
- Toronto Hydro notes that it relied on 2025 data from OEB Appendix 2-IB ("Customer, Connections, Load Forecast and Revenues Data and Analysis") updated on April 2, 2024, to populate customer numbers under the Billing Determinants tab of Appendix A. Table 1 below reconciles customer figures between the two sources.

/C

Table 1: 2025 Customer Numbers Reconciliation

Rate Class	OEB Appendix 2-IB (Update April 2, 2024)		DVA Continuity Schedule (Appendix A to JT5.13)	
	Customer Numbers	Devices/ Connections	Customer Numbers*	Devices/ Connections
Residential	618,693		618,693	
CSMUR	97,539		97,539	
GS < 50 kW	72,948		72,948	
GS 50-999 kW	9,941		9,941	
GS 1000-4999 kW	473		473	
Large User	44		44	
Street Lighting	n/a	172,781	1	n/a
Unmetered Scattered Load	n/a	12,873	791	n/a

*The proportion of customers for the Residential, CSMUR and GS<50 Classes are relied on to allocate Account 1551.

[2] Exhibit 9, Tab 1, Schedule 1 at page 19.
[3] EB-2022-065, OEB Decision and Order (December 8, 2022) at p. 16-17.
[4] Exhibit 9, Tab 2, Schedule 3.

Appendix A, Tabs 6 and 6.1

- Toronto Hydro notes that under tab 6 “Class A Consumption Data," on row 14 the year for account 1589 GA was last disposed remains as 2021. On row 17 of the same tab, the year account 1580 CBR Class B was last disposed has been updated to 2022, which previously incorrectly stated 2021.
- Upon further review of the 2024 DVA (Continuity Schedule) Workform utilized for 2025 Group 1 rate calculations, enabling macros in the files results in the deletion of 2022 Class A input data under the following tabs: “6. Class A Consumption Data” and “6.1a GA Allocation”, which resulted in the 2022 balances deferred from the 2024 incentive proceeding to not appear properly. Toronto Hydro is refiling the continuity schedule without the macros as Appendix A to this undertaking response to address the issue.

Appendix B – Reconciliation with Appendix A and Rate Smoothing

The calculation of rate riders in Appendix B to this response differs from the total DVA balances in Appendix A due to rate smoothing. As Toronto Hydro arranged the timing of dispositions to smooth out the customer rate impacts over the 2025-2029 rate period, this created incremental carrying charges for those balances which are not being disposed in 2025. For example, the utility proposes to dispose PILs and Tax Variance in 2025, hence no incremental carrying charges were calculated. However, Wireline Pole Attachments Revenue is proposed to be disposed in 2027, and therefore incremental carrying charges were calculated for years 2025 and 2026. In all cases Toronto Hydro calculated the incremental carrying charges using the OEB-prescribed DVA interest rate of 5.49% on the closing principal balance of each account as of December 31, 2023. The new Appendix C to this undertaking response provides a reconciliation of the DVA Continuity Schedule in Appendix A to the balances in the Rate Riders table in Appendix B.

/C

TECHNICAL CONFERENCE UNDERTAKING RESPONSES TO ONTARIO ENERGY BOARD STAFF

UNDERTAKING NO. JT5.14:

Reference(s): GA Analysis Workform

To file an updated version of the GA Analysis Workform.

RESPONSE:

Toronto Hydro has further updated the Global Adjustment ("GA") Analysis Workform based on 2023 actuals and is filing it as Appendix A to this undertaking response. Below Toronto Hydro provides certain explanatory notes to assist with the review of the appendices.

The updates to the GA Analysis workform are as follows:

1. Under tab GA 2023, for Note 5 ("Reconciling Items") item 7 in row 86, the response to Principal Adjustment on DVA Continuity Schedule in cell I86 changed from 'No' to 'Yes' and the explanation in cell D86 was updated accordingly.

2. Under tab Principal Adjustments, included $2,237,906 as the third reversal in cell J82 and adjusted cell J81 the second reversal item on unbilled to actual revenue differences to $405,528 from $2,643,434, effectively splitting out the latter figure into two current year principal adjustments.

Toronto Hydro has updated the GA Workform to clarify the adjusted net change in principal balance in the GL line in cell C90 under the GA 2023 tab.

On a quarterly basis, Toronto Hydro trues up/down its general ledger ("GL") to ensure Class A GA costs to match its Class A GA revenues. However, when Toronto Hydro accrued GA

/C

revenue of approximately $2.2 million in its GL in respect of a billing adjustment relating to a large customer in December 2023, the true up/down did not occur until 2024 due to timing. As a result, this amount was recognized under tab GA 2023 in cell C75 as a credit to the net change in principal balance in the GL line, resulting in the balance being approximately $6.7 million. As the total expected GA variance in cell K60 of the same tab does not capture the impact of this accrual, it is classified as a reconciling item under Note, 5 which resulted in Toronto Hydro having a reconciling item of approximately $2.2 million presented within the GA 2023 tab.

The impact of this accrual was also captured in the current year principal adjustment amount, since Toronto Hydro trues up accounting accruals to actualized billing and calculates the principal adjustment as the difference between the accounting accrual and the actualized billing. Toronto Hydro's changes to cells J81 and J82 of the Principal Adjustments tab is to clarify the impact of this amount i.e. a principal adjustment of the same amount in the Principal Adjustments tab of the GA Analysis Workform.

This reconciliation difference will reverse for 2024. Toronto Hydro confirms that this was a one-time occurrence that has not impacted previous years.

/C