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January 15, 2025

VIA: ELECTRONIC FILING

Mr. Adam J. Teitzman
Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Tampa Electric Company's Petition for Approval of 2026-2035 Storm Protection Plan
Dkt. No.: 20250016-EI

Dear Mr. Teitzman:

Attached for filing in the above docket, on behalf of Tampa Electric Company is the Direct Testimony of Jason D. De Stigter and Exhibit No. JDD-1.

Thank you for your assistance in connection with this matter.

Sincerely,

Malcolm N. Means

Malcolm N. Means

MNM/bml
Attachment
cc: Walt Trierweiler, Office of Public Counsel
TECO Regulatory

BEFORE THE

FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 20250016-EI

TAMPA ELECTRIC COMPANY'S

2026-2035 STORM PROJECTION PLAN

DIRECT TESTIMONY AND EXHIBIT

OF

JASON D. DE STIGTER

ON BEHALF OF

TAMPA ELECTRIC COMPANY

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

DIRECT TESTIMONY

OF

JASON D. DE STIGTER

ON BEHALF OF TAMPA ELECTRIC COMPANY

1. INTRODUCTION

Q. Please state your name and business address.

A. My name is Jason De Stigter, and my business address is 9400 Ward Parkway, Kansas City, Missouri 64114.

Q. By whom are you employed and in what capacity?

A. I am employed by 1898 & Co. as a Director and lead the Utility Investment Planning team as part of our Utility Consulting Practice. 1898 & Co. was established as the consulting and technology consulting division of Burns & McDonnell Engineering Company, Inc. ("Burns & McDonnell") in 2019. 1898 & Co. is a nationwide network of over 250 consulting professionals serving the Manufacturing & Industrial, Oil & Gas, Power Generation, Transmission & Distribution, Transportation, and Water industries.

Burns & McDonnell has been in business since 1898, serving multiple industries, including the electric power industry. Burns & McDonnell is a family of companies made up of more than 8,300 engineers, architects, construction professionals, scientists, consultants and entrepreneurs with more than 40 offices across the country and throughout the world.

Q. Briefly describe your educational background and certifications.

A. I received a Bachelor of Science Degree in Engineering and a Bachelor's in Business Administration from Dordt College, now called Dordt University. I am also a registered Professional Engineer in the state of Kansas.

Q. Please briefly describe your professional experience and duties at 1898 & Co.

A. I am a professional engineer with 16 years of experience providing consulting services to electric utilities. I have extensive experience in asset management, capital planning and optimization, risk and resilience assessments and analysis, asset failure analysis, and business case development for utility clients. I have been involved in numerous studies modeling risk for utility industry clients. These studies have included risk and economic analysis engagements for several multi-billion-dollar capital projects and large utility systems. In my role as a project manager, I have worked on and overseen risk and resilience analysis consulting studies on a variety of electric power transmission and distribution assets, including developing complex and innovative risk and resilience analysis models. My primary responsibilities are business development and project delivery within the Utility Consulting Practice with a focus on developing risk and resilience-based business cases for large capital projects/programs.

Prior to joining 1898 & Co. and Burns & McDonnell, I served as a Principal Consultant at Black & Veatch inside their Asset Management Practice performing similar studies to the effort performed for Tampa Electric Company ("Tampa Electric").

Q. Have you previously testified before the Florida Public Service Commission or other state commissions?

A. I provided written and rebuttal testimony on behalf of Tampa Electric Company for the 2020-2029 and 2022-2031 Storm Protection Plans ("SPP") before the Florida Public

Service Commission (Docket Nos. 20200067-EI and 20220048-EI). I have also provided written, rebuttal, and oral testimony on behalf of Indianapolis Power & Light, Baltimore Gas & Electric, Oklahoma Gas and Electric, Entergy Louisiana, Entergy New Orleans, Entergy Texas, AEP Texas, and Texas New Mexico Power. A complete list of testimony I have provided before other regulatory bodies is included with Exhibit JDD-1.

Q. What is the purpose of your direct testimony in this proceeding?

A. The purpose of my testimony is to summarize the results and methodology developed using 1898 & Co.'s Storm Resilience Model, with the following objectives:

- Calculate the customer benefit of hardening projects through reduced utility restoration costs and impacts to customers
- Prioritize hardening projects with the highest resilience benefit per dollar invested into the system
- Establish a long-term SPP that optimizes cost, maximizes customers' benefit, and does not exceed Tampa Electric technical execution constraints

Through my testimony I will describe the major elements of the Storm Resilience Model, which includes a Major Storm Event Database, Storm Impact Model, Resilience Benefit Module, and Budget Optimization & Project Prioritization. Specifically, I will define resilience, review historical major storm events to impact Tampa Electric service territory, describe the datasets used in the Storm Impact Model and how they were used to model system impacts due to storms events, and explain how to understand the resilience benefit results. Additionally, I will outline the key updates to the Storm Resilience Model for the 2026-2035 SPP. Throughout my testimony I will describe both how the assessment was performed and why it was performed as such. Finally, I will describe the calculations and results of the Storm Resilience Model.

Q. Are you sponsoring any attachments in support of your testimony?

A. Yes, I am sponsoring the 1898 & Co, Tampa Electric's 2026 – 2035 Storm Protection Plan Resilience Benefits Report that is being included as Appendix "I" in Tampa Electric's proposed 2026-2035 SPP.

Q. Were your testimony and the attachment identified above prepared or assembled by you or under your direction or supervision?

A. Yes.

Q. What was the extent of your involvement in the preparation of Tampa Electric's proposed 2026-2035 SPP?

A. I served as the 1898 & Co. project director on the Tampa Electric 2026-2035 Storm Protection Plan Assessments and Benefits Assessment. The evaluation utilized a Storm Resilience Model to calculate benefits. I worked directly with the Tampa Electric Team involved in the resilience-based planning approach. I was directly involved in the development of the Storm Resilience Model, the assessment and results, as well as being the main author of the report.

2. RESILIENCE-BASED PLANNING OVERVIEW

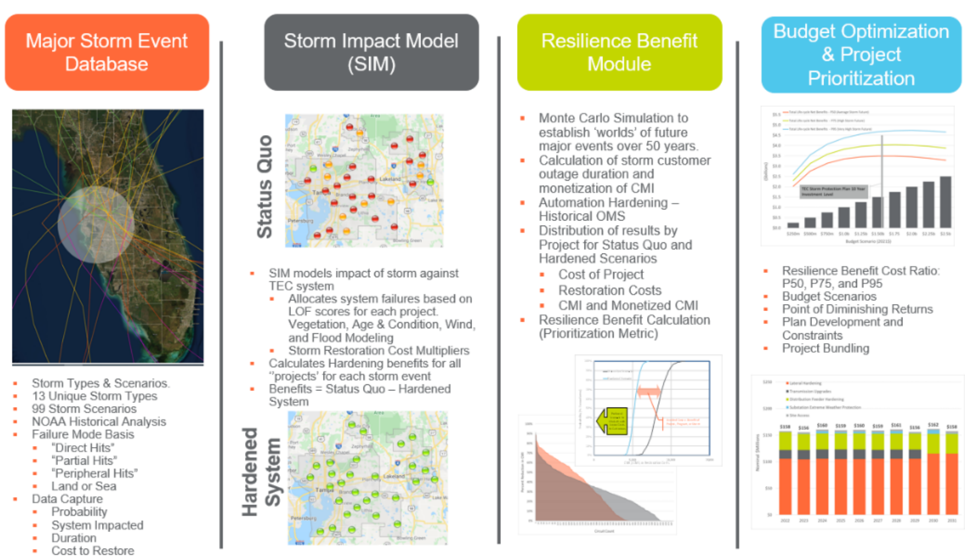
Q. Please describe the analysis 1898 & Co. conducted for Tampa Electric.

A. 1898 & Co. utilized a resilience-based planning approach to identify hardening projects and prioritize investment in the Tampa Electric Transmission & Distribution ("T&D") system utilizing a Storm Resilience Model. The Storm Resilience Model models the benefits of all potential hardening projects for an 'apples to apples' comparison across the system. The resilience-based planning approach calculates the benefit of storm hardening projects from a customer perspective. This approach calculates the resilience benefit at the asset, project, and program level. The results of the Storm Resilience Model are:

- Decrease in the Storm Restoration Costs
- Decrease in the customers impacted ("CI") and the duration of the overall outage, calculated as Customer Minutes Interrupted ("CMI")

The Storm Resilience Model employs a data-driven decision-making methodology utilizing robust and sophisticated algorithms to calculate the resilience benefit. Figure 1 provides an overview of the Storm Resilience Model used to calculate the project benefit and prioritize projects.

Figure 1: Storm Resilience Model Overview



The storm database includes the future “universe” of potential storm events to impact the Tampa Electric service territory. The Major Storm Events Database contains 13 unique storm types with a range of probabilities and impacts to create a total database of 99 different unique storm scenarios.

Each storm scenario is then modeled within the Storm Impact Model to identify which parts of the system are most likely to fail given each type of storm. The Likelihood of Failure (LOF) is based on the vegetation density around each conductor asset, the age and condition of the asset base, and the wind zone the asset is in. The Storm Impact Model also estimates the restoration costs and CMI for each of the projects. Finally, the Storm Impact Model calculates the benefit in decreased restoration costs and CMI if that project is hardened per Tampa Electric’s hardening standards. The CMI benefit is monetized using the U.S. Department of Energy’s (“DOE”) Interruption Cost Estimator (“ICE”) for project prioritization purposes.

The benefits of storm hardening projects are highly dependent on the frequency, intensity, and location of future major storm events over the next 50 years. Each storm type (i.e., Category 1 from the Gulf) has a range of potential probabilities and consequences. For this reason, the Storm Resilience Model employs stochastic modeling, or Monte Carlo Simulation, to randomly trigger the types of storm events to impact the Tampa Electric service territory over the next 50 years. The probability of each storm scenario is multiplied by the benefits calculated for each project from the Storm Impact Model to provide a resilience weighted benefit for each project in dollars. Feeder Automation Hardening projects are evaluated based on historical outages and the expected decrease in historical outages if automation had been in place.

The Budget Optimization and Project Scheduling model prioritizes the projects based on the highest resilience benefit cost ratio. The model prioritizes each project based on the sum of the restoration cost benefit and monetized CMI benefit divided by the project cost. This is done for the range of potential benefit values to create the resilience benefit cost ratio. The model also incorporates Tampa Electric’s technical and operational realities (Transmission outages) in scheduling the projects.

This resilience-based prioritization facilitates the identification of the critical hardening projects that provide the most benefit. Prioritizing and optimizing investments in the system helps provide confidence that the overall investment level is appropriate and that customers get the “biggest bang for the buck.”

Q. Which of the Storm Protection Plan programs are evaluated within the Storm Resilience Model?

A. The Storm Resilience Model includes project benefits results, budget optimization, and project prioritization for the following Storm Protection Plan programs:

- Distribution Lateral Undergrounding
- Transmission Asset Upgrades
- Substation Extreme Weather Hardening
- Distribution Overhead Feeder Hardening

Q. Please outline the key updates there were made to the Storm Resilience Model from the 2022-2031 SPP to the 2026-2035 SPP assessment.

A. The Storm Resilience Model was used in the development of the 2022-2031 SPP as well as the 2026-2035 SPP. The following are the key updates to the 2026-2035 Storm Resilience Model:

1. General – these updates include shifting of the time horizon, additional years of storms to the historical analysis, and accounting for completed projects.
2. Capital Cost Assumptions – based on actual completed projects and communicated increases in commodity prices, the cost assumptions for all project types were adjusted.
3. Lateral Undergrounding Approach – Based on continued lessons learned from the lateral undergrounding program, Tampa Electric has refined its lateral undergrounding project approach for this SPP. Tampa Electric has determined that the analysis should assume all laterals on a circuit will be undergrounded as part of the 1898 & Co. Analysis. This change will enhance the ability for Tampa Electric to contract out work and deliver benefits to all Tampa Electric customers on a circuit. Although the model assumes each lateral on a circuit will be undergrounded, during detailed distribution planning and engineering review, Tampa Electric may determine some lateral sections need not be undergrounded (e.g., feeds abandoned meters, crosses waterway, crosses railroads). By undergrounding all the electrically connected protection zones off a circuit feeder/mainline Tampa Electric will more easily be

able to anticipate costs and design work to minimize the number of new underground miles. It should be noted that Tampa Electric still has lateral undergrounding projects being designed and constructed as part of the 2022-2031 SPP. The analysis has been designed to assume these segments will be completed as planned so as not to duplicate costs or benefits.

Q. Please outline the type and count of hardening projects evaluated in the Storm Resilience Model.

A. Table 1 contains the list of potential hardening projects by program evaluated in the Storm Resilience Model.

Table 1: Potential Hardening Project Count

Program	Project Count
Distribution Lateral Undergrounding	847
Transmission Asset Upgrades	46
Substation Extreme Weather Hardening	6
Distribution Overhead Feeder Hardening	689
Total	1,588

Q. How were these potential hardening projects identified?

A. The potential hardening projects were identified based on a combination of data driven assessments, field inspection of the system, and historical performance of Tampa Electric's system during major storm events. The approach to identifying hardening projects employs asset management principles utilizing a bottom-up approach starting with the system assets. Additionally, hardening approaches for parts of the system were based on the balance of the resilience benefit they provide with the overall costs. Table 2 shows the asset types and counts included in the Storm Resilience Model used to develop hardening projects.

Table 2: Tampa Electric Asset Base

Asset Type	Units	Value
Distribution Circuits	**[count]**	**743**
Feeder Poles	[count]	61,805
Lateral Poles	[count]	120,005
Feeder OH Primary	[miles]	2,386
Lateral OH Primary	[miles]	3,737
Transmission Circuits	**[count]**	**229**
Wood Poles	[count]	3,087
Steel/Concrete/Lattice Structures	[count]	21,832
Conductor	[miles]	882
Substations	**[count]**	**9**

All of the assets that benefit from hardening are strategically grouped into potential hardening projects. For distribution projects, assets were grouped by their most upstream protection device, which was either a breaker, a recloser, trip savers, or a fuse. For lateral projects, all protection zones eligible for undergrounding were grouped together.

For distribution feeder projects, those with a recloser or breaker protection device, the preferred hardening approach is to rebuild to a storm resilient overhead design standard and add automation hardening. Assets in these projects include older wood poles and those with a 'poor' condition rating. Additionally, poles with a class that is not better than '1' were also included in these projects. The combination of physical hardening and automation hardening provides significant resilience benefit for feeders.

At the transmission circuit level, wood poles were identified for hardening by replacing with non-wood materials like steel, spun concrete, and composites. The non-wood materials have a consistent external shell strength while wood poles can vary widely and are more likely to fail. Transmission wood poles were grouped at the circuit level into projects.

For substations, Tampa Electric conducted a detailed assessment of extreme weather risk. Based on this, nine substations were identified that included flooding risk to the level that could justify investment, of which six were prioritized for this 2026-2035 SPP.

Q. Why is this approach to hardening project identification important?

A. This approach to hardening project identification is important for several reasons.

- The approach is comprehensive. As Table 2 shows, the approach evaluates nearly all of Tampa Electric’s T&D system. By considering and evaluating the entire system on a consistent basis, the results of the hardening plan provide confidence that portions of the Tampa Electric system are not overlooked for potential resilience benefit.
- By breaking down the entire distribution system by protection zone, the resilience-based planning approach is foundationally customer centric. Each protection zone has a known number of customers and type of customers such as residential, small or large commercial and

industrial, and priority customers. The objective is to harden each asset that could fail and result in a customer outage. Since only one asset needs to fail downstream of a protection device to cause a customer outage, failure to harden all the necessary assets still leaves weak links that could potentially fail in a storm. Rolling assets into projects at the protection device level allows for hardening of all weak links in the circuit and for capturing the full benefit for customers.

- The granularity at the asset and project levels allows Tampa Electric to invest in portions of the system that provide the most value to customers from a restoration cost reduction, CI, CMI perspective. The adopted approach provides confidence that the overall plan is investing in parts of the system that provide the most value for customers.
- These types of hardening projects enhance resilience by providing a diverse investment plan. Since storm events cannot be fully eliminated, the diversification allows Tampa Electric to provide a higher level of system resilience.
- The approach balances the use of robust data sets with Tampa Electric experience with storm events to develop storm hardening projects. Data-only approaches may

provide decisions that don't match reality, while people-driven only solutions can be filled with bias. The approach balances the two to better identify types of hardening projects.

Q. Why is it necessary to model storm hardening projects benefits using this resilience-based planning approach and Storm Resilience Model?

A. The Storm Resilience Model was architected and designed for the purpose of calculating storm hardening project benefit in terms of reduced restoration costs and CMI to build a SPP with the right level of investment that provides the most benefit for customer. It was necessary to model storm hardening projects using the resilience-based planning approach shown in Figure 1 for the following reasons:

1. The benefits of hardening projects are wholly dependent on the number, type, and overall impact of future storms to impact the Tampa Electric service territory. For this reason, the resilience-based planning approach includes the "universe" of potential major events that could impact Tampa Electric over the next 50 years, this is the Major Storm Event Database.

2. The cost to restore the failed assets is dependent on the extent of the damage and resources used to fix the system. The duration to restore affected customers is dependent on the extent of the asset damage and the extent of the damage on the rest of the system. Modeling this series of events for the entire system at the asset and project level for both Status Quo and Hardened scenarios is needed to accurately model hardening project benefits. Therefore, the resilience-based planning approach includes the Storm Impact Model to calculate the phases of asset and project resilience for each of the 99 storm events for both scenarios.

3. A project's resilience value comes from mitigating outages and associated restoration costs not just for one storm event, but from several over the life cycle of the assets. The Monte Carlo Simulation creates a 1,000-future storm "worlds." From this, the life-cycle resilience benefit of each hardening project can be calculated.

4. The Budget Optimization algorithm develops a long-term Storm Protection Plan that optimizes cost, maximizes customers' benefit, and does not exceed Tampa Electric technical execution constraints.

3. MAJOR STORM EVENT DATABASE

Q. Please provide an overview of the Major Storm Event Database and how it was developed.

A. The Major Storm Event Database includes the "universe" of storm events that could impact Tampa Electric's service territory over the next 50 years. It was developed collaboratively between Tampa Electric and 1898 & Co. It utilizes information from the National Oceanic and Atmospheric Administration ("NOAA") database of major storm events, Tampa Electric historical storm reports, available information on the impact of major storms to other utilities, and Tampa Electric experience in storm recovery. From that information, 13 unique storm types were observed to impact the Tampa Electric service territory. For each of the storm types, various storm scenarios were developed to capture the range of probabilities and impacts of each storm type. In total, 99 storms scenarios were developed to capture the "universe" of storm events to impact the Tampa Electric service territory. Table 3 provides a summary of the Major Storm Event Database. The table includes the ranges of probabilities, restoration costs, impact to the system, and duration of the event.

Table 3: Major Storm Event Database Overview

Storm Type No	Scenario Name	Annual Probability	Restoration Costs (Millions)	System Impact (Laterals)	Total Duration (Days)
1	Cat 3+ Direct Hit - Gulf	1.0% - 2.0%	$306 - $1,224	60% - 70%	17.4 - 34.5
2	Cat 1 & 2 Direct Hit - Florida	5.0% - 8.0%	$76.5 - $153	35% - 55%	6.0 - 8.8
3	Cat 1 & 2 Direct Hit - Gulf	2.0% - 7.0%	$153 - $306	45% - 60%	8.7 - 12.9
4	TS Direct Hit	16.5%	$25.5 - $76.5	12.5% - 31.3%	2.6 - 5.3
5	TD Direct Hit	13.3%	$5.1 - $15.3	6.3% - 15.6%	2.0 - 3.6
6	Localized Event Direct Hit	50.0%	$0.102 - $1.53	1.3% - 3.1%	0.3 - 0.6
7	Cat 3+ Partial Hit	3.0% - 5.0%	$91.8 - $184	36% - 48%	6.4 - 9.2
8	Cat 1 & 2 Partial Hit	7.0%	$15.3 - $91.8	8.5% - 28%	1.9 - 6.9
9	TS Partial Hit	16% - 19%	$11.5 - $30.6	8% - 15%	2.0 - 3.6
10	TD Partial Hit	8% - 15%	$0.4 - $3.1	2% - 3.8%	1.5 - 2.7
11	Cat 3+ Peripheral Hit	2.0% - 3.0%	$0.8 - $ 21.8	1.2% - 14.1%	1.0 - 3.0
12	Cat 1 & 2 Peripheral Hit	10% - 11%	$0.6 - $8.8	0.9% - 6.5%	0.9 - 2.3
13	TS Peripheral Hit	11% - 12%	$0.5 - $3.9	0.7% - 3.4%	0.9 - 1.3

Q. How were the storm impact ranges developed?

A. The range of system impacts for each storm scenario were developed based on historical storm reports from Tampa Electric and augmented by Tampa Electric’s team experience with historical storm events. The approach followed an iterative process of filling out more known impact information from recent events and developing impacts for those events without impact data based on their relative storm strength to the more known events.

4. STORM IMPACT MODEL

Q. Please provide an overview of the Storm Impact Model.

A. The Storm Impact Model identifies, from a weighted perspective, the particular laterals, feeders, transmission lines, and substations that fail for each type of storm in the Major Storm Event Database. The model also estimates the restoration costs associated with the specific sub-system failures and calculates the impact to customers in terms of CMI. Finally, the Storm Impact Model models each storm event for both the Status Quo and Hardened scenario. The Hardened scenario assumes the assets that make up each project have been hardened. The Storm Impact Model then calculates the benefit of each hardening project from a reduced restoration cost, CMI, and monetized CMI perspective.

Q. How are restoration costs allocated to the asset base for each major storm events?

A. Storm restoration costs were calculated for every asset in the Storm Protection Model including wood poles, overhead primary, transmission structures (steel, concrete, and lattice), transmission conductors, power transformers, and breakers. The costs were based on storm restoration cost multipliers above planned replacement costs. These multipliers were developed by Tampa Electric and 1898 & Co. collaboratively. They are based on the expected inventory constraints and foreign labor resources needed for the various asset types and storms. For each storm event, the restoration costs at the asset level are aggregated up to the project level and then weighted based on the project LOF and the overall restoration costs outlined in the Major Event Storm Database.

Q. How are customer outage durations calculated in the model for each major storm event?

A. Since circuit projects are organized by protection device, the customer counts and customer types are known for each asset and project in the Storm Impact Model. The time it will take to restore each protection device, or project, is calculated based on the expected storm duration and the hierarchy of restoration activities. This restoration time is then multiplied by the known customer count to calculate the CMI. The CMI benefits are also monetized.

Q. Why were CMI benefits monetized?

A. The CMI benefits were monetized for project prioritization purposes. The Storm Impact Model calculates each hardening project's CMI and restoration cost reduction for each storm scenario. In order to prioritize projects, a single prioritization metric is needed. Since CMI is in minutes and restoration costs are in dollars, the resilience-based planning approach monetized CMI. The monetized CMI benefit is combined with the restoration cost benefit for each project to calculate a total resilience benefit in dollars.

Q. How was the CMI benefit monetized?

A. CMI was monetized using DOE's ICE Calculator. The ICE Calculator is an electric outage planning tool developed by Freeman, Sullivan & Co. and Lawrence Berkeley National Laboratory. This tool is designed for electric reliability planners at utilities, government organizations or other entities that are interested in estimating interruption costs and/or the benefits associated with reliability or resilience improvements in the United States. The ICE Calculator was funded by the Office of Electricity Delivery and Energy Reliability at the DOE. The ICE calculator includes the cost of an outage for different types of customers. The calculator was extrapolated for the longer outage durations associated with storm outages. The extrapolation includes diminishing costs as the storm duration extends. These estimates for outage cost for each customer are multiplied by the specific customer count and expected duration for each storm for each project to calculate the monetized CMI at the project level.

5. RESILIENCE BENEFIT MODULE

Q. Please provide an overview of the Resilience Benefit Calculation Module

A. The Resilience Benefit Calculation Module of the Storm Resilience Model uses the annual benefit results of the Storm Impact Model and the estimated project costs to calculate the net benefits for each project. Since the benefits for each project are dependent on the type and frequency of major storm activity, the Resilience Benefit Module utilizes stochastic modeling, or Monte Carlo Simulation, to randomly select a thousand future worlds of major storm events to calculate the range of both Status Quo and Hardened restoration costs and CMI. The benefit calculation is performed over a 50-year time horizon, matching the expected life of hardening projects.

The feeder automation hardening project resilience benefit calculation employs a different methodology given the nature of the project and the data available to calculate benefits. The Outage Management System (OMS) includes 20 years of historical data. The resilience benefit is based on the expected decrease in impacted customers if the automation had been in place.

Q. What economic assumptions are used in the life-cycle Resilience Benefit Module?

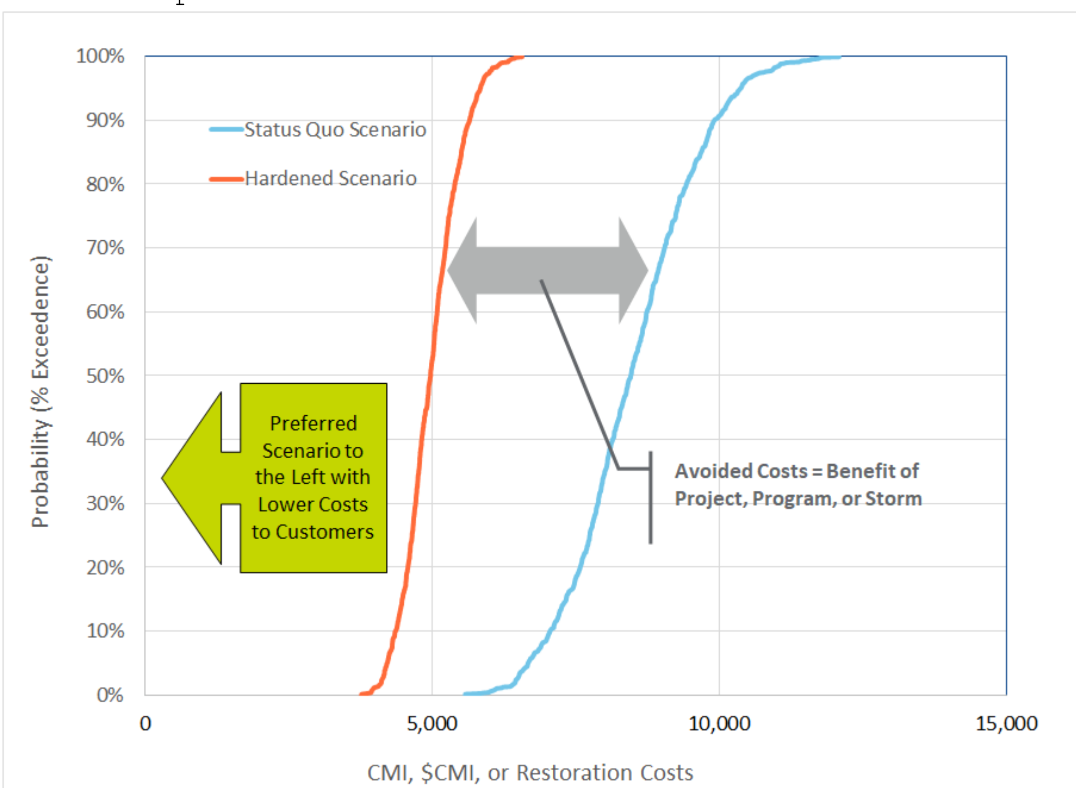
A. The resilience net benefit calculation includes the following economic assumptions.

- 50-year time horizon – most of the hardening infrastructure will have an average service life of 50 or more years.
- 2% escalation rate
- 6% discount rate

Q. How are the resilience results of the Monte Carlo Simulation displayed and how should they be interpreted?

A. The results of the 1,000 iterations are graphed in a cumulative density function, also known as an 'S-Curve'. In layman's terms, the thousand results are sorted from lowest to highest (cumulative ascending) and then charted. Figure 2 shows an illustrative example of the 1,000 iteration simulation results for the Status Quo and Hardened Scenarios.

Figure 2: Status Quo and Hardened Results Distribution Example



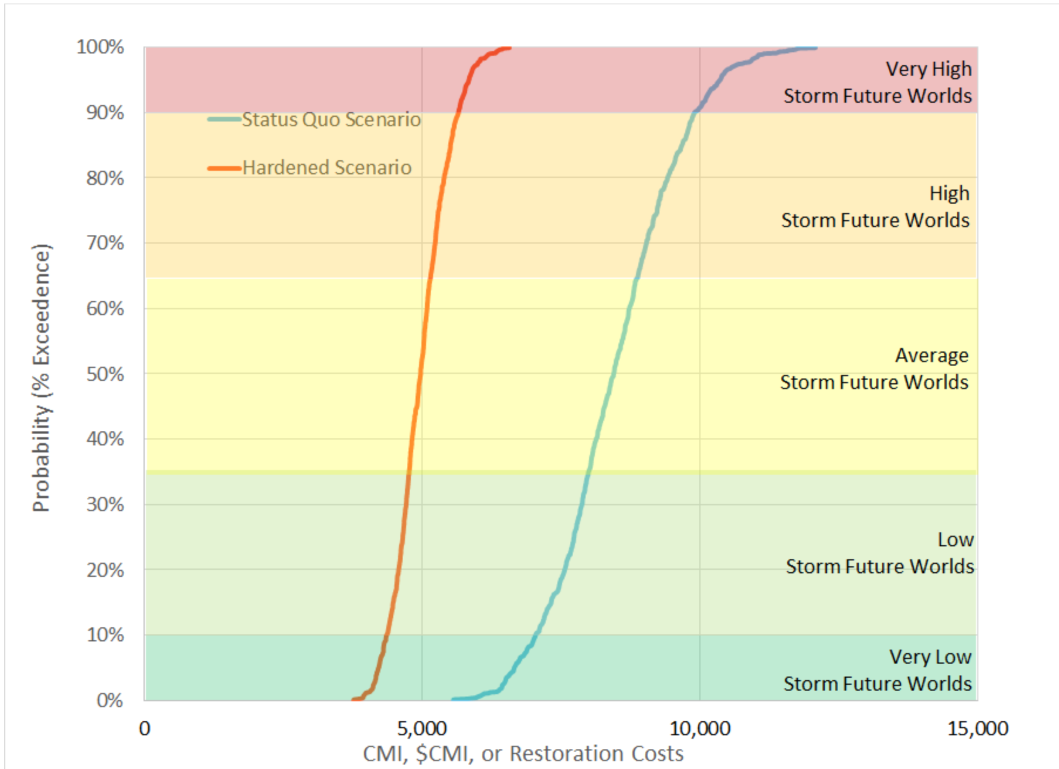
Since the figure shows the overall cost (in minutes or dollars) to customers, the preferred scenario is the S-Curve further to the left. The gap or delta between the two curves is the overall benefit.

The S-Curves typically have a linear slope between the P10 and P90 values with 'tails' on either side. The tails show the extremes of the scenarios. The slope of the line shows the variability in results. The steeper the slope (i.e., vertical) the less range in the result. The more horizontal the slope, the wider the range and variability in the results.

Q. How do S-Curves map to potential Future Storm Worlds?

A. Figure 3 provides additional guidance on understanding the S-Curves and the kind of future storm worlds they represent.

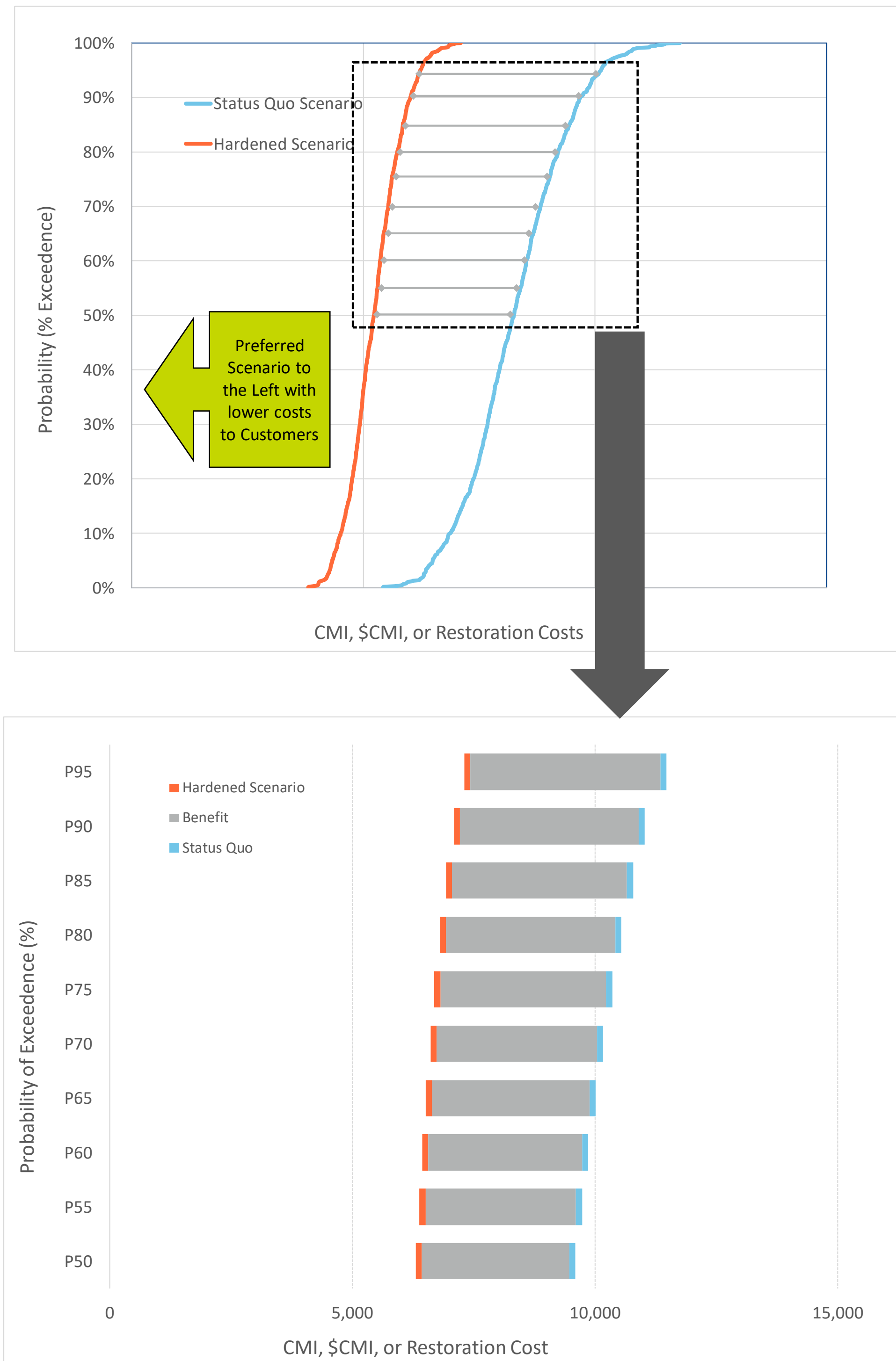
Figure 3: S-Curves and Future Storms



Q. How are the S-Curves used to display the resilience benefit results?

A. For the storm resilience evaluation, the top portion of the S-curves is the focus as it includes the average to very high storm futures, this is referred to as the resilience portion of the curve. Rather than show the entire S-curve, the resilience results will show specific P-values to highlight the gap between the Status Quo and Hardened Scenarios. Additionally, highlighting the specific P-values can be more intuitive. Figure 4 illustrates this concept of looking at the top part of the S-curves and showing the P-values.

Figure 4: S-Curves and Resilience Focus



Q. Please describe the analysis to calculate resilience benefit for automation hardening projects.

A. While many of the other Storm Protection Programs provide resilience benefit by mitigating outages from the beginning, feeder automation projects provide resilience benefit by decreasing the impact of a storm event.

The resilience benefit for feeder automation was estimated using historical Major Event Day ("MED") outage data from the OMS. MED is often referred to as "grey-sky" days as opposed to non-MED which is referenced as "blue-sky" days. Tampa Electric has outage records going back 20 years. The analysis assumes that future MED outages for the next 50 years will be similar to the last 20 years.

For the resilience benefit calculation, the Storm Resilience Model re-calculates the number of customers impacted by an outage, assuming that feeder automation had been in place. The Storm Resilience Model extrapolates the 20 years of benefit calculation to 50 years to match the time horizon of the other projects. Additionally, the CMI was monetized and discounted over the 50-year time horizon to calculate the net present value (NPV). The NPV calculation assumed a replacement of the reclosers in year

25; the rest of the feeder automation investment has an expected life of 50 years or more. The monetization and discounted cash flow methodology was performed for project prioritization purposes.

Q. Please provide an example of this calculation.

A. A historical outage may include a down pole from a storm event, causing the substation breaker to lock out resulting in a four-hour outage for 1,500 customers, or 360,000 CMI (4*1500*60). The Storm Resilience Model re-calculates the outages as 400 customers without power for four hours, or 96,000 CMI. That example provides a reduction in CMI of over 70%.

6. BUDGET OPTIMIZATION AND PROJECT SCHEDULING

Q. How were hardening projects prioritized?

A. All the projects are evaluated and prioritized using the same criteria allowing all 1,588 projects to be ranked against each other and compared. The Storm Resilience Model ranks all the projects based on their benefit cost ratio using the life-cycle 50-year NPV gross benefit value listed above. The ranking is performed for each of the P-values (P50, P75, and P95) as well as a weighted value.

Performing prioritization for each of the four benefit cost ratios is important since each project has a different rate of benefit change between the P50 to P95 values. For instance, many of the lateral undergrounding projects have the same benefit at P50 as they do at P95. Alternatively, many of the transmission asset hardening projects are minorly beneficial at P50 but have significant benefits at P75 and even more at P95. Tampa Electric and 1898 & Co. settled on a weighting of the three values for the base prioritization metric, however, investment allocations are adjusted for some of the programs where benefits are small at P50 but significant at P75 and P95.

Q. How was the overall investment level set and projects selected?

A. In developing the Tampa Electric Storm Protection plan project identification and schedule, the Tampa Electric and 1898 & Co team factored in the following:

- Resilience benefit cost ratio including the weighted, P50, P75, and P95 values.
- Internal and external resources available to execute investment by program and by year.
- Lead time for engineering, procurement, and construction

- Transmission outage and other agency coordination.
- Asset bundling into projects for work efficiencies.
- Project coordination (e.g., project A before project B, project Y at the same time as Project Z)
- Remaining transmission structures left to be converted from wood to non-wood (Transmission Asset Upgrades program)
- Remaining substations (six) identified for extreme weather protection measures

7. RESILIENCE BENEFIT RESULTS

Q. What is the investment profile of the Storm Protection Plan?

A. Table 4 shows the Storm Protection Plan investment profile. The table includes the buildup by program to the total. The investment capital costs are in nominal dollars, the dollars of that day. The overall plan is approximately $1.62 billion, although this table omits a small amount of cost that extends into 2036. Lateral undergrounding makes up most of the total, accounting for approximately 77.7% of the total investment. Feeder Hardening is second, accounting for 17.2%. Transmission upgrades make up approximately 3.74% of the total, with substations making up 1.4%.

Table 4: Storm Protection Plan Investment Profile by Program (Nominal $000)

Year	Lateral Undergrounding	Transmission Asset Upgrades	Substation Hardening	Feeder Hardening	Total
2026	$123,800	$17,300	$3,500	$22,400	$167,000
2027	$121,600	$16,800	$3,200	$28,300	$169,900
2028	$125,000	$16,700	$5,200	$28,100	$175,000
2029	$123,000	$9,600	$800	$28,100	$161,500
2030	$125,000	$-	$8,200	$28,400	$161,600
2031	$120,800	$-	$1,000	$28,300	$150,100
2032	$123,600	$-	$-	$28,300	$151,900
2033	$124,900	$-	$-	$28,100	$153,000
2034	$120,300	$-	$-	$28,000	$148,300
2035	$120,500	$-	$-	$28,100	$148,600
Total	$1,228,500	$60,400	$21,900	$276,100	$1,586,900

Q. What are the restoration cost benefits of the plan?

A. The 50 NPV of future storm restoration costs in a Status Quo scenario from a resilience perspective is $460 million to $1,480 million. With the Storm Protection Plan, the costs decrease by approximately 28% to 30%. The decrease in restoration costs is approximately $130 to $450 million. From a NPV perspective, the restoration costs decrease benefit is approximately 8% to 28% of the project costs.

Q. What are the customer outage benefits of the plan?

A. The customer outage benefits are projected to consist of approximately a 10% decrease in the storm CMI over the next 50 years.

Q. What are the key take-aways from how resilience-based planning assessment was performed?

A. The following are the key take-aways from how the resilience-based planning assessment was performed in the Storm Resilience Model:

- Customer and Asset Centric: The model is foundationally customer and asset centric in how it "thinks" with the alignment of assets to protection devices and protection devices to customer information (number, type, and priority). Further, the focus of investment to hardening all asset weak links that serve customers shows that the Storm Resilience Model is directly aligned with the intent of the statute to identify hardening projects that provide the most benefit to customers. With this customer and asset centric approach, the specific restoration cost saving and impact to customers in terms of CMI benefit, which are required by the statute, can be calculated more accurately.

- Comprehensive: The comprehensive nature of the assessment is best practice; by considering and evaluating nearly the entire T&D system the results of the hardening plan provide confidence that portions of the Tampa Electric system are not overlooked for potential resilience benefit.
- Consistency: The model calculates benefits consistently for all projects. The model carefully normalizes for more accurate benefits calculation between asset types. For example, the model can compare a substation hardening project to a lateral undergrounding project. This is a significant achievement allowing the assessment to perform project prioritization across the entire asset base for a range of budget scenarios.
- Rooted in Cause of Failure: The Storm Resilience Model is rooted in the causes of asset and system failure from two perspectives. Firstly, the Major Storm Event Database outlines the range of storm stressors and the high-level impact to the system. Secondly, the detailed data streams and algorithms within the Storm Impact Model are aligned with how assets fail, mainly

vegetation density, asset condition, wind zone, and flood modeling. With this basis, hardening investment identification and prioritization provides a robust assessment to focus investment on the portions of the system that are more likely to fail in the major storm.

- Drives Prudency: The assessment and modeling approach drive prudency for the Storm Protection Plan in that the business case allows Tampa Electric to invest in the portions of the system that provide the model value to customers.
- Balanced: Since storm events cannot be fully eliminated, the diversification of hardening measures allows Tampa Electric to provide a higher level of system resilience for customers.

Q. What conclusions can be made from the results of the resilience analysis?

A. The conclusions of Tampa Electric’s Storm Protection plan evaluated within the Storm Resilience Model are:

- The overall investment level of $1.62 billion for Tampa Electric’s Storm Protection Plan is reasonable and provides customers with maximum benefits. The projects selected have favorable project economics for the duration of the SPP.

- Tampa Electric's Storm Protection Plan results in a reduction in storm restoration costs of approximately 28% to 30%. In relation to the plan's capital investment, the restoration costs savings range from 8% to 28% depending on future storm frequency and impacts.
- The CMI decreases by approximately 10% over the next 50 years. This decrease includes eliminating outages all together, reducing the number of customers interrupted by individual outages, and decreasing the length of the outage time.
- The cost associated with purchasing the reduction in storm CMI (that is, the total Investment less the Restoration Cost Benefits) is in the range of $1.98 to $3.46 per minute. This entire range is less than the outage costs derived from the DOE ICE Calculator and less than the typical 'willingness to pay' found with customer surveys.
- Tampa Electric's mix of hardening investment strikes a balance between investment in the substations and transmission system targeted mainly at increasing resilience for the high impact / low probability events and investment in the distribution system, which is impacted by all ranges of event types.

- The hardening investment will provide additional 'blue sky' benefits to customers not factored into this report.

8. CONCLUSION

Q. Does this conclude your prepared verified direct testimony?

A. Yes.

1898 & Co.

Jason De Stigter, PE

Director - Utility Investment Planning

Jason leads the Utility Investment Planning business line at 1898 & Co., part of Burns & McDonnell. In this role, Jason is responsible for business development, marketing, staff training and development, solution and product development, and overall project delivery within the business line. The Utility Investment Planning business line supports electric utilities in developing long-term investment plans and portfolios to meet one or all of the following objectives: 1) aging infrastructure, 2) reliability, 3) resilience or system hardening, and 4) electrification. The business line owns solutions and tools around each of offerings to produce data-driven decisions. Jason is the main architect and solution developer of the data-driven analytic solutions for each of the four offerings.

Jason has 17 years of extensive experience in performing business case evaluation on a variety of project types helping utility clients with difficult investment decisions. Jason also has a deep financial and economic analysis background and specializes in business case evaluation and risk assessment and management for utility client. Jason has extensive experience modeling risk for utility industry clients. His modeling experience includes developing complex and innovative risk analysis models using industry leading risk analysis software tools employing Monte Carlo simulation and Optimization algorithms. His experience includes performing risk and economic analysis engagements for several multi-billion-dollar capital projects and large utility systems for aging infrastructure, system resilience, reliability and distribution automation, and electrification. Jason also serves as expert witness for many of these engagements supporting the full regulatory process.

Education

B.S. / Engineering
B.A. / Business Administration

Registrations

- Professional Engineer (KS)

8 years with 1898 & Co.
17 years of experience

Visit my LinkedIn profile.

1898 & Co.

TESTIMONY/REGULATORY FILING EXPERIENCE

Utility Company	Regulatory Agency	Docket No. | Year	Subject
Texas-New Mexico Power	Public Utility Commission of Texas	56954 | 2024 Direct Testimony (pg. 746-771) Filing/Sponsoring Report (pg. 435-645)	System Resiliency Plan (SRP) 2025-2027
Ohio Power Company (AEP Ohio)	Public Service Commission of Ohio	24-787-EL-RDR | 2024 Direct Testimony (pg. 1-13) Filing/Sponsoring Report (pg. 27-50)	gridSMART® Phase 3 DACR Project
Entergy Texas	Public Utility Commission of Texas	56735 | 2024 Direct Testimony (pg. 52-71) Filing/Sponsoring Report (pg. 84-193)	Texas Future Ready Resiliency Plan (Phase 1)
FirstEnergy Pennsylvania Electric Company	Pennsylvania Public Utility Commission	R-2024-3047068 | 2024 Rebuttal Testimony Not Publicly available	Enhanced Vegetation Management Program Benefit Cost Analysis
Oncor	Public Utility Commission of Texas	56545 | 2024 Direct Testimony (620-649) Filing/Sponsoring Report (pg. 229-460) Rebuttal Testimony Case has an initial settlement agreement	System Resiliency Plan (SRP) 2025-2027
Baltimore Gas & Electric	Maryland Public Service Commission	9692 | 2023 1898 Technical Report (No. 1 Apte Direct Testimony pg. 137-276) Rebuttal Testimony (No. 71) Oral Testimony	2024 – 2026 Mutli-Year Plan (MYP): Resilience Investment Plan
Southern Indiana Gas and Electric Company	Indiana Utility Regulatory Commission	45894 | 2023 Direct Testimony Rebuttal Testimony Waived on providing Oral Testimony	CIE South Transmission Distribution Storage System Improvement Charge (TDSIC) Plan
Entergy New Orleans	New Orleans City Council	UD-21-03 | 2022 *Testimony not provided, case is still pending	2023-2033 Storm Resiliency Plan
Entergy Louisiana	Louisiana Public Service Commission	U-36625 | 2022 Direct Testimony Filing/Sponsoring Report LPSC Approved First 3 Yrs or the plan	2023-2033 Storm Resiliency Plan
Tampa Electric Company (TEC)	Florida Public Service Commission	20220048-EI | 2022 Direct Testimony (412-485) Filing/Sponsoring Report (141-222) Oral Testimony Provided	2022 – 2031 Storm Protection Plan (SPP)
Oklahoma Gas and Electric Company (OG&E)	Oklahoma Corporation Commission	202100164 | 2022 Direct Testimony (1-45)	Grid Enhancement Business Case for 2020 & 2021 Investment

Utility Company	Regulatory Agency	Docket No. | Year	Subject
		Filing/Sponsoring Report (46-181) Rebuttal Testimony Not in Public Domain	
Tampa Electric Company (TEC)	Florida Public Service Commission	20200067-EI | 2020 Direct Testimony (549-623) Filing/Sponsoring Report (100-180) Rebuttal Testimony (72-105)	2020 – 2029 Storm Protection Plan (SPP)
Indianapolis Power & Light Company (now AES Indiana)	Indiana Utility Regulatory Commission	45264 | 2019 Direct Testimony Filing/Sponsoring Report Rebuttal Testimony Oral Testimony Provided	Indianapolis Power & Light Company Transmission Distribution Storage System Improvement Charge (TDSIC) Plan

Additionally, Jason testified in front of the State of Alaska Senate and House Resource committees on project economics and challenges of the AKLNG project.

PROJECT EXPERIENCE

System Resiliency Plan (SRP) Analysis & Investment Study – Benefit Cost Analysis / Texas New Mexico Power (TNMP)

Texas / 2024-Current

Project director and Witness for performing a cost benefit evaluation of resiliency investments for TNMP's System Resiliency Plan (SRP) for $750 million of distribution investment over the 2025 to 2027 time horizon. The project utilized 1898 & Co.'s Integrated Resilience & Risk Investment Model to develop and prioritize projects on a cost benefit perspective. The model employed data-driven analyses and robust algorithms to calculate the resilience benefit of over 10,500 potential resilience investments in terms of the range of reduced restoration costs and customer minutes interrupted (CMI). The modeling included building the relationships between NOAA weather data, historical OMS records, and GIS infrastructure data to understand the relationship between various weather events (thunderstorms, ice storms, blizzards, heat events, etc.) the number of customers impacted and the infrastructure vulnerability. The model then utilized this relationship to forecast future events and estimate the life-cycle impacts of not investing in the distribution system and with investments. 1898 & Co. evaluated distribution overhead hardening investments, protection modernization, vegetation management, and flood mitigation. The results of the project included a protection zone and circuit level benefit cost results for all 10,500 protection zones and 337 circuits on TNMP's system. The 1898 & Co. resilience benefit assessment report and Jason written testimony were included in the filing. 1898 & Co. is supporting the regulatory process to include responding to data requests and interrogatories.

Distribution Automation Circuit Reconfiguration Phase 3 Benefit Cost Analysis / AEP Ohio

Ohio / 2024-Current

Project director and Witness for performing a cost benefit evaluation for potential distribution automation circuit reconfiguration (DACR) investments across the AEP Ohio system. The project evaluated nearly 1,500 circuits across the system for investments in recloser deployment, new tie lines, and reconductoring. It also considered the effectiveness of each scheme. The evaluation identified over 330 circuits where the customer benefits are in excess of costs. The 1898 & Co. investment benefits cost assessment report and Jason written testimony were included in the initial filing. 1898 & Co. is supporting the regulatory process to include responding to data requests and interrogatories.

Enhanced Vegetation Management Benefit Cost Analysis Evaluation/ FirstEnergy Pennsylvania Electric Company

Pennsylvania / 2024

Project director and Witness for performing a scenario benefit cost evaluation for FirstEnergy Pennsylvania's Enhanced Vegetation Management program that is part of their rate case. The evaluation estimated the monetized customer benefits based on historical outage records for a range of improvement scenarios. The evaluation showed that an improvement of approximately 20-25 percent in vegetation related outages provides benefits in excess of costs for customers. Jason provided rebuttal testimony.

System Resiliency Plan (SRP) Benefit Cost Analysis and Plan Development / Oncor

Texas / 2024-Current

Project director and Witness for performing a cost benefit evaluation of resiliency investments for Oncor's System Resiliency Plan (SRP) for $3.4 billion of distribution investment over the 2025 to 2027 time horizon. The project utilized 1898 & Co.'s Integrated Resilience & Risk Investment Model to develop and prioritize projects on a cost benefit perspective. The model employed data-driven analyses and robust algorithms to calculate the resilience benefit of over 175,000 potential resilience investments in terms of the range of reduced restoration costs and customer minutes interrupted (CMI). The modeling included building the relationships between NOAA weather data, historical OMS records, and GIS infrastructure data to understand the relationship between various weather events (thunderstorms, ice storms, blizzards, heat events, etc.) the number of customers impacted and the infrastructure vulnerability. The model then utilized this relationship to forecast future events and estimate the life-cycle impacts of not investing in the distribution system and with investments. 1898 & Co. evaluated hardening investments, modernization, inspections, and vegetation management. The results of the project included a substation level benefit cost results for all 850+ substations on Oncor's system. The 1898 & Co. resilience benefit assessment report and Jason written testimony were included in the initial filing. Jason supporting the regulatory process to include responding to data requests and interrogatories. Jason also provide rebuttal testimony. The parties have a settlement agreement that is pending commission approval.

10 Year Storm Resiliency Plan / Entergy Louisiana

Louisiana / 2022-Current

Project director for developing and providing justification for Entergy Louisiana's 2024-2033 10-year Storm Resiliency Plan for its transmission and distribution system to mitigate the impact of major events. The project utilized 1898 & Co.'s Storm Resilience Model to develop and prioritize projects on a cost benefit perspective. The model employed data-driven analyses and robust algorithms to calculate the resilience benefit of over 150,000 storm hardening projects in terms of the range of reduced restoration costs and customer minutes interrupted (CMI). The Storm Resilience Model organized the system into 50 mile by 50 mile system sections and models 49 storm events against each section and estimates which parts of the system will fail in each storm event.

The model evaluates each project before and after hardening for both an overhead hardening and underground conversion. The model further utilizes Stochastic Model to simulate storm events and calculate resilience benefits. Finally, the model performs budget optimization to identify ideal investment levels and prioritize projects. The 1898 & Co. resilience benefit assessment report and Jason written testimony were included in the filing. Jason is supporting the regulatory process to include responding to data requests and interrogatories.

Resiliency Multi-Year Plan / Baltimore Gas & Electric

Maryland/ 2022-2023

Project director for developing distribution resiliency portfolio of overhead hardening and underground conversions for Baltimore Gas & Electric. Jason led the effort to identify and justify investments for the 2024 through 2026 time horizon. The project utilized 1898 & Co.'s Resilience Investment Model to develop and prioritize projects on a cost benefit perspective. The model employed data-driven analyses and robust algorithms to calculate the resilience benefit hardening projects and alternatives in terms of the range of reduced restoration costs and customer minutes interrupted (CMI). The output of the analysis included three years of specific distribution investments in overhead hardening and underground conversions and the benefits for those projects. 1898 & Co. provided a technical report that was included as an exhibit to BGE's witness. 1898 & Co supported the discovery process, provided rebuttal testimony, and testified on the stand in August 2023. The case was decided in December 2024. The resilience investment will be evaluated separate from the MYP.

Transmission Distribution Storage System Investment Charge Plan Development/ Southern Indiana Gas and Electric

Indiana / 2021-2023

Project director for developing the portfolio of investment projects for a Southern Indiana Gas and Electric, a CenterPoint company. Jason is leading the effort to identify and justify investments in transmission, substation, and distribution systems over the next 5 years. The evaluation leveraged 1898 & Co.'s AssetLens Analytics Engine, an asset investment planning tool to evaluate the life-cycle benefits of replacing Transmission and Distribution (T&D) infrastructure and deploying smart devices across the distribution system. The analysis leveraged utility datasets (GIS, OMS, distribution circuit models, asset management systems, condition records, customer counts and profiles) inside the engine's aging infrastructure and reliability analytics. The project included data cleansing, organizing, linking, and transformation and configuration of the holistic risk framework across poles, conductor spans, line transformers, breakers, power transformers, relays, and other assets classes. Jason submitted direct and rebuttal testimony, supported the discovery process. He was waived from oral testimony. Southern Indiana Gas & Electric got their full TDSIC plan approved.

Distribution Automation Plan Development / Confidential Client

Midwest / 2022-Current

Project director for developing and providing justification for a distribution automation circuit configuration investment portfolio for a Midwest Investor-Owned Utility. The evaluation utilized 1898 & Co.'s reliability and distribution automation analytics model inside our AssetLens Analytics Engine, an asset investment planning tool to evaluate the life-cycle benefits of replacing Transmission and Distribution (T&D) infrastructure and deploying smart devices across the distribution system. The analytics model estimates the expected benefit of deploying distribution automation to every circuits factoring in scheme effectiveness due to tie-line constraints and conductor capacity. The business case monetized the outage improvement and estimated the project cost to include new reclosers, associated communications upgrades, new tie lines, and conductor upgrades. Jason will serve as the expert witness and sponsor the technical report. The case is expected to be filed in May 2023.

Grid Investment Plan Benefits Assessment / Confidential IOU

Midwest / 2022 - 2023

Project director for development of the benefits assessment for a $2.6 billion grid investment plan. The plan includes investments in distribution circuit upgrades, distribution automation, substation rebuilds, capacity rebuilds, and low voltage conversions to improve reliability and resilience, manage long-term costs, modernize for the future, and decrease risk. The engagement include mapping investments to the underlying asset infrastructure, calculating the benefits using the AssetLens Analytics Engine analytics models, and developing the business case for over 6,000 different investment activities across 6 programs. The analysis and results are formalized within a technical report that will be submitted within the public record.

Grid Enhancement Investment Plan Benefits Assessment / Oklahoma Gas & Electric

Oklahoma / 2021-2022

Project director for development of the benefits assessment for OG&E's 2020 and 2021 Grid Enhancement Plan. The plan includes investments in distribution circuit upgrades, distribution automation, and substation rebuilds totaling nearly $250 million. Jason organized the business case framework including the linkage of investments to benefits approaches and calculating the life-cycle benefits in terms of decreased customer outages and avoided restoration costs. Jason also served as the expert witness for the benefits assessment and has provided direct testimony sponsoring the technical report, supported interrogatories and data requests, and provided rebuttal testimony. OG&E settled the case in June 2022.

2022-2031 Storm Protection Plan Resilience Assessment / Tampa Electric Company

Florida / 2021-2022

Project director for supporting the development of TEC's 2022-2031 10-year Storm Protection Plans for its transmission and distribution system in accordance with Florida Statute 366.96. This project is an update to the original 2020-2029 10-Yr Storm Protection Plan. The project utilized 1898 & Co.'s Storm Resilience Model to develop and prioritize projects on a cost benefit perspective. The model employed data-driven analyses and robust algorithms to calculate the resilience benefit of over 20,000 storm hardening projects in terms of the range of reduced restoration costs and customer minutes interrupted (CMI). The Storm Resilience Model models nearly 100 storm events and estimates which parts of the system will fail in each storm event. The model evaluates each project before and after hardening. The model further utilizes Stochastic Model to simulate storm events and calculate resilience benefits. Finally, the model performs budget optimization to identify ideal investment levels and prioritize projects. The 1898 & Co. resilience benefit assessment report and Jason written testimony were included in the filing. Jason supported the regulatory process to include responding to data requests and interrogatories. Jason testified in hearings in Tallahassee in early August 2022. The commission approved nearly all of TEC investment plan.

Long-term Portfolio Development / Public Service New Mexico

New Mexico / 2021-Current

Project director for developing the portfolio of investment projects for Public Service New Mexico (PNM). Jason led the effort to identify and justify investments in PNM's transmission, substation, and distribution systems over the next 20 years. The evaluation leveraged 1898 & Co.'s AssetLens Analytics Engine, an asset investment planning tool to evaluate the life-cycle benefits of replacing Transmission and Distribution (T&D) infrastructure and deploying smart devices across the distribution system. The analysis leveraged PNM datasets (GIS, OMS, distribution circuit models, asset management systems, condition records, customer counts and profiles) inside the engine's aging infrastructure and reliability analytics. The project included data cleansing, organizing, linking, and transformation and configuration of the holistic risk framework across poles, conductor spans, line transformers, breakers, power transformers, relays, and other assets classes. The evaluation organized all PNM's assets into over 20,000 projects. The risk framework allowed for the calculation of benefit in financial terms across each of the 20,000 projects from, specifically the mitigated reactive and restoration costs and the monetization of customer outages. Finally, the project included budget optimization to identify the point of diminishing returns to provide valuable management insights into the level of needed investment in the system over the next 20 years. The overall investment level is confidential. PNM is currently executing the projects that resulted from the evaluation and moving their overall investment levels to manage system risk.

2020-2029 Storm Protection Plan Resilience Assessment / Tampa Electric Company

Florida / 2019-2020

Project director for supporting the development of TEC's 2020-2029 10-year Storm Protection Plans for its transmission and distribution system in accordance with Florida Statute 366.96. The projects utilized 1898 & Co.'s Storm Resilience Model to develop and prioritize projects on a cost benefit perspective. The model employed data-driven analyses and robust algorithms to calculate the resilience benefit of over 20,000 storm hardening projects in terms of the range of reduced restoration costs and customer minutes interrupted (CMI). The Storm Resilience Model models nearly 100 storm events and estimates which parts of the system will fail in each storm event. The model evaluates each project before and after hardening. The model further utilizes Stochastic Model to simulate storm events and calculate resilience benefits. Finally, the model performs budget optimization to identify ideal investment levels and prioritize projects. Tampa Electric Company $1.5 billion 10-year plan was approved in September 2020. The 1898 & Co. resilience benefit assessment report and Jason written testimony were included in the filing. Jason supported the regulatory process to include responding to data requests and interrogatories. He also provided rebuttal testimony. Tampa Electric settled with the interveners.

Grid Investment Business Case / Confidential IOU

Southeast / 2021

Project director for development of a business case for all grid investment planned projects over the next 10 years. Business case evaluated both mitigated life-cycle reactive and restoration costs and monetization of customer outages. Investments included traditional rebuilds for reliability and resilience purposes, distribution automation, communications, and deployment of new technologies. The business case was used for internal executive management approvals.

Distribution Investment Plan Development with AssetLens / Evergy

Missouri and Kansas / 2019-Current

Project director for configuration and implementation of AssetLens for Evergy's distribution system across multiple states and jurisdictions. AssetLens is an asset investment planning software developed by 1898 & Co. to 1) automate project identification in T&D systems using typical utility data set and 2) provide business justification for all projects in life-cycle NPV benefit terms. The software ingests a range of datasets to include GIS, OMS, distribution circuit models, asset management systems, condition records, customer counts and profiles and performs the necessary cleansing, transformation, and linking. Jason led the effort to configure the risk framework analytics that estimate the risk adjusted life-cycle costs and customer impact for all T&D asset classes including poles, pole tops, primary conductor spans, primary underground sections, secondary cable, line transformers, manholes, conduit, splices in manholes, network assets and more. The analytics employ a risk-based methodology across a range of failure types (various probabilities and consequences) to calculate the annual risk costs for a Status Quo and Investment scenario. Life-cycle risk costs include a range of reactive and restoration costs and the monetization of customer outages. The evaluation organized assets into over 100,000 potential projects and scheduled investments to maximize benefit given budget, schedule, and other technical constraints. The overall investment level is confidential. AssetLens visualizes the project plan geospatially providing specific assets for replacement with the business case results for each project. Evergy's distribution engineering teams has been using AssetLens to develop work orders and executive the project plan. It was also used to support their regulatory filing to the Missouri commission.

Distribution Automation Plan Development / Confidential IOU

Central Midwest / 2021-Current

Project director for development of a distribution automation investment plan for the next 5 years. The project involved using GIS and outage records to circuits that would provide the most benefit from the deployment of reclosers. The effort included estimating the number of devices for each circuit and placement of devices for the first few years of the plan. The business case results include the estimated decrease in customer outages and monetization of the outages for an investment business case. The utility is currently developing work orders for 2022 projects.

Overhead and Underground Business Case Development / Confidential IOU

Upper Midwest / 2021-Current

Project director for development of a business case comparing overhead rebuilds to a new modern standards or undergrounding. The business case was performed from a life-cycle cost perspective and impact to customers over a range of events to include extreme weather. The business case evaluated a range of areas of the system to include urban, rural, and suburban. The result of the evaluation may be used for responding to regulators requests.

Long-term Investment Plan Development / Confidential IOU

Midwest / 2021

Project director for identification and justification of distribution circuit and substation investments for a long-term investment plan. The evaluation utilized the AssetLens Analytics Engine to evaluate a range of investment options across the grid, establish 'ideal' investment levels, and provide direction to the 'ideal' split of investment across the system. The utility utilized the study to help develop their long-term investment plan for executive management approval and regulatory strategy.

Distribution Automation Business Case Pilot / Confidential IOU

Midwest / 2021

Project director for a pilot study on distribution automation project identification and justification. The evaluation performed 8760 modeling to understand system overloading constraints to performing automated load transfer schemes. The constraints analysis was utilized in the business case assessment to understand the percentage of time the scheme could operate and provide benefits to customers and if there was a business case to make other grid investments to unlock potential overloading constraints.

Distribution Reliability Investment Plan Development with AssetLens / Confidential IOU

Midwest / 2020-Current

Project director for development of a 10-year distribution investment plan focused on improving overall system reliability and delivery of AssetLens. The data and analytics-based planning approach included the cleansing, organizing, transformation, and linking of GIS, OMS, distribution circuit models, customer data, and condition information. The planning analytics included evaluation of the benefits and costs of rebuilding each protection zone, over 40,000, across they system. Benefit profiles included the mitigated reactive and restoration costs and decreased customer outages monetized using the DOE ICE Calculator. The project also included budget optimization to identify the long-term need for investment. The overall investment level is confidential. The client's distribution engineering team is currently utilizing the AssetLens solution to build work orders from the projects identified. The client is also moving toward the more 'ideal' long-term investment levels to manage system risk.

Long Term Electric Transmission and Distribution Capital Plan / Indianapolis Power & Light

Indiana / 2017-2019

Project manager for developing IPL's asset risk model. The asset risk model includes transmission circuit, substation, and distribution circuit assets. The asset risk model was used to identify and prioritize asset replacements for nearly $750 million of the $1.2 billion filing. Jason developed an innovative approach for modeling distribution circuit risk down to the span level. For the risk model, Jason developed an integrated and holistic probability and consequence of failure framework to evaluate any asset consistently. The approach has allowed IPL to prioritize investment across transmission and distribution and substations and circuits. The analysis included using Burns & McDonnell's proprietary capital optimization algorithm to group assets into projects and prioritize projects to maximize risk reduction benefit. Burns & McDonnell prepared two reports that are part of IPL's public record filing. Jason also provided written (direct and rebuttal) and oral testimony. The entire plan (100%) was approved in February of 2020.

Grid Modernization Engineering Study / Entergy

Louisiana/Mississippi/Arkansas/Texas / 2016–2019

Entergy is embarking on a new approach to electric distribution planning, design and engineering to meet the future needs of its customers. The new approach includes developing modernize electric distribution equipment, engineering and design, and construction standards to drive value throughout the supply chain from material purchasing, inventory, system design, and construction. Additionally, the grid modernization approach leverages a modern holistic distribution asset and capital planning process with associated tools (DNV GL's Synergy) to facilitate efficient and robust performance and risk assessment of Entergy's electric distribution system. The approach identifies the portfolio of issues facing a family or cluster of distribution feeders and then develops the ideal portfolio of projects to address to improve feeder performance, cost, and risk.

Project manager for the business case evaluation and capital project prioritization aspects of Grid Modernization Engineering Study for Entergy. For the portfolio of projects, Jason developed a robust business case methodology that calculates risk reduction benefits, reliability improvement, and operational efficiency (i.e. fewer truck rolls) to justify each capital investment.

Entergy intends to use the results of the engineering study to propose a list of grid modernization project to consider for regulatory approval and funding. Additionally, these projects and the holistic planning approach will be the first step in an evolutionary change to build Entergy's grid of the future, ready for the next generation of consumers and system performance.

69 kV Wood Pole Replacement Program Evaluation / Salt River Project (SRP)

Phoenix, Arizona / 2017–2018

Project manager for evaluation of the 'ideal' level of 69 kV wood pole replacement SRP should execute each year. The effort includes development of an asset risk model, including risk framework, and various replacement strategies that maximize risk reduction while also maintaining overall budget levels. The final outcome will include the risk mitigated for the whole portfolio over 30 years for a range of budget levels to identify an 'ideal' overall investment rate.

PRIOR EXPERIENCE

Capital and Operations & Maintenance (O&M) Budget Prioritization / Tulsa Metropolitan Utility Authority (TMUA) Utility Enterprise Initiative

Tulsa, Oklahoma / 2013-2016

Project manager for the Capital Prioritization and Optimization task of TMUA's Asset Management implementation initiative, Utility Enterprise Initiative. He used a 'Project Prioritization and Optimization' solution for several water and wastewater projects as part annual cycle phased approach (executed three of four phases). Jason was responsible for leading workshops with engineering and maintenance staff, developing business case approaches for each water/wastewater project, performing Monte Carlo and optimization simulations, and developing strategies for the Utility's capital improvement plan (CIP) during a period of tight budget constraints to minimize rate increases. TMUA was working toward codifying the process and tool into their own annual budget and rates process. As such, Jason was responsible for developing users guide documentation and holding training on the process and tool for TMUA.

2017 Executive Asset Management Plan Alternatives Evaluation / Washington Suburban Sanitation Commission (WSSC)

Laurel, Maryland / 2015

Project manager for alternatives evaluation to support WSSC in the development of their 2017 Enterprise Asset Management Plan Business Case. Effort included developing forecasted 30-year capital plans optimizing on level of service, risk and cost. WSSC utilized the results of the evaluation to develop long term forecasts of capital improvements for communication to decision make Capital Prioritization Pilot Project / Salt River Project (SRP)

Project Prioritization / Salt River Project

Arizona / 2013-2014

Subject matter expert for this pilot study for SRP to prioritize and optimize several electrical generation, transmission and distribution planned investments. Allowed SRP management the opportunity to further develop and improve upon their current budget processes and to consider adopting the solution enterprise-wide. Jason's responsibilities included developing business case approaches for several of the pilot study projects and supporting workshops.

Long Term Electric Transmission and Distribution Capital Plan / Duke Energy

Indiana / 2014-2015

Subject matter expert and manager for development of a risk-based electric T&D capital plan that included Duke's long-term electric transmission and distribution (T&D) investments. This work provided evidence of how Duke's investments in its system provided risk reduction benefits and focused spending on high risk assets. As a capital prioritization and risk subject matter expert, he also developed capital plan profiles and resulting risk reduction solutions which were key to showing the value of the 7-year capital plan.

Long Term Electric Transmission and Distribution Capital Plan / Northern Indiana Public Service Company (NIPSCO)

Indiana / 2013-2014

Subject matter expert for development of a long-term $1 billion plus capital plan for NIPSCO's electric T&D infrastructure. A system risk model was developed to analyze and score asset risk across the T&D system for NIPSCO. The model highlighted the risk reduction benefits achieved through NIPSCO's long-term asset replacement program, which is focused on addressing high-risk assets that are nearing the end of their useful life.

Capital Prioritization System Master Plan / Hetch Hetchy Water and Power

California / 2009, 2011, 2012

Primary consultant for this system master plan, developing the analysis and prioritization of recommended capital and O&M projects for the Hetch Hetchy power, transmission and civil asset system. The process utilized a risk-based approach to economically schedule investments to maximize risk reduction given a certain budget constraint. The Hetch Hetchy Reservoir system lies within the scenic Yosemite National Park and provides electricity and water storage for the San Francisco Public Utility Commission.

Capital Project Prioritization with Risk Assessment / Colorado Springs Utilities

Colorado Springs, Colorado / 2008

Primary analyst on an innovative capital project prioritization process for Colorado Springs Utilities' Raw Water System. The engagement applied the Strategic Value Creation process to quantify the physical and financial parameters of capital and O&M projects identified for the utility's raw water system. A wide variety of projects and risk were then prioritized to develop the system capital improvement plan while considering utility risk tolerance, budget constraints and other planning criteria. Monte Carlo simulations were used to quantify the physical and financial parameters of each individual project, and the projects are evaluated and ranked using a consistent and transparent approach.

Jason was responsible for performing the Monte Carlo analysis, understanding the risks of each CAPITAL and O&M project, and prioritizing the projects to reduce the overall risk to the client.

Alaska Liquefied Natural Gas (AKLNG) Economic and Risk Analysis / State of Alaska Departments of Natural Resources and Revenue

Alaska / 2013-2016

Project manager responsible for economic and risk analysis for the AKLNG project on behalf of the State. In this role, Jason developed analysis to explore various project questions and negotiating position to better understand the perspective of each project sponsor and the best position for the State. He routinely developed materials to present to the commissioners of the departments or Natural Resources and Revenue, the State of Alaska legislature, negotiating teams, and the governor's office. On a few occasions, Jason has testified to the state of Alaska legislature of the economics and risks associated with the AKLNG project.

Deep Tunnel Sewerage System (DTSS) Phase 2 Resiliency Assessment / Singapore Public Utilities Board (PUB)

Singapore / 2014-2015

Subject matter expert for an alternative's resiliency assessment of several deep tunnel sewerage systems alternatives for Singapore PUB. In his role for this engagement, Jason created an innovated approach to evaluating the resiliency of several tunneling alternatives including total risk weighted level of service and cost over the asset's life cycle. The assessment identified several key risks impacting each alternative then quantifying the likelihood and the level of service and cost impacts of each risk. Employing Monte Carlo simulation, the risk cost and discount to level of service scores were calculated to develop a range of potential benefit cost ratios for each alternative. Singapore PUB utilized the process and results to identify a preferred alternative and move forward with key design decisions.

Kirkwood Penstock Risk Evaluation / Hetch Hetchy Water and Power

California / 2014

Project manager for a risk assessment of HHWP's critical Kirkwood Penstock which over 80% of San Francisco Bay's water supply moves through. The risk assessment following guidelines set out by the United States Bureau of Reclamation including a failure modes and effects analysis applying a qualitative scoring-based approach to evaluate the likelihood and consequence of failure for each failure mode. HHWP utilized the results of the evaluation to prioritize investment needs to ensure reliability of this critical asset.

Business Case Evaluation and Risk Analysis / Hampton Roads Sanitation District (HRSD, Wastewater Utility)

Virginia / 2011-2012

Business case evaluation and lead risk consultant for this long-term evaluation of the business case and associated risk of alternative wastewater system master plans. Working with Hampton Roads' senior management team, Jason evaluated the economics and risk of alternative strategic long-term wastewater system expansion plans related to biosolids management, which involved hundreds of millions of dollars in capital and O&M expenditures. This developed a long-term strategy that is now being used to optimize short- and long-term implementation plans for HRSD's wastewater system.

Conveyance Alternative Risk Assessment / Metropolitan Water District

California / 2010

Primary consultant for this engagement which analyzed several water conveyance options for the California State Department of Water Resources. This analysis was focused on capital cost and schedule risk of different multi-billion-dollar canal and tunnel conveyance alternatives. Jason was the risk specialist for the Environmental team for the risk assessment workshop. Utility decision-makers utilized the results to more fully understand the risk inherent in each alternative to decide on a preferred alternative.

Integrated Water Power Plant Economic and Regulatory Assessment / Public Authority for Electricity and Water of Oman

Oman, Middle East / 2009-2010

Primary analyst for the economic and regulatory (tariff) modeling of a new, highly efficient integrated water & power plant. Jason's responsibilities included performing economic and tariff modeling of several different desalination and power plant alternatives and presenting final results to the Chairman of the Public Authority for Electricity and Water of Oman.

AGIA Economic and Risk Modeling / State of Alaska Department of Natural Resources (DNR)

Alaska / 2009-2010

Primary analyst for this economic and risk modeling assignment for the State of Alaska DNR. Analysis included modeling and evaluation of different natural gas pipeline project risk factors, as well as risk mitigation measures the state has within its control. The results of the analysis assisted the State of Alaska in negotiations with other pipeline stakeholders.

Black & Veatch's Energy Market Perspective Emissions Modeling

Overland Park, Kansas / 2012-2013

As part of Black & Veatch's annual release of its Energy Market Perspective, Jason developed a fundamental economic model to calculate emissions prices based on the EPA's Cross State Air Pollution Rule.

Commercial Modeling and Analysis / Alaska Gasline Development Corporation (AGDC)

Anchorage, Alaska / 2010-2011

Lead consultant for ongoing commercial and tariff modeling for AGDC's analysis of in-state pipeline alternatives. This modeling included sensitivity and scenario analysis, midstream tariff modeling, and stakeholder cash flow analysis.

Black & Veatch's Energy Market Perspective

Overland Park, Kansas / 2009-2011

The Energy Market Perspective developed by Black & Veatch uses an integrated market modeling approach to develop price forecasts for energy and natural gas prices. The modeling team, which included Jason, developed forecasts for CO2 taxes, energy demand and peak demand, generation retirements, generation expansion, renewables buildout and transmission expansion. Using these forecasts, the integrated market model used an interactive process of a production cost model for electric prices and a fundamental market model for natural gas prices.

Jason's principal responsibilities included developing forecasts, running and understanding the production cost model for a large region in the United States, and drawing conclusions for the region. The main forecasts Jason developed included energy and peak demand, generation retirements, generation expansion, and transmission expansion. Furthermore, Jason was responsible for developing the final report for the regional perspective.

Alaska Gasline Inducement Act (AGIA) Net Present Value (NPV) and Risk Analysis / State of Alaska Departments of Natural Resources and Revenue

Alaska / 2007-2008

In 2007, the state of Alaska passed the Alaska Gasline Inducement Act (AGIA). This act created a framework for the State to issue a license to build a 1,400 mile pipeline to transport natural gas from the North Slope of Alaska to either the North American market or elsewhere.

Uncertainty for a project of this size (over $30 billion) is understandably significant. In order to quantify this significant uncertainty, risk analysis was performed explicitly with the NPV model to evaluate the level of project risk to the various stakeholders due to various assumptions such as commodity prices, capital cost escalation, project schedule uncertainty, and reserve risk.

Jason performed economic, risk and financial analysis for several different stakeholders for the proposed projects and several sensitivities and alternative scenarios. Jason's main responsibilities included model development/creation, Monte Carlo risk modeling, and understanding risk for each stakeholder. He also performed financial analysis, data validation, and report and presentation support.

Socioeconomic Analysis, Riverbend Unit 3 and Fermi Unit 3 Nuclear Licensing Project / Entergy and Detroit Edison

Louisiana and Michigan / 2007-2008

Senior analyst served as an economist for a detailed socioeconomic analysis associated with the construction and operating license application (COLA) process for Entergy and Detroit Edison. He was responsible for developing population distributions; population projections; demographic characteristics to include age, sex, race and income; transient population distributions; and community characteristics for the surrounding area. Jason was also responsible for writing and reviewing significant portions of the COLA

Market and Economic Analysis / Termobarranquilla

Colombia, South America / 2007-2008

As a senior analyst, Jason provided market analysis, economic analysis and a discounted cash flow model to evaluate the worth of the Termobarranquilla power plant after an energy market restructuring in Colombia. He was responsible for developing an energy market model, economic dispatch model, discounted cash flow model and writing the report.

Taylor Energy Center Need for Power Application / Various Clients

Florida / 2006

Jason performed production costing, economic analysis and other support to facilitate the completion and filing of the Taylor Energy Center (TEC) Need for Power Application (NFP). The NFP provided a determination of the most cost-effective capacity addition to satisfy forecasted capacity requirements for the four separate utilities participating in the project while maintaining consistency with the Florida Public Service Commission statutory requirements. The analysis considered self-build and purchase-power alternatives.

Portfolio of Wind Farms and Coal Fired Plants / Sembcorp Industries Pte Ltd.

China / 2011

Lead consultant to Sembcorp Industries Pte (buy-side), in support of their potential acquisition of an equity position in a Chinese investment company (confidential). This engagement required due diligence site visits and technical and commercial review of a wind portfolio and coal fired generation plant in Shanxi Province, Hebei Province, and Inner Mongolia Autonomous.

Water and Wastewater Utility Independent Engineer's Report / Confidential Client

2011

Primary consultant assisted and prepared an independent engineer's report for a confidential client seeking to divest its portfolio of water and wastewater utilities. The report provided an overview of the systems, the major sources of supplies, rates, and environmental and regulatory issues. Major facilities were evaluated to document the condition of specific utilities. A final report was prepared and delivered to the client for use in its divestment proceedings.

Combined Cycle Due Diligence / Confidential Client

California / 2011

Jason was involved with the technical due diligence of 1,000 megawatt (MW) combined-cycle power plant in the state of California. Jason was responsible for reviewing maintenance and performance reports on plant equipment and safety along with O&M and energy management agreements. Jason also developed the corresponding report sections that summarized the results of the analysis.

Engineer's Report / Philadelphia Gas Works (PGW)

Philadelphia, Pennsylvania / 2010-2011

Lead consultant on the engineer's reports developed for PGW's last two revenue bond issues for $165 million and $150 million, respectively. Proceeds from the bond issues funded needed capital improvements to PGW's distribution system and LNG facilities. The engineer's report summarized the findings of a study of PGW's facilities, management, operations, gas supply, rates and marketing, and customer service, and assessed the financial feasibility of the bond issue.

E.ON US Portfolio Due Diligence, Various Coal, Gas and Hydroelectric Power Plants / E.ON

Kentucky, United States / 2010

Jason performed technical due diligence for the potential sales of approximately 9,500 MW coal, gas and hydroelectric generating assets in the state of Kentucky. Jason was responsible for reviewing maintenance and performance reports on plant equipment and safety along with O&M and energy management agreements. Jason also developed the corresponding report sections that summarized the results of the analysis.

Technical Due Diligence / Con Edison Development, Inc.

2007

Jason performed a technical due diligence assessment of certain power generation facilities in the northeast United States. He was responsible for developing power plant performance sections of the assessment and reviewing O&M, power purchase, maintenance, gas supply, oil supply, electrical interconnection and water supply agreements.

PUBLICATIONS AND PRESENTATIONS

- *Asset Management: A Framework for Maximized Value*, published and featured in Burns & McDonnel's quarterly BenchMark article in 2020. (Video and quoted)

- How IPL Created an Optimized Capital Plan to manage risk across the entire T&D system, published and presented at the 2020 DistribuTECH conference. (Co-Author)
- How IPL solved the challenges of modeling linear assets in their asset risk model by leveraging GIS, published and presented at the 2020 DistribuTECH conference. (Co-Author)
- Capital Planning for Grid Modernization, Building the Grid of Tomorrow, 2018 EUCI course presenter. (Co-presenter)
- *Changing the Way the Grid's Future is Planned*, published Burns & McDonnell white paper in 2017. (Co-Author)
- Monetizing Risk Helps Tulsa Optimize Capital Investments, published in the July 2016 Journal American Water Works Associate (JAWWA). (Co-Author)
- Monte Carlo Simulations Take The Chance Out Of Investment Decisions, published in the April 2016 Breaking Energy. (Co-Author)
- Monetizing Risk – Capital Investment Prioritization and Optimization for Tulsa Metropolitan Utility Authority, published at the 2016 Utility Management Conference. (Co-Author)
- Priorities: Getting the Most From Your Capital Improvement Plan, published in the May 2015 Florida Water Resources Journal. (Author)
- Monetizing Risk – A Capital Investment Prioritization and Optimization Model, presented and published at the 2015 Texas Water Conference. (Co-Author/Presenter)
- How to Get More Reliability Bang from Your Capital Spending Buck, presented and published at the 2014 Florida Water Resources Conference. (Co-Author/Presenter)
- Triple Bottom Line and Monte Carlo Simulation: Business Case Evaluation Methodologies and Testing Sensitivities: Understanding Economic Models and Uncertainty in Results, presented at the 2013 WEFTEC conference workshop titled "WERF Barriers to Biogas Workshop: Learn to Use the Right Economic Methodologies to Evaluate Cost-Saving Projects". (Presenter)
- The Challenge of Regulatory Compliance and Multiple Facility Upgrades – A Progressive System Approach, presented and published at the 2012 WEFTEC conference proceedings. (Co-Author)
- Asset Management and Maintenance Strategies – Balancing Costs and Risk, poster presentation and published at Hydrovision 2011 conference. (Co-Author)